City of Winnipeg

Comprehensive Assessment of the City of Winnipeg Water System as it Relates to Recent Boil Water Advisories
FINAL REPORT

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April 30, 2015

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Dear Ms. McCombe:

Project No: 60340679

Regarding: Comprehensive Assessment of the City of Winnipeg Water System as it Relates to Recent Boil Water Advisories

Please find attached our Final Report for the Comprehensive Assessment of the City of Winnipeg Water System as it Relates to the Recent Boil Water Advisories. This Final Report incorporates comments from the City and Province; however the primary findings remain unchanged from our Draft Report submission.

We sincerely thank you for the significant effort put forward by City staff in compiling the data required to undertake the Assessment. Our work would not have been possible without your input.

Sincerely,
AECOM Canada Ltd.

S.R.(Ray) Bilevicius, M.A.Sc., P.Eng.
Associate Vice-President, Operations Manager, Manitoba Water

SRB:SH:td
Encl.

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	SAH	March 30, 2015	Final Draft
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AECOM Signatures

Report Prepared By:

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Abbreviations

AECOM	AECOM Canada Ltd.
AGI	Acute Gastrointestinal Illness
ALS	ALS Canada Ltd.
APHA	American Public Health Association
AWWA	American Water Works Association
BFP	Back Flow Preventers
BWA	Boil Water Advisory
CALA	Canadian Association for Laboratory Accreditation
CFU	Colony-Forming Unit
City	City of Winnipeg
CPL	Cadham Provincial Laboratory
DS	Distribution System
DWQSR	*Drinking Water Quality Standards Regulation*
EC	*Escherichia coli*, *E. coli*
GCDWQ	*Guidelines for Canadian Drinking Water Quality*
GI	Gastrointestinal
GM	Guidance Manual
HPC	Heterotrophic Plate Count
hrs	Hours
km	Kilometre
L	Litre
m	Metre
mg	Milligram
ML	Megalitre
mL	Millilitre

MLD	Megalitre per Day
mm	Millimetre
MPNU	Most Probable Number
NTU	Nephelometric Turbidity Unit
ODW	The Manitoba Office of Drinking Water
POE	Point of Entry
POU	Point of Use
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
QC	Quality Control
RTCR	Revised Total Coliform Rule
RTCR GM	Revised Total Coliform Rule Guidance Manual
SOP	Standard Operating Procedures
SR	Service Request
SWI	Supporting Work Instructions
SWP	Safe Work Procedure
TC	Total Coliform
TCR	Total Coliform Rule
Turb	Turbidity
USEPA	United States Environmental Protection Agency
WRHA	Winnipeg Regional Health Authority
WTP	Water Treatment Plant
WWD	City of Winnipeg Water & Waste Department
UV	Ultraviolet

Executive Summary

Water samples collected from the City of Winnipeg (City) water distribution system on January 26, 2015, and analyzed by the contract laboratory ALS Canada Ltd (ALS) on January 26, 2015 showed a highly unusual pattern of detection for Total Coliform (TC) and *Escherichia coli* (*E.coli*, EC). Of the 42 samples collected, 6 were positive for TC, and of these 6, 5 were positive for EC. Heterotrophic Plate Counts (HPC), free chlorine residuals, and turbidity levels (all indicators of bacterial water quality) were normal, as were other water quality and system operations parameters. The Medical Officer of Health for the Winnipeg Regional Health Authority (WRHA) issued a precautionary boil water advisory for the City of Winnipeg, which was lifted after two days of repeat samples produced normal results (no TC/EC positive samples, and continued normal levels of turbidity, free chlorine residuals, and HPC). The Manitoba Office of Drinking Water (ODW) followed on February 3, 2015 with an order to: *"…carry out an investigation of the water system which shall be completed in accordance with the US Environmental Protection Agency's Revised Total Coliform Rule Assessments and Corrective Actions Guidance Manual (September 2014) … adapted as necessary to accommodate the regulatory regime in Manitoba.*" The City retained AECOM Canada Ltd. (AECOM) to lead the investigation.

The overall investigation included initial assessments and detail review of the entire water system from supply to distribution to sampling and laboratory procedures. While water quality events such as these can be difficult or impossible to ultimately explain with certainty, this investigation concluded that it was very unlikely that the water supply was contaminated or that public health was at risk.

The preliminary investigations were conducted by AECOM to identify areas of the water system that presented a vulnerability and for which more detailed analysis was required. City staff compiled records on water quality, water sampling locations, water system facilities, and water system operations and maintenance data and provided them to AECOM. These data were reviewed and a preliminary report was provided to the City on February 18, 2015.

AECOM conducted a review of select City facilities and processes on February 24-27, 2015 during which time the sampling procedures, laboratory analytical procedures, and several key facilities were observed. Results of the site visit were summarized and presented to City staff on February 27, 2015 at which time various scenarios were developed to systematically evaluate all data and information pertinent to the January 26, 2015 event, noting that this event was the most recent and conditions affecting the event were readily available. Also reviewed were conditions surrounding two positive TC/EC events that occurred in 2013 and 2014.

Facilities review sheets (as requested by ODW) were completed for facilities near the sample sites that tested positive for TC/EC. These assessments included investigations of sampling sites (investigation of plumbing, cross connections, filters), pumping stations, water reservoirs, distribution system infrastructure (air relief valves, valve chambers, pipe materials), groundwater wells, operations and maintenance activities, pressure monitoring, and environmental factors. City staff provided computer simulations of typical distribution system hydraulic patterns, along with records on distribution system (DS) operation and maintenance activities, customer water quality complaints, and facilities in the DS. City staff provided graphical illustrations of these data to allow analysis of associations between any suspect activities/facilities and the positive water quality samples of January 26, 2015.

The major findings of the facility reviews are summarized as follows:

- Operations and maintenance records were reviewed for any activities that might have been associated with a potential contamination of the water supply. System records were reviewed and found to be normal for the 2 weeks prior to the January 26, 2015 event.
- An evaluation of the City's Standard Operating Procedures (SOP) and Safe Work Procedures (SWP) as they relate to distribution system maintenance was conducted. Overall, it was noted that SOPs and SWPs were robust, although some greater documentation and regular review was recommended.
- A hydraulic modelling analysis was conducted by the City that evaluated flow patterns during the day of the January 26, 2015 event. Based on a hydraulic analysis of likely contamination scenarios, the probability that a single contamination event can be attributed to the January 26, 2015 event is low.
- Discoloured water complaint data for 2 weeks prior to the January 26, 2015 event were examined to see if there was any correlation between discoloured water and the event. No link could be found between historical discoloured water complaints and historical positive bacteriological samples.
- Cross connection inspections were conducted at each of the sampling locations where positive TC/EC samples were collected. These inspections provided no indication of a problem associated with the January 26, 2015 event.
- Pressure monitoring points were evaluated to determine if significant pressure losses in the distribution system occurred. No unusual pressure readings/losses were noted immediately before or after the January 26, 2015 event. All available system pressure readings were found to be within acceptable ranges.
- An evaluation of the air relief system and its associated valve pits was conducted in order to review the possibility of air release valves having played any part in the January 26, 2015 event. While some deficiencies were noted, no evidence of direct contamination related to the January 26, 2015 event was found.
- Groundwater wells upstream of positive sampling points showed no record of cross connection, impacting the January 2015 event.
- No confirmed extreme changes in reservoir levels were noted, or were likely to be a cause of contamination.

While no major system deficiencies were found a number of recommendations for improvement were identified for existing facilities, sampling and analytical procedures and documentation.

Independent reports were also secured regarding laboratory and sampling processes associated with the January 26, 2015 event. A number of areas for improvement were noted.

To gain insight into the possible causes of the positive TC/EC detections of January 26, 2015 and to focus efforts on the assessment, all available data and records were systematically reviewed against a series of hypothetical contamination scenarios to identify how these data tended to support or refute each scenario analyzed. Three general contamination scenarios were considered; single point, multiple point, and sampling/laboratory.

Single Point-Source of Contamination: In this scenario, the source of the contamination occurred at a single point-source in the DS, resulting in the positive TC/EC samples observed. Review of the data indicated that this particular scenario was highly unlikely, noting:

- The detection of contamination at sample locations on January 26, 2015 followed by the disappearance of contamination on January 27, 2015 is not consistent with normal flow patterns and water travel time in the DS. Computer simulations indicate that the age (time of travel) of water at the sample sites which tested positive on January 26, 2015 varies by as much as two days, presenting an impossible timeline if associated with a single contaminant source flowing through the system, particularly considering the presence of a strong chlorine residual;

- The geographical location of positive samples surrounded by negative samples was inconsistent with contaminated water flowing through the pipes;
- Other water quality parameters (normal chlorine, low HPC, low turbidity) associated with the positive samples are not consistent with a contamination of the DS; and
- Public health data provided no indication of a widespread contamination of the DS.

Multiple Point-Sources of Contamination: in this scenario, a surge or drop in pressure triggered multiple point sources of contamination randomly spread throughout the DS. Under this scenario, the pattern of detection and disappearance of the contamination in 24 hours is plausible, if it is assumed that the surge disturbed contaminant-laden sediment in the bottom of the pipes, or allowed contaminated water to flow into the DS as the lower pressure associated with a surge passed through the system. The disappearance of the contamination is consistent with the presence of a strong chlorine residual in the DS, which would have been effective in killing microbes introduced during the event. This scenario could have been triggered by a hydraulic condition consistent with a power failure at one of the pumping stations, a large break in the DS, or the rapid closing of a large valve in the DS. A review of all available operations data indicated that this scenario was highly unlikely, noting:

- No significant events were observed in the DS capable of providing such a hydraulic surge;
- Turbidity data were normal, indicating that there was no sediment stirred up in the positive samples;
- Pressure readings at the 11 pressure monitoring stations (recorded every 2 minutes) indicated no period of unusually low or high pressures during the 2 week period prior to January 26, 2015; and
- As with the single source scenario, none of the other water quality or public health data indicated that a contamination event occurred in the DS.

It was thus concluded that it was highly unlikely that any contamination event occurred in the DS itself, and that other than the TC/EC water quality analyses, all other water quality and operational data indicated no public health risk was associated with the positive EC results of January 26, 2015.

Sampling/Laboratory Contamination Scenario: it is plausible that contamination was inadvertently introduced into samples collected and analyzed on January 26, 2015. The samples could have been contaminated randomly, and thus not be associated with the time of collection or the geographic location of the samples, consistent with what was observed. This scenario is also consistent with public health data, which provided no evidence consistent with contamination in the DS. The other water quality data collected with the samples (HPC, chlorine residual, and turbidity) are consistent with what would be expected in certain sampling/lab contamination scenarios, as noted below:

- Two City staff collected the 42 samples taken on January 26, 2015; all of the positive samples were taken by a single sample collector and those samples were analyzed on January 26, 2015. The second sample collector samples were analyzed on January 27, 2015. This implicates either the one sample collector, or the lab analysis on the January 26, 2015.
- In a sample collection contamination event, it is typically expected that HPC and TC data are both elevated, but in this event the HPC samples were normal and counter-indicative of a sample-collection related contamination;
- In a sample collection contamination event, normal chlorine levels would be expected, as the sample is dechlorinated as soon as it enters the sample bottle. Thus normal chlorine readings, which are

taken immediately prior to bacterial sampling, would be expected in both a sample collection contamination or a laboratory contamination event; and

- The mixed genetic strains found in the 5 positive EC samples are indicative of a complex contaminant source containing multiple strains of EC, as opposed to a single strain of EC. This indicates that it is unlikely that the source of contamination was the positive control used by the laboratory; but may have been a complex source of contamination from either a sample collection or lab event.

Conclusion and Recommendations

It is impossible to retrospectively prove or disprove any of the above scenarios. Water quality data, operational records, and public health records, however, provide compelling evidence that the positive TC/EC samples detected on January 26, 2015 did not originate in the distribution system, and were not indicative of a contamination event of the City water supply. A similar conclusion was drawn from the data trends from the October 2013 event.

It appears most likely that the source of the positive samples originated in either a sample collection or laboratory contamination event. Available data are no more convincing for either of these two possibilities, and expert reviews are split regarding which is the most likely.

The event of May 2014 involved only one positive sample, and thus the possibility of a localized contamination event cannot be definitively ruled out. The presence of a strong chlorine residual, low turbidity, no operations or maintenance issues and negative repeat samples, along with no indication of an increase in public health impact, favor a scenario where the positive sample was caused by sample collection or laboratory contamination.

The facility assessment and sampling/analysis process review resulted in a number of recommendations for improvement, many of which have been implemented or are underway. The recommendations include:

- An annual review focussing on system water quality vulnerability. This review should be performed by City staff involving a cross section of appropriate employees most familiar with the processes as performed in the field, along with managers and supervisors.
- Periodic evaluation of the water system SOPs and practices in the field. This review should be conducted annually in order to reflect the most current standards and best practices. The City's current operational procedures generally follow good industry practice.
- Remediation of minor contamination risks identified in the City's facilities, including reservoirs and valve chambers.
- Improvements in the sampling collection and laboratory analysis processes.
- A periodic review of vulnerabilities to the sampling points should be considered to ensure changes to plumbing are not affecting tested water quality. Such a review should be conducted as part of an annual assessment, and would likely require its own Standard Operating Procedure.
- An evaluation of the City's quality control (QC) process should be conducted to improve sample collection, start to finish.
- Determining the business case for the creation of an in-house general testing facility within the City's facilities.
- Working with the third party analytical laboratory conducting water quality testing to identify and reduce the possibility of contamination at the laboratory.

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1. Introduction

The City of Winnipeg (City) water system consists of a raw water intake and pumping station located at Shoal Lake on the Manitoba / Ontario border; an estimated 136 km long aqueduct that conveys water from Shoal Lake to four raw water reservoirs; a water treatment plant consisting of a raw water pumping station, dissolved air flotation clarification, ozonation, biologically activated carbon filtration, residuals treatment, chemical feed and storage, a clearwell, a booster pumping station, ultraviolet (UV) disinfection, fluoride addition, and orthophosphate addition for corrosion control; two branch aqueducts feeding three treated water reservoirs (Wilkes, MacLean and McPhillips); and three booster pumping stations that deliver water through a vast array of underground piping.

The City's raw water supply is being treated to meet provincial standards under conditions laid out in the water system Operating Licence. These include the *Manitoba Drinking Water Safety Act* (C.C.S.M. c. D101), the *Drinking Water Safety Regulation* (M.R. 40/2007), and the *Drinking Water Quality Standards Regulation* (DWQSR) (M.R. 41/2007). While provincial regulations regarding water quality supersede federal regulations, the *Guidelines for Canadian Drinking Water Quality* (GCDWQ) also dictate various water quality standards under the DWQSR. Of particular importance is the requirement to have less than one detectable Total Coliform (TC) and *Escherichia coli* (*E.coli*, EC) per 100 mL of treated water.

Water samples collected from City's water distribution system on January 26, 2015 showed a highly unusual pattern of detection for TC and EC. Of the 42 samples collected, 6 were positive for TC, and of these 6, 5 were positive for EC. HPC (heterotrophic plate counts) counts (a general indicator of microbial water quality) and free chlorine residuals (also an indicator bacterial water quality) were normal, as were other water quality and system operations parameters. The Medical Officer of Health for the Winnipeg Regional Health Authority (WRHA) issued a precautionary boil water advisory, which was lifted after two days of repeat upstream/downstream samples produced normal results (no TC/EC positive results, and continued normal levels of turbidity, free chlorine residuals, and HPC). The ODW followed on February 3, 2015 with an order, in accordance with The Drinking Water Safety Act, to: *"…carry out an investigation of the water system which shall be completed in accordance with the U S Environmental Protection Agency's Revised Total Coliform Rule Assessments and Corrective Actions Guidance Manual (USEPA RTCR) (September 2014) … adapted as necessary to accommodate the regulatory regime in Manitoba."* This Guidance Manual (GM) states that the assessment should include a review of:

- Samples, sampling sites and sampling procedures in the area near positive sample(s);
- Operational data and water quality data;
- Operational activities and unusual activities;
- Distribution system components (e.g., pipes, valves, pumps, etc.);
- Storage facilities;
- Treatment facilities; and
- Source water,

and further that:

> *"…the assessment form must describe sanitary defects detected, corrective actions completed, and a proposed timetable for any corrective actions not completed. If no sanitary defects were identified, systems may also note in their form that no sanitary defects were identified."*

ODW directed that the assessment be completed by a qualified professional engineer registered to practice in Manitoba with assistance from City staff. ODW further confirmed on February 4, 2015 that a Level 2 assessment under the GM was to be performed. ODW also requested that EC events from May, 2014 and October 2013 be included in the assessment.

The City engaged AECOM Canada Ltd. (AECOM) with the task of leading this assessment. Mr. Steve Hubbs, PE, was retained under a sub-contract with AECOM to direct and write the assessment report.

One of the first steps in the assessment was to prioritize facilities for evaluation by analyzing likely scenarios for the cause of the January 2015 event, noting that this event was the most recent and conditions affecting the event were readily available. City staff compiled records on water quality, water sampling locations, water system facilities, and water system operations and maintenance data and provided them to AECOM. These data were reviewed, and a preliminary report was generated. A site visit was scheduled February 24-27, 2015 during which the sampling procedure, laboratory analytical procedure, and several key utility facilities were observed. Results of the site visit were summarized and presented to City staff on February 27, 2015 at which time various scenarios were further developed to systematically evaluate all data and information pertinent to the event. City staff provided computer simulations of typical distribution system hydraulic patterns, and produced graphical illustrations of major facilities and maintenance work activities.

Based on the scenarios developed at the February 27, 2015 meeting with City staff, facilities were identified that would be evaluated in the assessment, according to the format provided in the GM. These facilities included:

- All sampling stations;
- Air relief valve pits near sample locations positive for TC and subject to flooding;
- Four high-risk potential cross connection locations with backflow preventers near the positive sites;
- Facilities near the positive sites that were subject to field maintenance in the two weeks prior to January 26, 2015; and
- Any other facilities that were considered possibly associated with the January 26, 2015 event, including the laboratory.

Records and facility evaluations collected in this assessment are found in the Appendices. This assessment report is structured as a systematic evaluation of the likely causative scenarios, based on observations, data analysis, and records provided by City staff and independent reports. In addition to the TC samples found positive on January 26, 2015, positive samples reported for TC and EC on May 26, 2014 and October 7, 2013 were also included in this assessment and analyzed using the same structured approach.

2. Data Compilation and Analysis

Consistent with the requirements of the GM, historical data for all RTCR compliance monitoring activities were provided for a period from January 1, 2010 through February 11, 2015. These data were analyzed for comparison to the USEPA Total Coliform Rule (TCR) database (37 states data for the year 2005) (US Data). A brief summary of these data is provided in the **Table 1**.

Table 1: Summary of the City of Winnipeg TCR Compliance Data and Comparison to US Data

	# Samples	TC+	% TC+	# EC+	% EC+
USEPA TCR database (2005)	1,642,162	38,773	**2.36%**	1353	**0.082%**
City of Winnipeg-Excluding January 26, 2015	11,096	42	**0.38%**	3	**0.027%**
City of Winnipeg-Including January 26, 2015	11,138	50	**0.45%**	8	**0.072%**
Louisville, KY(2005) (pop. 740,000)	3,606	5	**0.14%**	1	**0.028%**

These data indicate that excluding the event of January 26, 2015, the City compliance data compares favourably to results across the US and to a similarly sized US city. Prior to this event, the City had experienced only 3 compliance samples positive for EC in the past 5 years.

Compliance data collected during the October 7, 2013 event, the May 26, 2014 event and the January 26, 2015 event that were positive for TC are presented in **Table 2**. These data indicate that an unusually large number of samples were both TC and EC positive, despite the presence of a good chlorine residual, low turbidities, and, with the exception of one sample (SW12, May 26, 2014), low HPC counts. For all three events, samples collected the previous week and repeat samples on the two days following were all negative for TC and EC, with all other water quality parameters in normal ranges.

Table 2: Positive TC/EC Compliance Samples Collected 2010 - 2015

Sample Name	Date Sampled	Free Chlorine (mg/L)	Turb (NTU)	EC (MPNU/ 100 mL)	TC (MPNU/ 100 mL)	HPC (CFU/mL)
SW-07	26-Jan-15	0.74	0.17	1	1	<10
SE-04	26-Jan-15	0.78	0.31	1	3	<10
SE-03	26-Jan-15	0.76	0.25	1	4	<10
NE-01	26-Jan-15	0.49	0.26	1	5	<10
NE-07	26-Jan-15	0.96	0.19	9	53	<10
NE-06	26-Jan-15	0.95	0.31	<1	1	<10
SW-12	26-May-14	0.94	0.10	11	201	1390
SE-07	07-Oct-13	0.38	0.13	2	4	<10
SE-08	07-Oct-13	0.57	0.20	3	8	<10
SW-07	07-Oct-13	0.74	0.26	<1	3	<10
SE-05	07-Oct-13	0.67	0.26	<1	3	<10

Under the USEPA Revised Total Coliform Rule (RTCR) of 2014, violations of the rule occur when more that 5% of TC samples are positive in any given month, or when a given sample location is positive for TC for two consecutive days, with one of these samples also being EC positive. By this definition, the data from January 26, 2015 would not trigger a RTCR violation, as the repeat samples were negative (no sample locations were positive on consecutive days). However, the number of TC/EC positive samples was highly irregular and warranted follow up from the ODW as regulator and the City as utility.

HPC, free chlorine residual, and turbidity data were further analyzed over the 5 year period and for the October 7, 2013, May 26, 2014 and January 26, 2015 events to provide insight into the events. Free chlorine residuals would be expected to decrease in the presence of any significant contamination event; this trend wasn't observed during the October 7, 2013, May 26, 2014 and January 26, 2015 events. To evaluate the possibility of artificial bias in the chlorine dataset, the frequency distribution for free chlorine residuals over the 5 year period was reviewed for abnormal truncation at lower levels of reported data (indicative of an artificially biased dataset). As shown in **Figure 1**, no abnormalities were observed, with the shape of the distribution fitting a normal distribution and indicative of a reliable dataset.

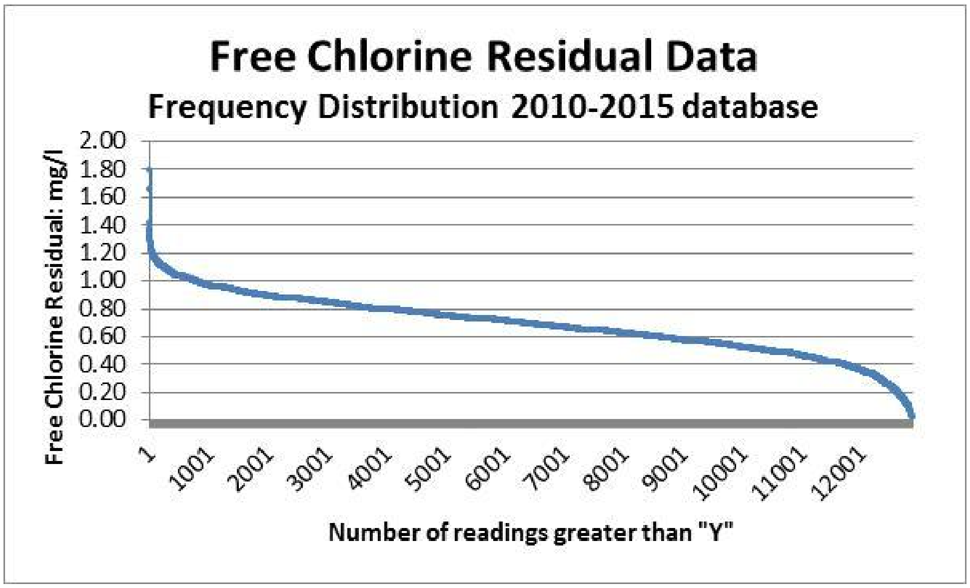


Figure 1: Frequency Distribution of Free Chlorine Residual Data, 2010-2015.

Chlorine residual data for the two-week period prior to and including the October 7, 2013 event were analyzed and found to be representative of very good water quality, with the average and minimum free chlorine levels at 0.69 mg/L and 0.24 mg/L respectively. HPC values for the same period represented very good water quality, with 114 of 132 samples below the detection limit of 10 CFU per mL, and a maximum HPC level of 260 CFU per mL on September 23, 2013.

Chlorine residual data for the two-week period prior to and including the May 26, 2014 event were analyzed and found to be representative of very good water quality, with the average and minimum free chlorine levels at 0.88 mg/L and 0.15 mg/L respectively. HPC values for the same period represented very good water quality, with 159 of 168 samples below the detection limit of 10 CFU per mL, and a maximum HPC level of 50 CFU per mL on May 20, 2014.

Chlorine residual data for the two-week period prior to and including the January 26, 2015 event were analyzed and found to be representative of very good water quality, with the average and minimum free chlorine levels at 0.77 mg/L and 0.16 mg/L respectively. HPC values for the same period represented very good water quality, with 151 of 160 samples below the detection limit of 10 CFU per mL, and a maximum HPC level of 330 CFU per mL on January 19, 2015.

One possible explanation for the unusual pattern of TC/EC positives during the January 26, 2015 event was that sediment-imbedded TC/EC was re-suspended in pipes during some unobserved hydraulic event, resulting in a "pulse" of sediment and the observed spike in TC/EC detections. To evaluate this possibility, data on turbidity and chlorine residuals from the main flushing database were analyzed to determine if there was an association between suspended sediment (as indicated by turbidity levels) and decreased free chlorine levels (which might be associated with the possible presence of TC/EC). Data presented in **Figure 2** indicates no such correlation, with a correlation coefficient (R^2) near zero. Noting that chlorine residuals and turbidity levels were normal for the two weeks prior to the January 26, 2015 event, and that increases in sediment levels have no apparent impact on chlorine residuals, the available chlorine and turbidity data provided no support for a TC/EC contamination scenario involving re-suspension of sediment in the distribution system.

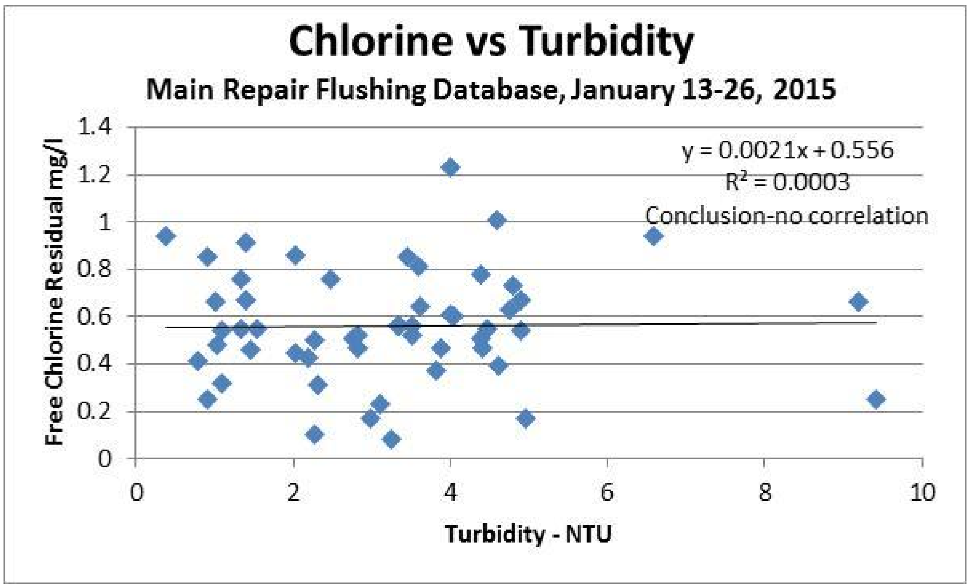


Figure 2: Free Chlorine Vs Turbidity from the Main Flushing Database

In addition to the TCR compliance database, the City database of non-compliance monitoring (additional samples taken beyond what is required by regulation from January 1, 2010 – February 11, 2015) was analyzed in detail for possible clues to the January 26, 2015 event. This database includes records from 5044 samples from 19 locations in the distribution system throughout the City. TC, EC, and HPC are measured at each location weekly. As of October 2013 chlorine residuals were measured at these locations as well. Data from the compliance database were combined with data from the non-compliance database for further analysis. This combined database provided 16,531 samples for analysis; a rich database for statistical analysis.

HPC values from the combined dataset are provided in **Figure 3**. Of the 16,088 analyses of HPC in the dataset, 89% were reported as <10 CFU/mL, indicating very good water quality. HPC values reported as <10 CFU/mL were arbitrarily assigned a value of 5 to allow graphing on the log-scale in **Figure 3**. Higher HPC levels tended to be reported in warmer weather months. HPC levels reported over the 5 year period provided no indication of problematic distribution system biofilm or sediment-attached microorganisms.

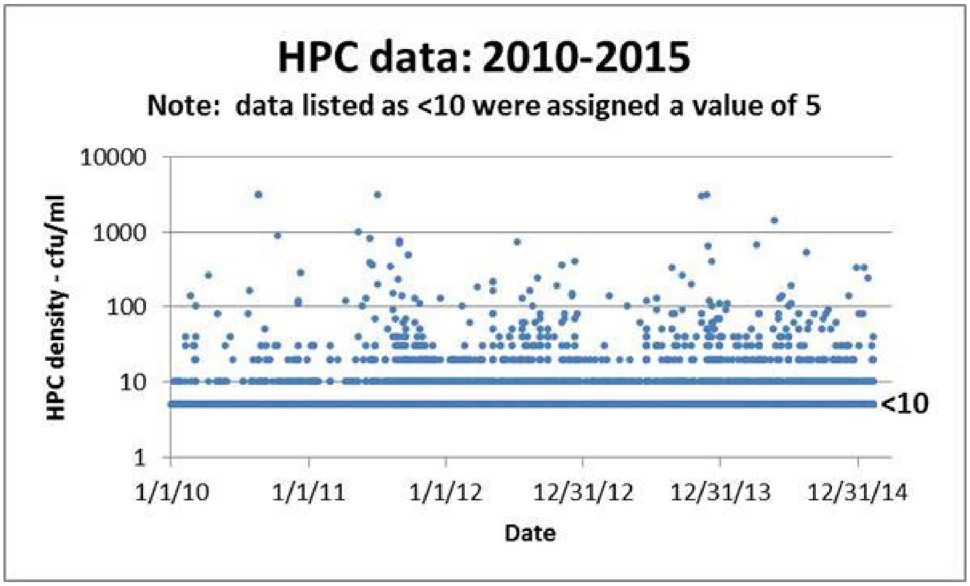


Figure 3: HPC Data from January 1, 2010 through February 11, 2015.

Data from the 2010-2015 combined dataset were sorted and parsed to a subset that contained matched pairs of quantified HPC data (reported above the detection limit) and free chlorine data. A total of 1350 matched pairs of data were graphed to determine if there was an association between increased HPC levels and decreased chlorine residuals (**Figure 4**). The correlation coefficient (R^2) of near zero indicates that there was no observed correlation between HPC and free chlorine residuals. Only two data points (the first two on the x-axis) represent an expected trend of higher HPC with lower chlorine residuals, with chlorine residuals of 0.02 and 0.05 mg/L, respectively. Chlorine residuals below 0.1 mg/L are considered to be near the detection limit for field analysis. This analysis indicates that if a short-term pulsed sanitary contamination of the distribution system had occurred, it would be possible to detect elevated HPC levels even in the presence of measurable chlorine residual. However, no HPC were detected and free chlorine residuals were normal from the samples which tested positive on January 26, 2015, which is counter-indicative of a contamination event in the distribution system. This same trend was observed for the October 2013 event. HPC levels were high in the May 2014 event, which more closely resembles expected trends from an environmental contaminant source that could have originated in the DS, the sampling process, or the lab process.

The review of over 16,000 samples in the 5 year period prior to and including the January 26, 2015 event provided no indication that the City distribution system was contaminated on January 26, 2015 other than the positive TC and EC samples. The January 26, 2015 finding of positive TC and EC in several samples coincident with normal free chlorine levels and low HPC levels, however, is consistent with a sanitary contamination in the sample collection and/or analysis processes. Data trends from the October 2013 event are very similar to those of January 2015 event, likewise indicating a contamination in the sample collection or lab analysis process. Data from the single positive sample during the May 2014 event contained high HPC levels along with elevated TC and a positive EC detection, but with low turbidity, a strong chlorine residual, negative repeat samples, and no indication of increased gastrointestinal (GI) disease. While the compilation of all data from the May 2014 event indicate that the likely source of contamination was either sample collection or lab analysis, it is impossible to definitely rule out the DS as a possible source of the contamination.

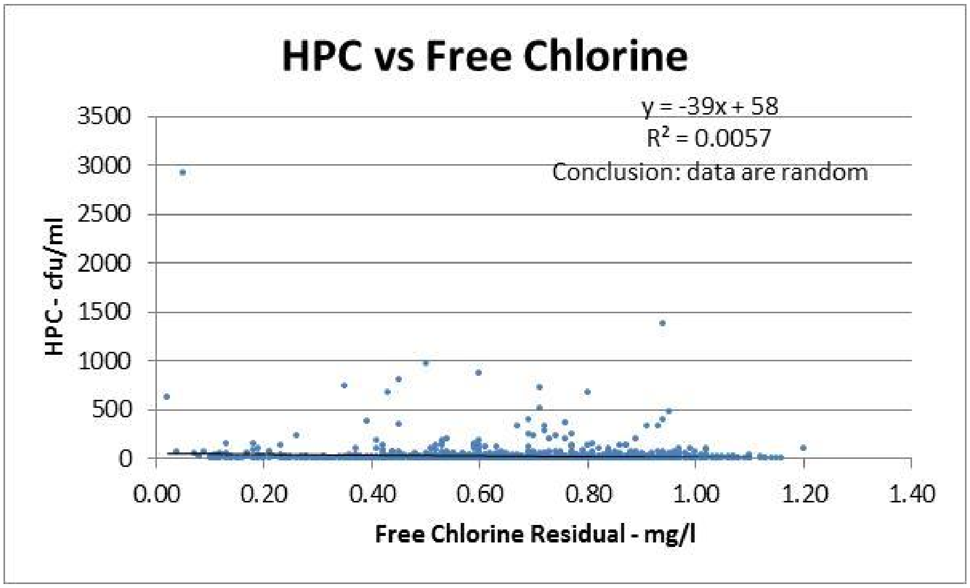


Figure 4: HPC vs Free Chlorine Residual of Matched-Pair Data from the Combined Database

3. Water Sampling and Laboratory Assessment

As an element of this assessment, the sampling and analytical protocol typical of that on January 26, 2015 was reviewed in detail. City sample locations and sample collection procedures were evaluated by a certified auditor on February 11, 2015 and by AECOM (unannounced) on February 25, 2015. [redacted] Sample locations were generally clean. General findings during these reviews are provided below.

The bacterial sample reception and processing procedures for the analysis of EC and TC by QuantiTray (IDEXX) and HPC by APHA 9215B were also evaluated by a certified auditor on February 17, 2015 and by AECOM (unannounced) on February 25, 2015. Reports of the analysis performed by the contract laboratory are provided in **Appendix B**. Findings during these reviews are provided below.

3.1 Sampling Protocol Review

On February 25, 2015, AECOM met with a sample collector at sample location NE-07 at approximately 10:00 am. This was an unannounced review, and the sample collector was met at the 4th of 14 sample stops. The AECOM rode with the sample collector to the end of the route, and followed the samples into the laboratory for analysis.

The sample protocol followed was consistent, but there were several areas of improvement that were noted during the review:

- [redacted]
- Many sample taps had aerators which could not be removed by the sample collector. This included “tamper proof” aerators which required a special tool for removal (which the sample collector did not have). Microbiological sampling from taps with aerators attached is not recommended.
- Inability to remove aerators affects the amount of water flowing from the faucet, and thus extends flushing time required to clear the service line back to the main. Temperature stability was used as an indication when the sample line had been adequately flushed. The City should consider a volumetric requirement for flushing specific to each sample location, with sample collectors checking flowrates at maximum flush volume to assure the flush time and volume is adequate to clear the sample line.

A detailed list of recommendations has been provided to the City for consideration, and is provided in **Appendix B**.

3.2 Laboratory Protocol Review

AECOM accompanied the sample collector to the contract laboratory. Samples were received at a common reception desk for all samples arriving at the laboratory. Samples from City were labeled, arranged by sample ID number, analyzed for HPC, prepared for analysis by Colilert QuantiTray technique for TC and EC, placed into QuantiTrays, and incubated. After the samples were processed for HPC, the labels were stamped noting HPCs had been completed, and the samples were transferred to the Colilert preparation bench. At this point, any excess water above the 100 mL mark on the sample bottle was decanted using a vacuum tube. Samples were then transferred to the bench where the Colilert media was added, and the QuantiTray was sealed. Sealed QuantiTrays were placed in an incubator.

The overall technique of the four lab personnel involved in the analytical process was methodical and clean. Areas for improvement were observed and are noted below:

- The order of analysis was the order provided by the City on the chain of custody sheet. The samples should be ordered from "cleanest" to "least clean", based on the source of the sample. Under this protocol, raw water samples and construction-related samples would be numbered to be at the end of the analytical protocol, reducing the possibility that the cleaner samples are contaminated by less clean samples.
- The City's drinking water samples may be analyzed in a batch with samples from other sources. The City should request that their samples be run as a separate batch, isolated from any other samples of unknown source.
- The vacuum decantation step used to adjust the volume of sample in the sample bottle after HPC analysis and before TC/EC analysis should not be used on the City's samples. This technique as observed increases the risk of contamination between the HPC step and the TC/EC step in the analytical process. Samples that are de-chlorinated (as are all DS samples) are particularly susceptible to contamination during sample handling. The City and lab should consider reviewing this process step to minimize the risk of sample contamination.
- The chain of custody sheet (or similar formal documentation) should be initialed by the analyst at the end of each analytical step in the process to allow retrospective analysis of results.

A detailed list of recommendations regarding the analysis of the City samples has been provided to the City and the lab, and is provided in **Appendix B**.

3.3 External Reports

In addition to this report, independent reports related to the January 26, 2015 event were provided by:

- Dr. Jared **Bullard** (Associate Medical Director, Cadham Provincial Laboratory (CPL)) regarding genotype analysis of the 5 positive EC samples from the January 26, 2015 event analyzed at CPL on February 5, 2015.
- W. **Lipinsky**, (Assessor, Independent Consultant) regarding a February 11, 2015 assessment of sampling procedures and conditions at the 6 positive sites from January 26, 2015 event.
- M. H. **Brodsky** (Assessor, Brodsky Consultants) regarding laboratory procedural protocols used on the microbial samples collected on January 26, 2015 and analyzed by the ALS laboratory, and a subsequent report on AECOMs protocol review.
- Lisa **Richards**, MD MSc FRCPC (Medical Officer of Health, Winnipeg Regional Health Authority), March 13, 2015, regarding public health disease records and observations following the 3 EC positive sample events from January 1, 2013 through January 26, 2015.

Lipinski and Brodsky were retained by the City to conduct analyses independent of AECOM. Each of these reports is provided in **Appendix C**, and are summarized below.

Bullard's report provides results of genotype differentiation from 4 of the 5 EC positive samples from January 26, 2015. A total of 7 EC isolates were analyzed for genotypes: 4 from sample location NE-07 (9 total QuantiTray cells positive for EC), and one each from the remaining 3 sample locations. In addition, the ALS laboratory EC positive control was analyzed, as were triplicates of the CPL method control, for a total of 11 traces on the analytical run. Results indicated each of the 7 isolates analyzed from the City samples was genotypically different, and none of these matched the genotypic pattern of the ALS control. Bullard concluded that:

> *"…the isolation of 7 different E.coli strains is inconsistent with a common source lab error or systematic lab contamination. The combination of one collector, plus one side of the city, plus no apparent contamination in any other trays that day, in addition to multiple genotypes of E.coli (likely representing multiple sources of contamination rather than a single one) suggests, in a balance of probabilities, a collection/specimen handing (pre-analytic) issue rather than an analytic or post-analytic issue."*

In Bullard's conclusion, the term "pre-analytic" refers to any activity prior to when the sample (with Colilert reagent added) is sealed in the QuantiTray. Thus, his statement above implies that the source of the TC/EC detected in the QuantiTray likely originated prior to the sample being sealed in the QuantiTray, which includes the DS, the sampling process, and the laboratory process up to the point of the sample being sealed in the QuantiTray.

Lipinsky's report was requested by the City to provide opportunities for improvement in microbial sampling techniques. He identified 12 action items and 8 recommendations regarding the sampling procedure. The action items refer to documentation, handling and storage of sample containers, clean sampling procedures, and a review process for procedural changes in sampling. The action items indicated opportunities for improvement.

Lipinski held interviews with sampling staff and supervisory staff, including an interview with the technician who sampled all of the positive samples. He noted that the technician is a qualified and trained drinking water sample collector and is aware of the procedures and importance of water testing. The technician was unable to identify anything that could have resulted in potential contamination on January 26, 2015 and indicated that it was another routine sampling day.

He concluded that:

> *"Based on what was observed during this assessment, there is a low probability that positive results can occur as a result of contamination at the time of sampling. This is supported by test results from the 2014 sampling season where there was only one positive E.coli sample. There are a number of potential sources for positive coliform results in drinking water other the sampling phase. To ensure that the probability of contamination during sampling is eliminated, a number of continual improvement items have been recommended".*

Lipinsky's list of action items and recommendations were consistent with recommendations by AECOM.

Brodsky's report indicated that the laboratory providing the analysis of samples on January 26/27, 2015 followed Standard Operating Procedures (SOP) and procedures appropriate for the analysis. He recommended two items that deal with additional documentation in the area of Control of Records that could be improved. He specifically focused on the HPC and IDEXX Colilert QuantiTray methodology, although he did not provide reference or details regarding the IDEXX QuantiTray method. Brodsky reviewed only the methods presented in SOPs. Methods not in the SOP were not reviewed, and he did not comment on the specific handling of samples for volume reduction prior to analysis for TC/EC. He concluded that:

> *"My observations of their analytical and QC records indicated that the laboratory followed sample handling, preparation and analytical protocols and procedures as per their Quality Management*

> *System. The evidence I examined indicated that the samples in question were not contaminated with coliforms and E. coli by cross contamination in the laboratory."*

Brodsky did not provide detailed descriptions of sample handing during the HPC and TC/EC analyses. In a subsequent report, he later clarified that he did not observe the vacuum-siphon volume reduction step between the HPC and TC/EC steps observed by AECOM. Brodsky stated:

> *"The analysts who processed the samples indicated that they did not use the syphoning. Based on all this evidence I concluded that the syphoning technique was not used in the processing of the samples in question and therefore was a non-issue with respect to the possibility of cross contamination of those samples. In addition, if this was a high risk procedure, there would have been historical evidence of cross contamination in blank sample controls whenever this procedure was used. There was no such evidence. This conclusion was supported by QC data recently provided on the syphoning equipment and technique that showed that it does not contribute to microbial contamination of the samples."*

Richard's report of March 13, 2015 comments on the lack of unusual disease activity during the period following the 3 EC positive sample events since January 26, 2013. In her report she states that:

> *"In the case of a major contamination of the City's water supply, a rapid and dramatic increase of case counts would be expected (e.g., hundreds of cases), and would likely be preceded by a similarly dramatic rise in emergency room visits for GI complaints. The number of reported cases of infections that could typically be caused by waterborne pathogens from January 1, 2013 to February 28, 2015 was reviewed. The observed reports of GI infections during this time period did not indicate that there was a GI outbreak related to any of the three events listed above."*

3.4 City Response to Recommendations

Lipinski's audit of the City SOP for bacteriological sampling and monitoring program identified 12 action items and 8 items of recommendation for improvement. The City has reviewed all action items from the audit, generally categorized as management items (process review, quality assurance, and technical issues), and sampling methods items (missing process steps, errors in sampling, and suggestions for improvement).

The 4 management items will all be addressed over a prioritized 3 year period, noting that those items requiring significant resources and upgrades to the Analytical Serviced Branch will require more time to implement. Of the action items for the Sampling Methods, all of the 9 items have been reviewed and a procedure for implementing action items is in place. These changes will be included in the revised SOP for Bacteriological Monitoring and Sampling and related Supporting Work Instructions (SWI), which will be in effect no later than April 30, 2015.

Regarding recommendations for improvement from Lipinski's audit, the City has reviewed these recommendations categorized as management items (quality control (QC) and technical issues), and sampling methods items (documentation, additional process steps). Of the management issues, items related to additional studies and QC samples (field blanks, duplicates) have been addressed through validation studies and the QC program is reviewed annually (next review scheduled in October/November 2015). The handling of samples and sample procedures within the contract lab will be reviewed and modifications, if required, will be in place by June 30, 2015.

Other items for improvement are to be covered in review and update of sampling SOPs scheduled for completion in 2015. Two recommended items regarding sample locations in privately owned sample locations open to public access are beyond the City's ability to control (cleanliness of sample sink and removable aerators), and a modified version of this recommendation is being considered.

A detailed listing of the specific action and recommendation items and the City's response is provided in **Appendix B**.

4. City Facility Assessments

4.1 Introduction

Facility review sheets (as requested by ODW) were completed for facilities near the sample sites that tested positive for TC/EC. These assessments included investigations of sampling sites (investigation of plumbing, cross connections, filters), pumping stations, water reservoirs, distribution system infrastructure (air relief valves, valve chambers, pipe materials), groundwater wells, operations and maintenance activities, pressure monitoring, and environmental factors. City staff provided computer simulations of typical distribution system hydraulic patterns, along with records on distribution system (DS) operation and maintenance activities, customer water quality complaints, and facilities in the DS. City staff provided graphical illustrations of these data to allow analysis of associations between any suspect activities/facilities and the positive water quality samples of January 26, 2015.

The assessments of the City's water systems were conducted in accordance with the United States Protection Agency's (USEPA) Revised Total Coliform Rule (RTCR). The RTCR Guidance Manual (GM) provides a format for evaluating facilities and operational activities during an incident assessment. This format was used to compile data for the 28 inspection categories, such as an evaluation of potential cross connections and an evaluation of environmental effects. Detailed results of this assessment are provided in **Appendix A**.

Under the RTCR rule, two types of assessments may be conducted:

- A Level 1 Assessment, which includes a general overview of operational practices and basic inspections of the water system (supply, treatment and distribution); or
- A Level 2 Assessment, which investigates the same parameters as a Level 1 assessment, but on a more detailed scale.

The City's water system was investigated under the Level 2 Assessment under this Rule. Assessments focused on the areas that were found to have water samples testing positive for TC and EC. Data for a majority of these assessments were collected by the City for evaluation, by AECOM. The assessment included a review of recent condition assessments where available.

Further analyses included:

- An evaluation of potential backflow and cross connections around sampling sites testing positive for TC/EC;
- An evaluation of air relief valve pits around sampling sites testing positive for TC/EC which were previously identified as having water in them;
- Hydraulic modelling of the distribution system to evaluate water flows patterns and travel times; and
- An evaluation of discoloured water events in relation to sampling sites testing positive for TC/EC.

4.2 Background

4.2.1 Water Treatment and Disinfection

The City's Water Treatment Plant (WTP) includes a variety of pathogen removal and inactivation processes including filtration and chlorination. Sodium hypochlorite is added on a flow paced basis for primary disinfection. The WTP also includes additional treatment systems such as ozone and ultraviolet

(UV) disinfection, which ultimately provide a multi-barrier approach to removing pathogens from the City's water supply. Treated water is delivered to the City's distribution system via three reservoirs and pumping stations located within the City.

It is noted that the primary focus of this assessment is on the facilities and operation of the City's distribution system. A review of data from the three positive TC/EC events indicates that the WTP was not the likely source of any of the positive samples considered in this report. The treatment facility and plant records were reviewed, however, to verify that the plant was performing adequately. The plant was found to be in excellent condition and well operated.

4.2.2 Reservoirs

The City of Winnipeg is serviced by three reservoirs in the distribution system, as follows:

- The McPhillips Reservoir was constructed in the 1970s and is divided into east and west cells, each with 120 ML of storage.
- The Wilkes Reservoir, which supplies the Hurst Pumping Station, is divided into three cells. The south cell is the largest and has a total storage volume of 112 ML. The remaining two smaller cells, located to the north, are designated east and west. Each has storage volumes of 78 and 62 ML, respectively.
- The MacLean Reservoir is the most recent distribution reservoir constructed in the system. The reservoir is divided into identical north and south cells each with approximately 111 ML of storage.

The City regularly drains, cleans and inspects the reservoirs at the McPhillips, MacLean and Hurst pumping stations. This typically occurs on an annual basis, and is a manual operation which is mainly intended to remove sediment that has accumulated at the bottom of the reservoirs and to facilitate regular inspection.

4.2.3 Pumping Stations

The three pumping stations, McPhillips, Hurst, and MacLean, supply all of the water to the City's distribution system.

Each pumping station has chlorination facilities to boost and maintain chlorine residuals within the distribution network.

4.2.4 Piping Infrastructure

The City's distribution system consists of a regional feedermain network and local watermain network.

- The regional system consists of a network of feedermains which are supplied by the Hurst, McPhillips and MacLean pumping stations. The pumping stations operate in a single pressure zone with the primary feedermains linking the stations together, thereby providing redundancy to the system. The regional feedermain network is connected to the local watermain network at a limited number of locations, and is predominately constructed of pre-stressed concrete pressure pipe;
- The local watermain network consists of approximately 2,500 km of piping constructed primarily of PVC, asbestos cement, and cast iron piping; and
- All customer service connections, hydrants, and distribution valves are on the local watermain network.

4.3 General Water System Review

In general, the City facilities were found to be in good working order and records were available to assess operations and maintenance activities that presented potential contamination risks to the water supply system. As might be expected in a thorough vulnerability assessment of any complex water utility system, several potential sources of contamination were identified. Each of these was considered in a structured risk evaluation analysis as either a single source of potential contamination, or in a scenario where a common hydraulic event triggered the simultaneous intrusion of contamination from several potential contamination sources.

Based on the inspections conducted, the following observations were noted.

4.3.1 WTP Operation

The WTP was visited on February 26, 2015 and plant records for filter performance and disinfection were reviewed for the month of January 2015. The plant appeared to be well maintained, with all processes operating within established operational goals. Review of plant data for the month of January 2015 indicated no unusual events during the month. No unusual operating conditions were experienced prior to the May 2014 and October 2013 events.

4.3.2 Distribution System Maintenance

The City's operational procedures, including tool disinfection, are documented and generally follow good industry practice.

Operations and maintenance records were reviewed for any activities that might have been associated with a potential contamination of the water supply. Much like the locations of the positive samples, repair activities and main hydrant operation were randomly distributed over the distribution system for the two weeks prior to the contamination event, as shown in **Figure 5** and **Figure 6**. For the two weeks prior to the January 26, 2015 event, no clear pattern between maintenance activities and the positive TC sites was evident. Maintenance activities upstream of water samples testing positive for TC/EC (as shown by the shaded gray area in **Figure 5** and **Figure 6**) do not appear to be responsible for most of the positive samples. While there was some activity in the upstream areas of two of the sample locations that tested positive (SW-07 and NE-01), these sample locations are hydraulically disconnected from the other sample locations. System records were reviewed and found to be normal for the 2 weeks prior to January 26, 2015 event. Similar analysis was performed for valve work and miscellaneous daily work in **Appendix A**. No issues were identified; these observations were consistent across all three events.

4.3.3 Water Sampling Locations

Sampling locations testing positive for TC/EC in the City (**Figure 7**) were evaluated by AECOM and City staff. Of note was the correlation between the positive samples attributed to a single sample collector (**Figure 8**). Some of the existing water sampling locations appear to be at risk of contamination due to the following circumstances:

- The placement of aerators on faucets, many of which are non-removable. Aerators have the potential for collecting debris over a long period of time, which may occasionally influence water samples and be non-reflective of the water quality currently in the distribution system.

  A recent analysis indicated that of the 65 faucets used for collecting microbial samples, 45 had aerators attached, and of these 45 only 21 were reported as removable in 2015. Assuming this same ratio of removable aerators over the past 5 years, the frequency of positive TC detections at the sample locations with aerators was lower than those with aerators that were removed during sampling. Thus, while the practice of taking samples from faucets with aerators attached is not recommended, it does not appear to have affected samples collected prior to January 26, 2015. It is noted that an increase in non-removable aerators has been observed in recent years.

- The use of in-line filters which may not have been maintained. Similar to the aerators, in-line filters require regular maintenance in order to remove debris. If water samples are to be collected from plumbing that contain such filters, maintenance logs for those filters should be kept and evaluated on a regular basis.
- The presence of dormant piping within the premises near the sampling location. Generally, the City is responsible for addressing dormant or 'dead-end' piping that is present in the distribution system, which contains stagnant water which may have deteriorating water quality. Such piping should be identified in private establishments that may be selected for water sampling in order to prevent stagnant water from interfering with the results.
- The use of backflow preventers, including air-gap preventers that are not regularly monitored/ tested.
- Sampling points that are located in areas such as bathrooms, where potential for bacterial cross contamination with fecal coliform bacteria is greater than it needs to be.
- Sampling locations with unusually long service lines. Sampling locations should generally be located close to the water meter as possible to reflect distribution water as opposed to plumbing issues within the building.

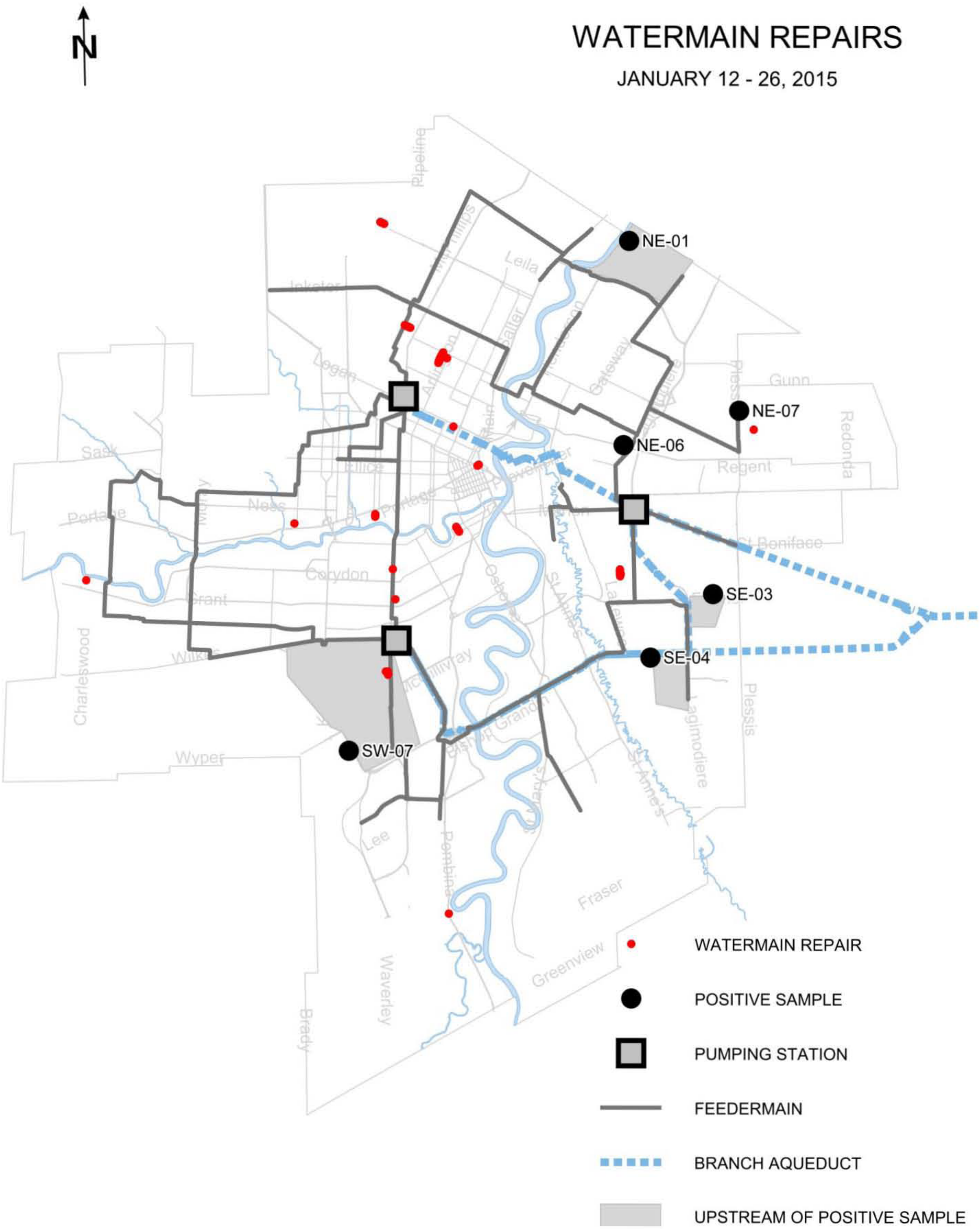


Figure 5: Significant Watermain Repair Activities 14 Days Prior To and Including January 26, 2015.

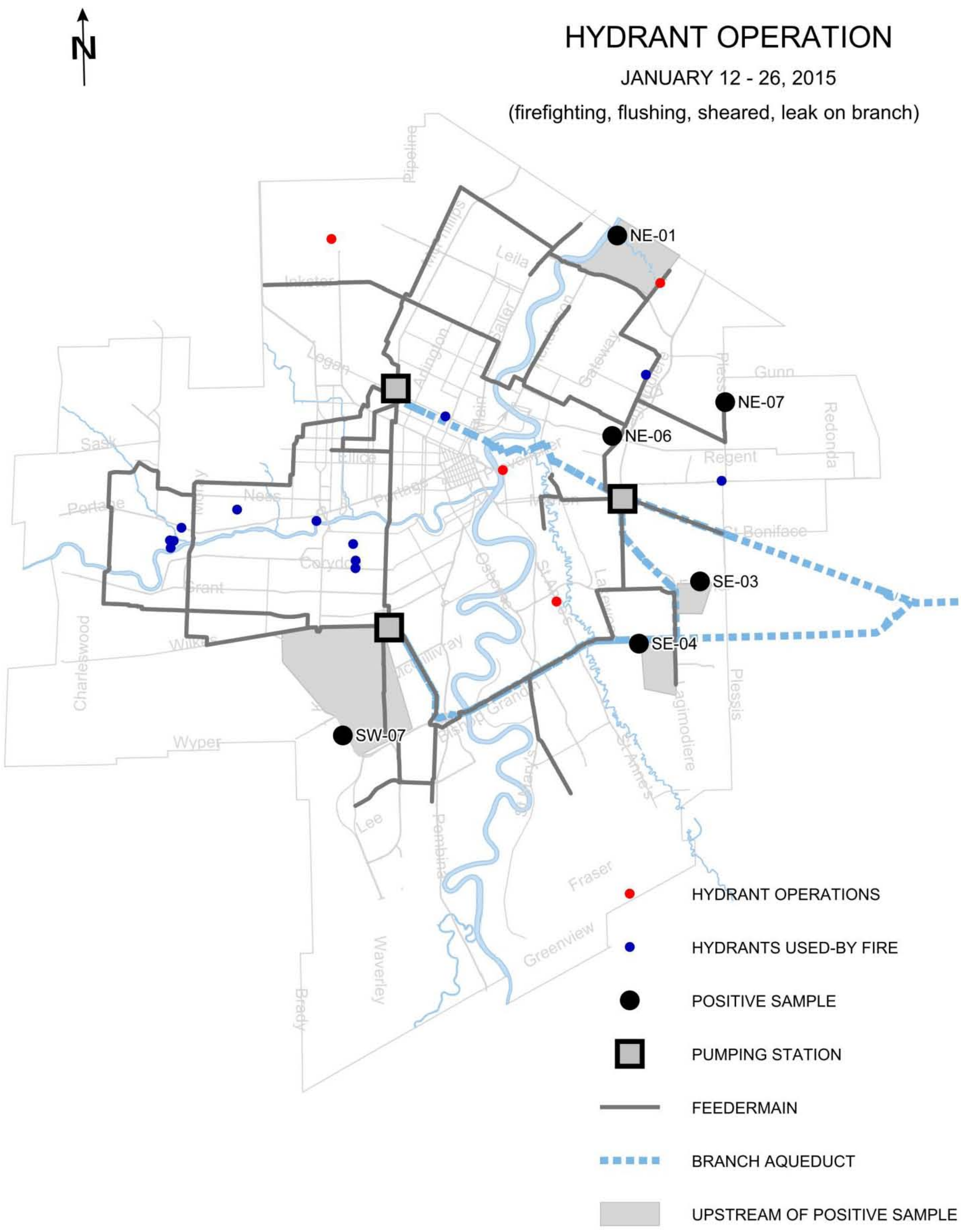


Figure 6: Hydrant Operation, Jan 12-26, 2015

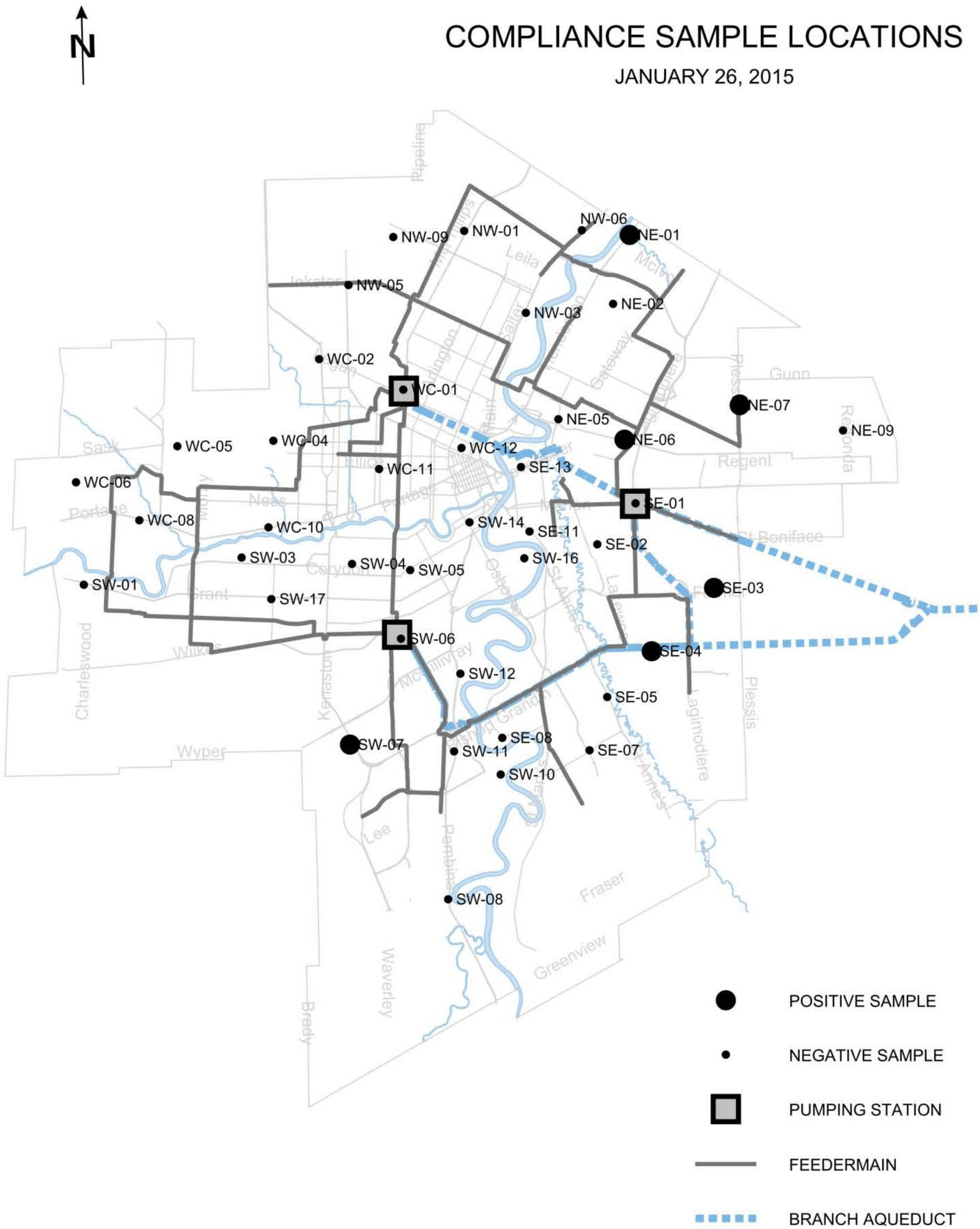


Figure 7: Compliance Sample Locations, Jan 26, 2015

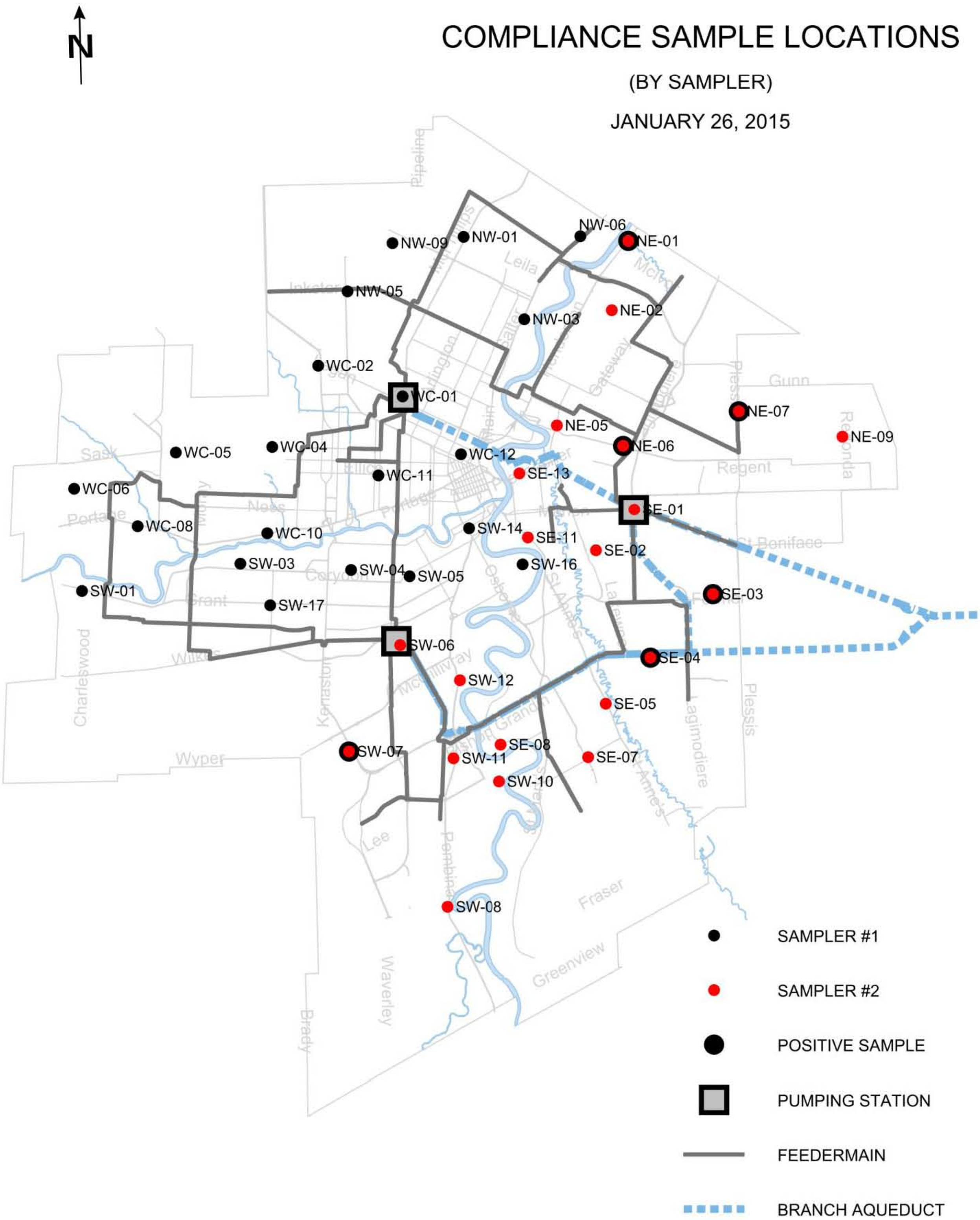


Figure 8: Compliance Sample Locations (by Sample Collector), Jan 26, 2015

4.3.4 General Security

The City protects its facilities from unauthorized entry. Primary facilities were inspected and found to be adequately secured against unauthorized entry.

4.3.5 External Water Sources

Ninety-nine non-domestic licenced groundwater wells exist within the City limits, as shown in **Figure 9**. In order for a cross connection to occur, an illegal connection from the well to the City of Winnipeg watermain system would be required. Although there are some wells in the upstream vicinity of the some of the sample points, they are not hydraulically connected to the other sample locations that tested positive. In addition, there are several wells that are in the upstream location of other sampling points that did not test positive.

River data and rainfall level data is collected at various points within the City. These data were analyzed for the three positive sample events specifically looking at spring runoff as a contributing factor. An example of this data is shown in **Figure 10**. Anomalous changes in river levels within the City were not noted during the 2013 and 2014 events. Ice cover during winter months limits the available readings into 2015. As such, sudden changes in river levels are not expected to be a significant factor during the three positive sample events.

4.3.6 Reservoirs

The MacLean and Wilkes reservoirs and their associated pumping stations were inspected in conjunction with this assessment. Several minor contamination risks were identified for improvement. These facilities were all considered as potential point-source risks in the analysis of water quality data from the January 26, 2015 event. In general, the items identified related to recommendations for additional external signage, a minor addition to non-process plumbing, and replacement of a specific ventilation fixture. Reservoir levels were investigated as potential sources of contamination. Extremely low reservoir levels or large aggregate changes in flow may affect water quality due to disturbance of existing sediments, equipment failure, etc. No extreme changes in reservoir levels were noted, as shown in **Figure 11**, **Figure 12** and **Figure 13**. The apparent sudden drops in reservoir levels at McPhillips on Jan. 16 and 21, 2015 (**Figure 13**) are due to an instrumentation fault. Chlorine residual is continuously monitored at the reservoir discharge and there has been no indication of problems maintaining chlorine levels leaving the reservoirs, indicating this as a source of a contamination is unlikely.

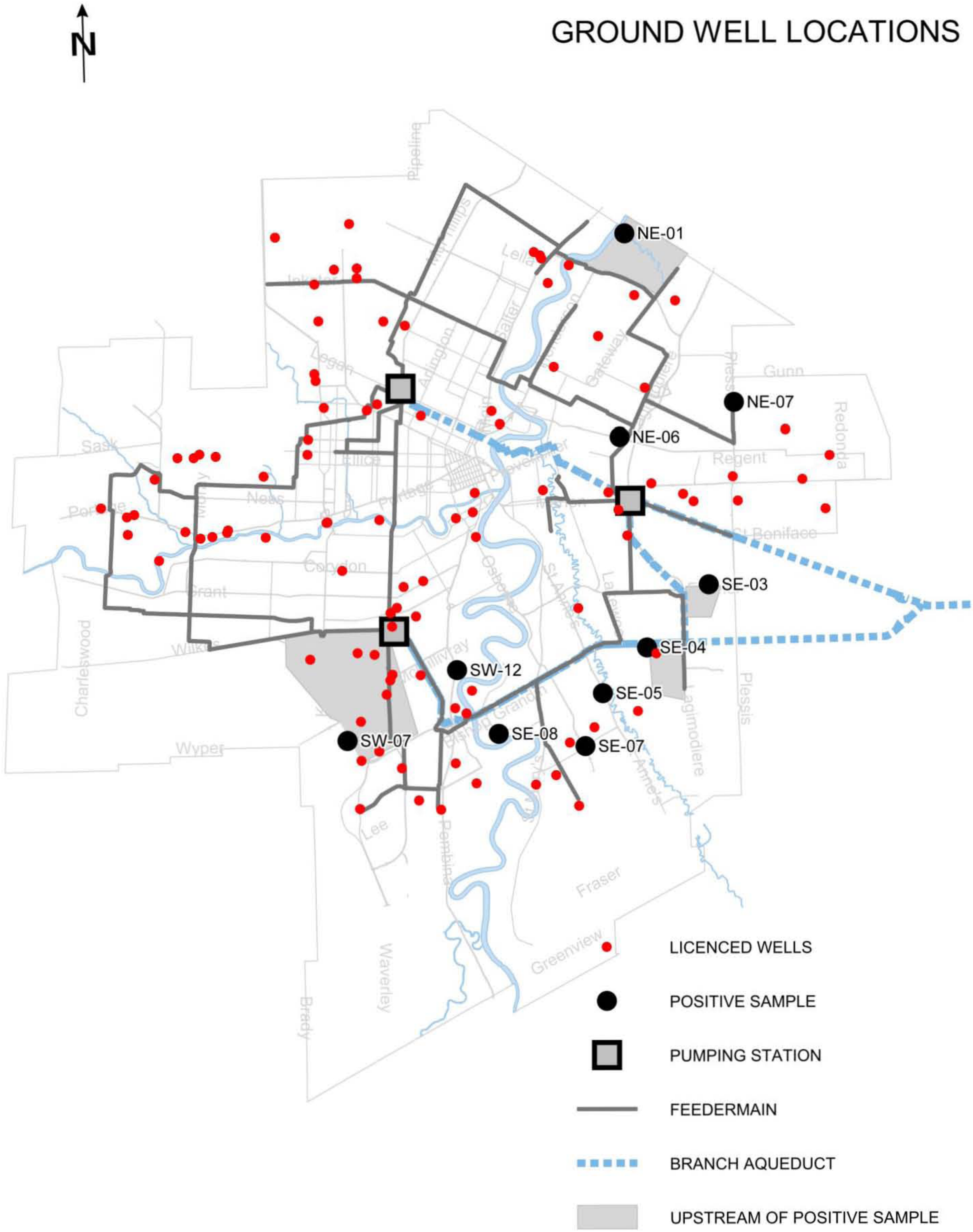


Figure 9: Ground Well Locations

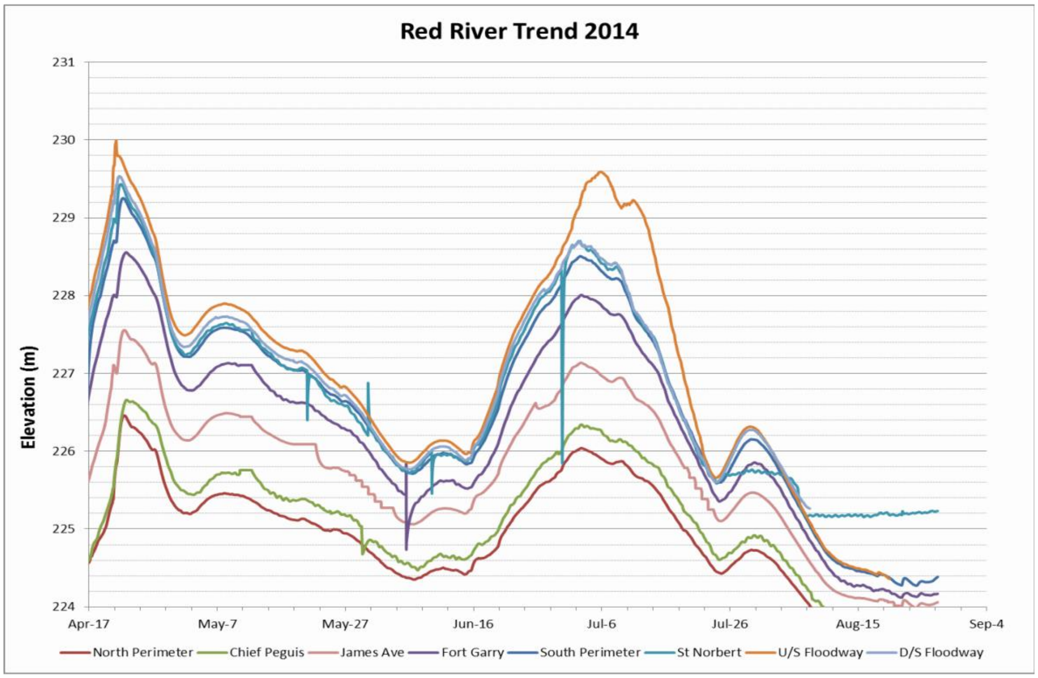


Figure 10: River Elevation Readings, Apr 17-Sep 4, 2014

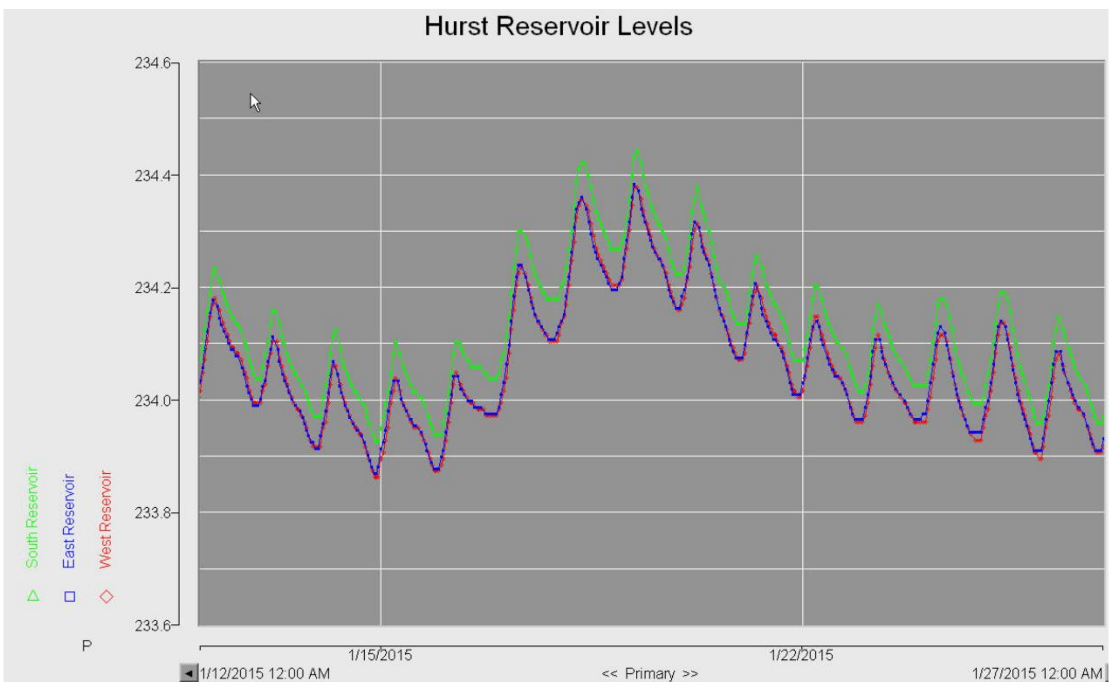


Figure 11: Hurst Reservoir Water Levels, Jan 12-Jan 27, 2015

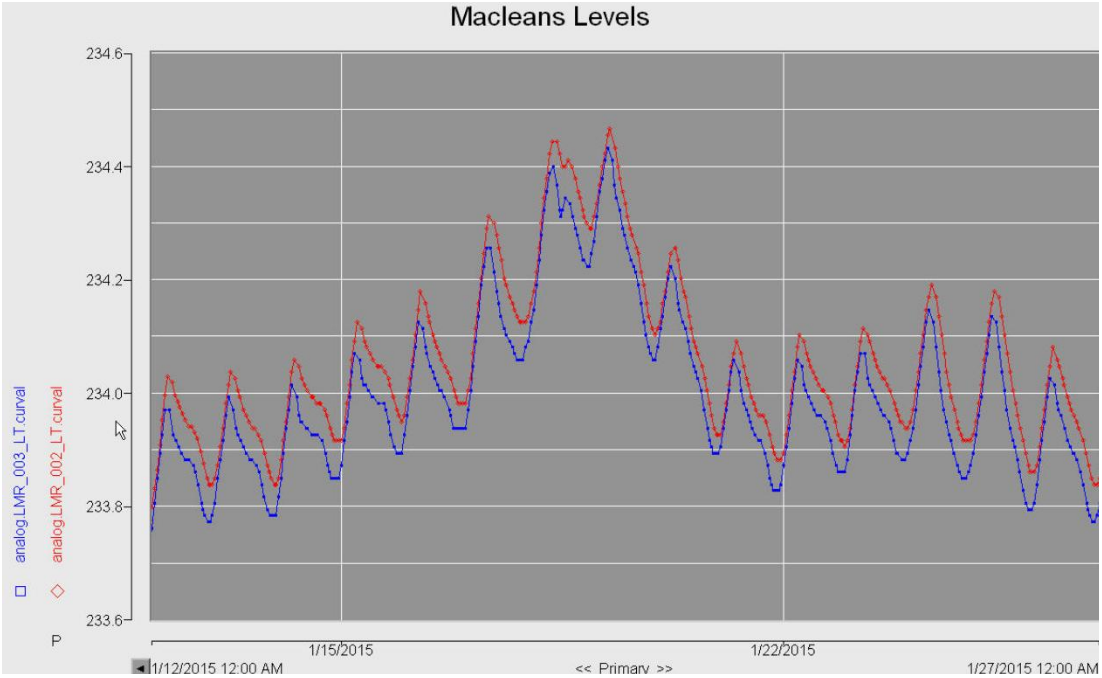


Figure 12: MacLean Reservoir Water Levels, Jan 12-Jan 27, 2015

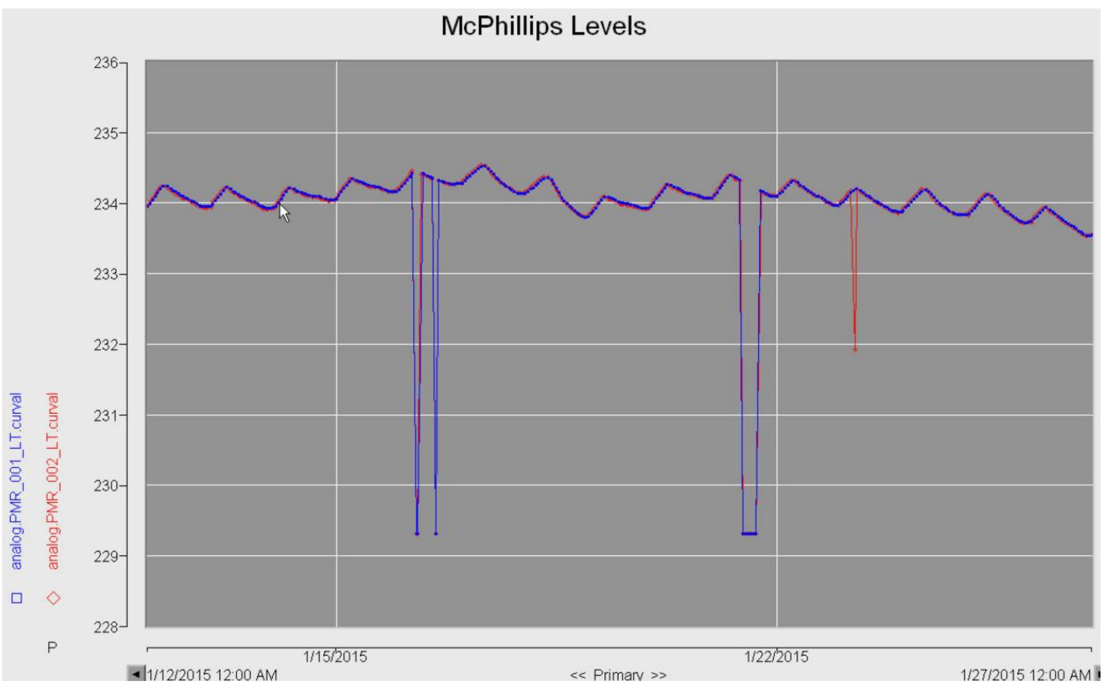


Figure 13: McPhillips Reservoir Water Levels, Jan 12-Jan 27, 2015

4.4 Standard Operating Procedure Evaluation

The City currently has Standard Operating Procedures (SOP) and Safe Work Procedures (SWP) for a majority of its water systems operations. A review of 14 of the City's procedures was conducted, including procedures for disinfection before watermain repair, water quality testing after watermain repair, and site-specific reservoir maintenance. All were found to be adequately descriptive for field application.

While these SOPs are regularly updated, it is suggested that regular reviews of these procedures be conducted to ensure they are up-to-date, address all potential system vulnerabilities, and align with industry best practices. For instance, the disinfection procedures accepted by industry for disinfection of watermains (AWWA C651-14) was updated on February 1, 2015, with new disinfection requirements depending on whether the watermain is new or repaired; these requirements should be considered for incorporation into the City's existing SOP for returning watermains to service. The City is planning to review the new standard and existing SOP.

4.5 Pressure Monitoring Review

The City continuously monitors pressure readings throughout the distribution system and at each pumping station, as noted in **Figure 14** , **Figure 15** and **Figure 16** . Pressure-monitoring points are calibrated annually at a minimum. If issues arise between calibrations (e.g. loss of signal, erroneous readings, plugged impulse lines), the City will perform maintenance as required.

On January 18, 2015 the [redacted] distribution monitoring stations recorded minimum pressures of 41.59 psi and 47.13 psi, respectively. The pressure drop is attributed to valve operations on the Birds Hill Feedermain. Five pressure monitoring stations reported minimum pressure readings of under 60 psi during the period of December 1, 2014 to February 17, 2015 (data provided in **Table 3**). The remaining 6 stations reported no minimum values less than 60 psi for the period. These data indicate that pressures were maintained above 60 psi most of the time, and always above 42 psi.

On January 16, 2015 a power failure occurred at the McPhillips Pumping Station. Gas engines were able to maintain pressure in the system, which never fell below 65 psi at the station.

Valve operations for 2 weeks prior to January 26, 2015 were reviewed for activity that might have caused hydraulic disruption in the system. The only operation involving a reduction in pressure took place on January 18, 2015 at Panet Road and Fournier Street. This work involved valve operation on the Birds Hill Feeder Main to facilitate nearby maintenance activities. The remaining 6 valve operations between January 19, 2015 and January 26, 2015 were reported as resulting in no reduction in system pressure.

Table 3: Minimum Pressure Readings for Pressure Stations Reporting Below 60 psi

Station	Date	Pressure (psi)
[redacted]	December 26, 2014	47
	January 18, 2015	42
	January 3, 2015	59
	January 3, 2015	58
	January 18, 2015	47

Overall, available pressure readings were found to be within acceptable ranges. No unusual pressure readings/losses were noted immediately before or after the January 26, 2015 contamination event.

Similar analyses were performed for the October 2013 and May 2014 events and no issues were identified.

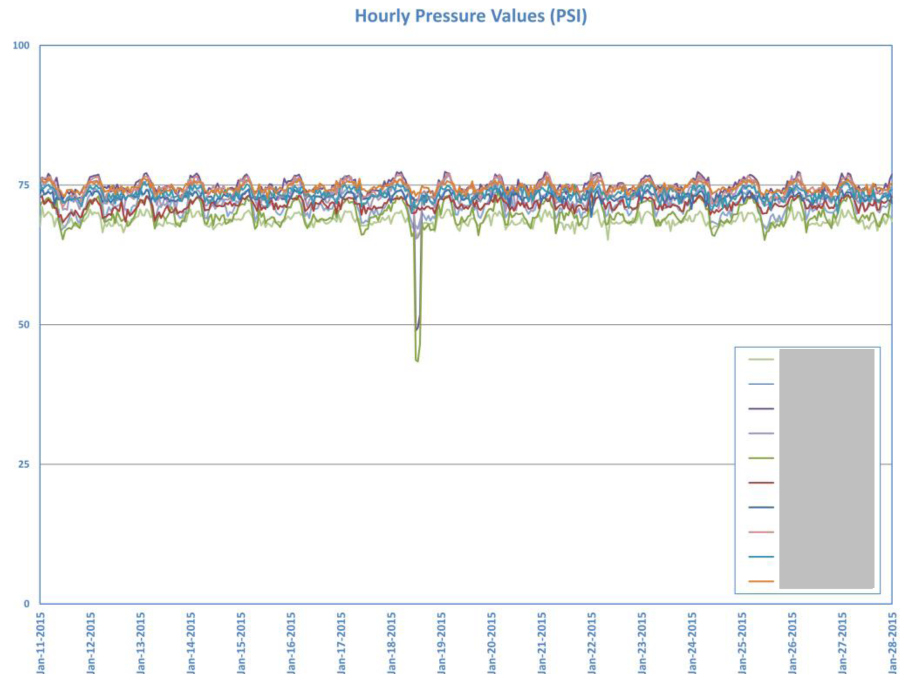


Figure 14: SCADA Hourly Pressure Values

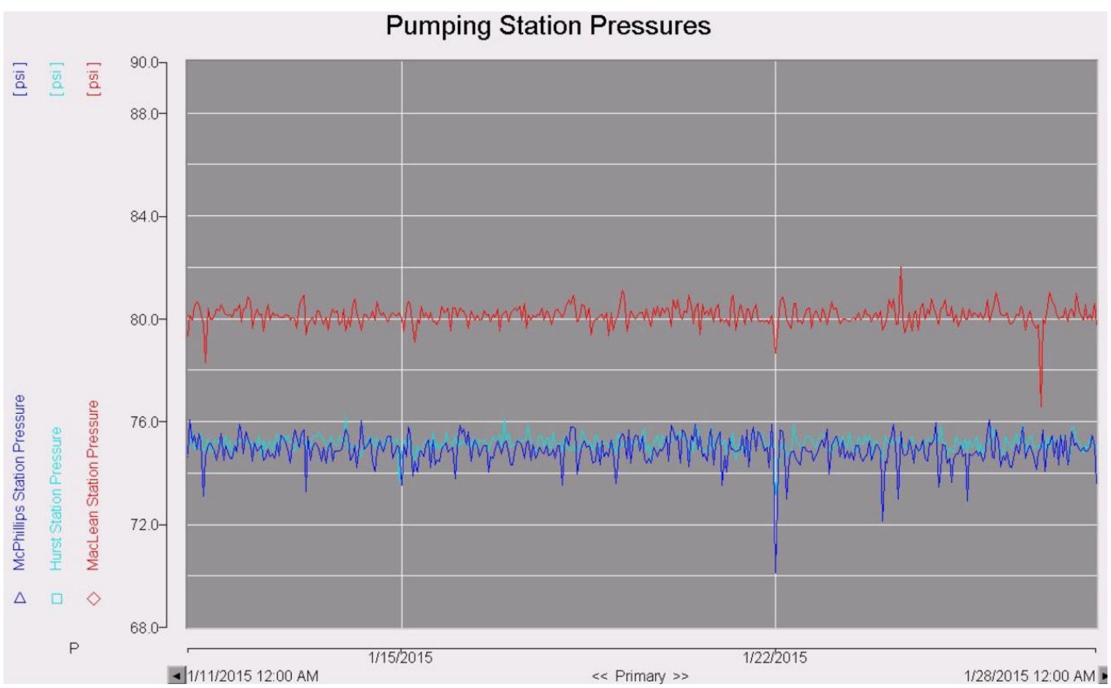


Figure 15: Pumping Station Pressure Readings, Jan 11-Jan 28, 2015

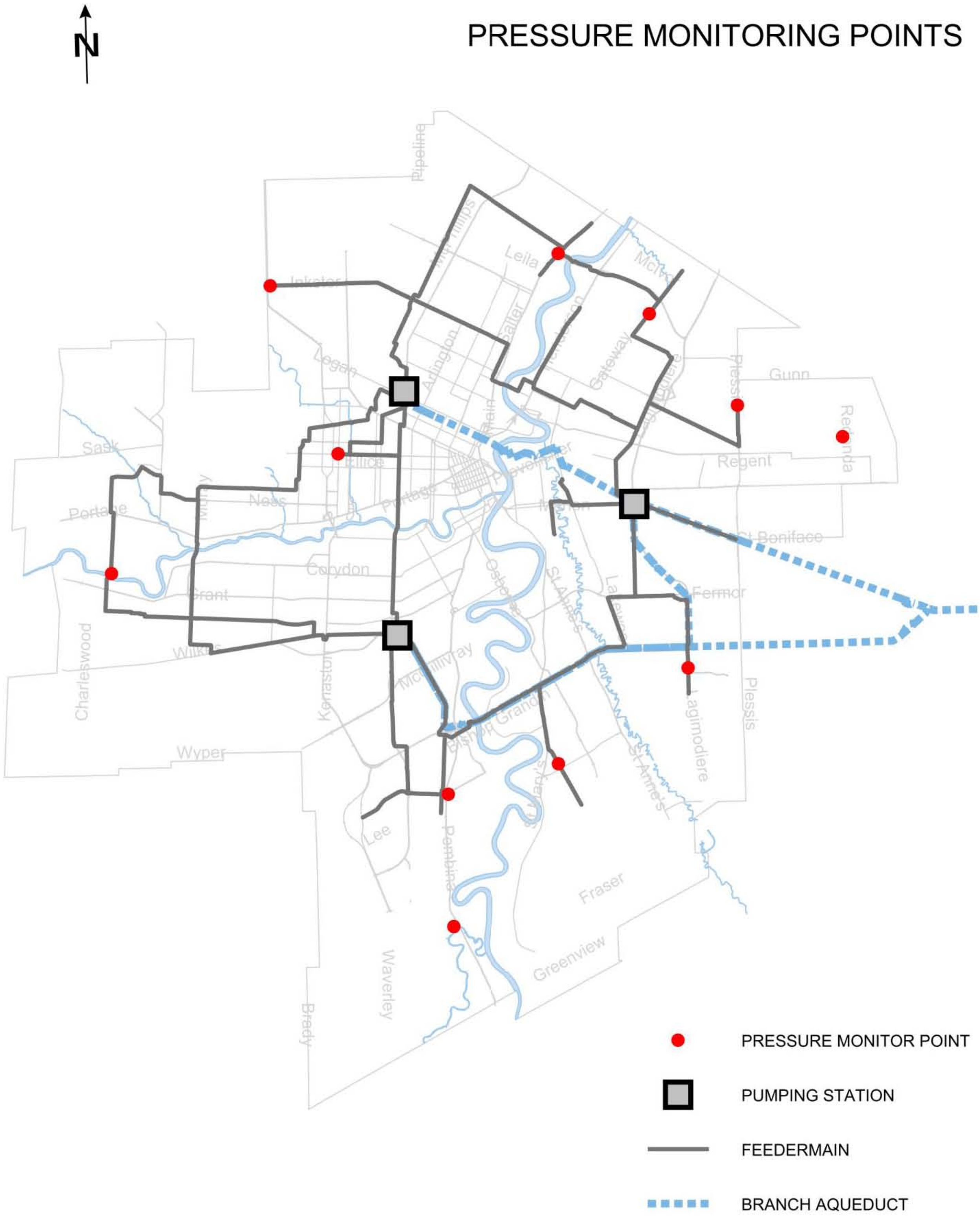


Figure 16: Pressure Monitoring Points in the Distribution System

4.6 Backflow and Cross Connection Evaluation

The City has maintained an active backflow prevention program since 1985. The current staff of 5 committed to the program is commendable for a city the size of Winnipeg. The program manages approximately 11,000 active back flow preventers (BFP) and tracks approximately 9000 per year (82% compliance rating), which indicates a thorough and tenacious program. The program has excellent metrics on inspections, work orders, and compliance records. The program leadership is active in Canadian and US cross connection control programs, and has published in trade journals regarding cross connection control.

Cross connection inspections were conducted at each of the sampling locations where positive TC/EC samples were collected. These inspections provided no indication of a problem associated with the three events.

Cross connection inspection records for facilities located near the positive TC/EC samples were reviewed as possible sources of contamination (**Appendix D**). These were included in the scenario analysis for potential point-source contaminations, as noted in Section 6.

In order to determine if backflow or cross connection contributed to the January 26, 2015 , May 26, 2014, and October 7, 2013 positive sample events, the backflow records were inspected for establishments that were located within a 500 m radius of the water sampling points which tested positive.

4.6.1 Methodology

4.6.1.1 Backflow

Twelve sample points were investigated as follows:

- Six locations that tested positive for TC and/or EC on January 26, 2015 (NE-01, NE-06, NE-07, SE-03, SE-04, and SW-07);
- One location that tested positive for TC/EC on May 26, 2014 (SW-12);
- Three locations that tested positive for TC and/or EC on October 7, 2013 (SE-05, SE-07, and SE-08); and
- Two additional locations that did not test positive on any of the three dates listed above (SE-02 and SW-04).

4.6.1.2 Cross Connection

Fourteen establishments were examined for premise isolation, including ten sample locations and four high risk establishments. These included the following:

- Six locations that tested positive for TC and/or EC on January 26, 2015 (NE-01, NE-06, NE-07, SE-03, SE-04, and SW-07);
- One location that tested positive TC and EC on May 26, 2014 (SW-12);
- Three locations that tested positive for TC and/or EC on October 7, 2013 (SE-05, SE-07, and SE-08); and
- Four establishments that were in the vicinity of the January 26, 2015 positive sample locations that were deemed to be high risk and have the most potential to actually create a cross contamination that would result in positive bacteriological samples.

4.6.2 Results

4.6.2.1 Backflow

The list of backflow records reviewed can be found in **Appendix D**. This list indicates when the backflow preventers were last inspected and what actions were taken if an inspection was overdue.

4.6.2.2 Cross Connection

Sample Locations: Not all of the ten sample locations investigated (NE-01, NE-06, NE-07, SE-03, SE-04, SW-07, SW-12, SE-05, SE-07 and SE-08) had or required backflow preventers. One issue was found at the establishment that houses sample point NE-07. A work order was sent out to resolve the issue and was completed on February 27th, 2015.

It is not suspected that a cross connection occurred at NE-07, just the potential for a cross connection had a depressurization of the distribution system occurred.

High Risk Establishments: The results of these inspections can be found in **Appendix D**. Issues were found for three of the four locations inspected. One of the locations already has plans in place to correct the problems. The other two locations were issued work orders.

4.6.3 Conclusions

Generally, cross connections must be regularly managed to prevent the occurrence of a backflow event. The City has a robust cross connection prevention program in place for public protection.

4.7 Valve Pit Evaluation

The City maintains automatic and manual air relief valves in the distribution system that allows the release of entrained air in the distribution system, protecting both piping and its associated equipment. Such valves are usually installed in valve pits and are installed only on the regional feedermain system. If automatic relief valves are malfunctioning and submerged, they can present a potential contamination source under low pressure conditions.

All air relief valves were inspected in a 2013 assessment of the City's inventory of feedermain valve chambers. Air relief valve pits previously identified as having water in them and located near the TC-positive sample locations of the January 26, 2015, May 26, 2014, and October 7, 2013 positive sample events were inspected after the January 26, 2015 event as part of the assessment. None of the automatic air relief valves had water above the air relief valve vent. (**Appendix D**)

4.7.1 Methodology

In August of 2013, AECOM completed a "Feedermain Valve Chamber Condition Assessment" report. In this report, all of the air chambers and valve pits in the City were inspected. The ones that were identified as having water in them were plotted on a City map to see where they were in relation to the positive bacteriological sample sites from the January 26, 2015, May 26, 2014, and October 7, 2013 events. None of the air chambers and valve pits previously identified as having water in them were in the vicinity of sample point SW-12, the sole positive sample in the May 26, 2014 event. Fifteen air chambers and valve pits were identified as previously having had water in them and as being in the vicinity of the positive bacteriological sample sites for the January 26, 2015 and October 7, 2013 events. The location of these sites can be seen in **Figure 17**. The original inspection reports for all 15 valves can be found in **Appendix D**.

4.7.2 Results

City staff set out on the first week of March, 2015 to investigate the 15 air chambers and valve pits that were identified as previously having had water in them. The results of these investigations are summarized in **Table 4**.

Table 4: Results of the Air Chamber/Valve Pit Investigation

Valve Pit Inspection #	Asset ID #	Results of Inspection	Corrective Actions
VP-01	W-AV70000003	Water level at the top of pipe -not above air release valve	Chamber pumped out March 8, 2015
VP-02	W-AV70000043	3 inches of water in chamber	
VP-03	W-AV70000044	3 inches of water in chamber	
VP-04	W-AV70000110	Dry	
VP-05	W-AV70000116	Water level over air release valve	Chamber pumped out March 7, 2015
VP-06	W-AV70000293	Dry	
VP-07	W-AV70000312	Dry	
VP-08	W-VP00000103	Chamber full of water -not above air relief valves	Chamber pumped out March 6, 2015
VP-09	W-VP00000115	3 inches of water in chamber	
VP-10	W-VP00000125	2 chambers - both dry	
VP-11	W-VP00000131	Water level over air release valve	Chamber pumped out March 8, 2015
VP-12	W-VP00000177	5 feet of water in chamber -not above air release valve	Chamber pumped out March 6, 2015
VP-13	W-VP00000179	Chamber is alarmed when water level is 2 feet	When alerted, chamber is pumped out
VP-14	W-VP00000195	Dry	
VP-15	W-VP00000568	Some water in the chamber - not above air release valve	Chamber pumped out March 11, 2015

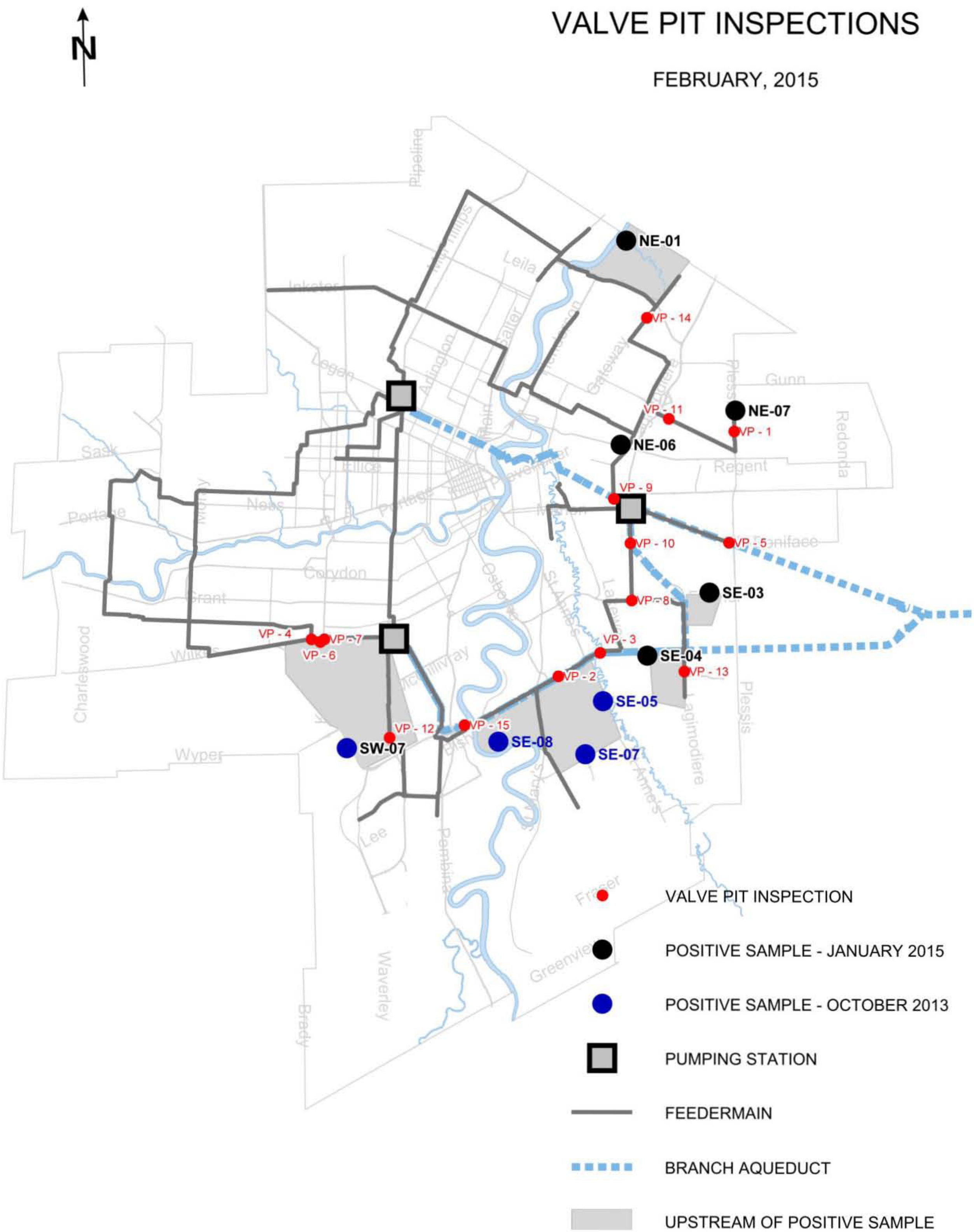


Figure 17: Valve Pit Inspections

4.7.3 Discussion

If a complete loss of pressure occurred in the distribution system, there is potential that water in the valve chamber could be drawn into the feedermain if the automatic air relief valve was submerged. Of the 15 air chambers and valve pits inspected, 10 of them had water. Two of the 10 had water above the air relief valve. The first location where the air relief valve was submerged, VP-05, was on a feedermain flowing east of the MacLean Pumping Station and is not hydraulically connected to any of the sample sites that tested positive for TC on either January 26, 2015 or October 7, 2013. The second location, VP-11, is on a feedermain that feeds sample point NE-07, which tested positive on January 26, 2015. This location, however, is not hydraulically connected to any of the remaining five sample sites which tested positive on January 26, 2015. In addition, both air relief valves that were submerged were manual air relief valves, not automatic. The risk of backsiphoning is associated with automatic air relief valves. Considering this, and the fact that no pressure loss in the system was observed on either event, it is very unlikely that submerged air release valves contributed to the January 26, 2015, May 26, 2014 or the October 7, 2013 positive sample results.

4.7.4 Conclusions

The air chambers/valve pits were likely not the cause of the positive coliform events. Despite this, many of the valve pits were filled with water from the environment – efforts should be made to reduce the chance of having automatic air relief valves from being submerged. Regular inspection and maintenance of such pits are part of the City's current SOPs.

4.8 Hydraulic Model Analysis of January 26, 2015 Distribution Sampling

4.8.1 Hydraulic Modelling

A hydraulic model analysis of the distribution system compliance sampling locations as it pertains to the water quality results from January 26, 2015 was conducted by the City's Winnipeg Water & Waste Department (WWD). This work was undertaken to support the Level 2 Assessment ordered by the Office of Drinking Water and completed by AECOM. **Appendix D** contains a summary of hydraulic analyses for the positive distribution sample results from 2013 and 2014.

The WWD Water Planning & Project Delivery Branch currently uses and maintains an EPANET hydraulic model of the water distribution system. The model file represents an 'all-pipes' network representation and the model performance is verified annually against field measurements. Hydraulic modeling simulations can be used to estimate distribution flow patterns, calculate water age (i.e. travel time), and source tracing analysis.

4.8.2 Source Tracing and Water Age Analysis

EPANET software allows source tracing and water age analyses to simulate the movement of water over time. This makes possible an evaluation of hydraulic flow patterns in the distribution system to estimate water travel time (water age), as well as the zone of influence both upstream and downstream of a user-specified model node. Further, the zone of influence of a water source (i.e. pumping station) can be estimated. In this manner, the movement of a contaminant within the water distribution system can be simulated.

4.8.3 Hydraulic Model Parameters

The following summarizes the assumptions, parameters and limitations of the hydraulic model analysis:

1. An Average Daily Demand of 190 MLD was selected for the analysis which is representative of normal City of Winnipeg water demand in January.
2. Typical diurnal demand pattern for the City.
3. The McPhillips Pumping Station is turned off for night time demand (12:00 am – 6:00 am).
4. 1-hour computational time step.
5. Constant discharge pressure at the pumping stations as per normal operations.
6. Normal distribution operations (i.e. no watermain breaks, hydrant flow etc.).
7. All valves are assumed to be in the open position, except for where the North Kildonan 600 mm feedermain crosses the Red River as this section was known to be offline on January 26, 2015 due pipe failure experienced the previous summer.

4.8.4 Scenario Analysis and Findings

4.8.4.1 Single Point Contamination in the Local Distribution System

A trace analysis was completed for each location sampled on January 26, 2015 which tested positive for EC and TC. The simulations were performed with a model node representative of the positive sample location as the source to estimate the downstream zone of influence of water passing through the sample location. Also, simulations were performed with the source node representative of the feedermain offtake(s) which supply each of the positive sample locations to estimate the upstream flow path of water to the sample location. Refer to **Appendix D** for screen captures from EPANET model trace simulations, which are representative of one time step during the simulation.

From a review of the flow patterns upstream of the sample locations which tested positive, it is noted that NE-06, NE-07 and SE-03 have little to no upstream influence. That is, they are located very close to feedermain offtakes, and as such, there is very little opportunity for any backflow from customer connections to be the cause of the sample results at these locations.

The January 26, 2015 sample at NE-07 had relatively higher values of EC and TC. A single point source contamination in the local water distribution system in vicinity of NE-07 is considered very unlikely as none of the other positive sample locations are within the hydraulic zone of influence downstream of NE-07. This is also supported by the model predicted feedermain flow directions and water age. The water age analysis is discussed later in this document. The feedermain flow paths are summarized in **Figure 19** (refer to Section 6) and indicate the normal feedermain flow directions for daytime and nighttime.

None of the January 26, 2015 sample locations which tested positive are connected in terms of the hydraulic zone of influence, downstream and upstream, within the local water distribution network. As such, a single point source contamination in the local water distribution system, in the vicinity of any of the sample locations which tested positive on January 26, 2015, is very unlikely. Additional sample locations which were tested on January 26, 2015 (and were found negative) were reviewed to determine if they are located within the hydraulic zone of influence of the samples locations which tested positive, as described below:

- NE-05 is located within the downstream zone of influence NE-06. From the model simulation, the estimated water travel time from NE-06 to NE-05 is 14 hours. The January 26, 2015 sample from NE-05 tested negative for TC and EC. NE-06 and NE-05 were sampled at 9:20 am and 9:10 am, respectively on January 26, 2015.

- NE-09 is located within the downstream zone of influence NE-07. From the model simulation, the estimated water travel time from NE-07 to NE-09 is 38 hours. The January 26, 2015 sample from NE-09 tested negative for TC and EC. NE-07 and NE-09 were sampled at 9:38 am and 9:55 am, respectively on January 26, 2015.
- SE-05 is located within the downstream zone of influence SE-04. From the model simulation, the estimated water travel time from SE-04 to SE-05 is 38 hours. The January 26, 2015 sample from SE-05 tested negative for TC and EC on January 26, 2015. SE-04 and SE-05 were sampled at 2:45 pm and 2:28 pm, respectively on January 26, 2015.

4.8.4.2 Single Point Contamination at the MacLean Reservoir

Five of the six positive samples from January 26, 2015 are supplied by the MacLean Reservoir and Pumping Station. These sample locations are in relatively close proximity to feedermain offtakes, and somewhat follow the north or south feedermain flow path from the pumping station, albeit with some negative samples in between. As such, the possibility of a single point contamination at the MacLean Reservoir was reviewed as part of the hydraulic model analysis.

Water age simulations were completed to estimate the travel time of water from the MacLean Pumping Station to each of the locations sampled on January 26, 2015 that are supplied by the MacLean Reservoir.

Table 6 shows the results of the analysis sorted by travel time from the MacLean Pumping Station to each sample location, as well as the time that the samples were taken. **Figure 19** (refer to Section 6) summarizes this information on a map of the feedermain network shown along with the sample locations. Refer to **Appendix D** for a screen capture from the EPANET model which shows colour coded simulated water age in the distribution system for one time step representative of typical or average water age.

Based on the hydraulic model predicted travel time of water from the MacLean Pumping Station to the sample locations which tested positive on January 26, 2015, the time that a potential contamination would have left the MacLean Pumping Station was back-calculated; this is summarized in **Table 5** below.

Table 5: Back-Calculated Date That Potential Contamination Would Have Left the MacLean Pumping Station

NE-01	
NE-07	
SE-04	
SE-03	
NE-06	

Table 6: Average Water Age for Sample Locations Supplied by the MacLean Reservoir

Sampling Location	*E.coli*-QT (MPNU/ 100 mL)	Total Coliform-QT (MPNU/ 100mL)	Time Sampled (hrs)	Water Age from MacLean (hrs)	Water Age from MacLean (days)
MacLean Station Discharge					
SE-01 [redacted]	<1	<1	10:18	-	-
From MacLean to NE Sorted by Travel Time					
NE-06 [redacted]	<1	1	9:20	[redacted]	[redacted]
NE-05 [redacted]	<1	<1	9:10	[redacted]	[redacted]
NE-07 [redacted]	9	53	9:38	[redacted]	[redacted]
NE-02 [redacted]	<1	<1	8:54	[redacted]	[redacted]
NE-09 [redacted]	<1	<1	9:55	[redacted]	[redacted]
NE-01 [redacted]	1	5	8:42	[redacted]	[redacted]
From MacLean to SE Sorted by Travel Time				[redacted]	[redacted]
SE-02 [redacted]	<1	<1	10:37	[redacted]	[redacted]
SE-03 [redacted] Ave.	1	4	15:04	[redacted]	[redacted]
SE-04 [redacted]	1	3	14:45	[redacted]	[redacted]
SE-05 [redacted].	<1	<1	14:28	[redacted]	[redacted]
SE-13 [redacted]	<1	<1	11:12	[redacted]	[redacted]
SE-11 [redacted]	<1	<1	10:52	[redacted]	[redacted]

The water travel time to the sample locations which tested positive in the northeast zone varies by as much as two days. Three samples from the northeast with travel times between the highest and the lowest values for travel time (both of which were tested as positive) came back as negative. It is noted that the follow up testing completed on January 28 and 29, 2015 came back negative at all of the re-sample locations. The water travel time to all sample locations in the southeast varies by as much as only 10 hours. Four of the six locations in the southeast sampled on January 26, 2015 came back negative. The sample locations in the southeast which tested negative were also in relatively close proximity to feedermain offtakes.

From the results shown in **Table 5**, a potential contamination from the MacLean Reservoir would have had to have been present over a two day period to align with the positive sample results.

Finally, for a contamination of the MacLean Reservoir to be a plausible scenario it would be expected to notice higher values for EC and TC for the samples sites with the shortest water age. The measured high chlorine residual for all samples which tested positive also does not support this scenario.

4.8.4.3 Contamination from January 18, 2015 Feedermain Operations

It was suggested that the Level 2 Assessment include a review of the operation of the Birds Hill Feedermain on January 18, 2015 which caused numerous discoloured water complaints from customers. Refer to **Appendix D** for a map indicating the locations of the discoloured water complaints received by the Department on January 18, 2015.

Comparing the water age map and the locations of the January 18, 2015 discoloured water calls (**Appendix D**), it is evident that the water in the affected area turns over in 1 to 4 days. As such, this water had left the distribution system prior to the sampling conducted on January 26, 2015. The presence of any contamination may have been detected as part of the routine sampling conducted on January 19, 2015.

4.8.5 Conclusions

Based on the results of the hydraulic analysis, it is highly unlikely that the following scenarios contributed to the January 26, 2015 positive samples:

- a single point contamination of the distribution system;
- a single point contamination of the MacLean Reservoir; or
- contamination from the January 18, 2015 Birds Hills Feedermain operation

The appearance and disappearance of contamination (within a day) in sample locations with hydraulic travel times that are days apart do not appear to be indicative of a single contamination event.

4.9 Effect of Di scoloured Wat er o n th e J anuary 26, 2015 Pos itive Bacteriological Samples

4.9.1 Methodology

Prior to this assessment, the City had undertaken extensive investigations on causes and possible effects of discolored water. No links to bacteriological parameters were found. However, as part of this assessment, the most recent positive TC/EC event was investigated as it related to discolored water to see if the previous conclusion is still valid. Discoloured water complaint data for 2 weeks prior to the January 26, 2015 positive bacteriological samples were examined to see if there was any correlation between discoloured water and the event. To determine this, the discoloured water calls (information requests and Service Requests (SR)) were examined to see if any of the complaints were in the vicinity (upstream and downstream influence) of the six positive EC and TC samples. For the occasions where a substantial number of complaints in the vicinity of the sample point was observed (greater than 10), the estimated number of times that the water would have turned over between when the calls were received and when the positive samples were taken was calculated. This number was calculated by taking the number of days between when the calls were received and when the positive samples were taken and dividing this number by the estimated average water age at the sampling point. The average water age and upstream / downstream zone of influence were estimated from hydraulic model simulation as outlined in Section 4.8.

4.9.2 Observations

Table 7 summarizes two weeks of complaint data in relation to the six positive samples taken on January 26, 2015. For occurrences where the number of complaints is greater than 10, the estimated number of times that the water would have turned over between when the calls were received and when the positive samples were taken is listed. **Appendix D** illustrates complaint data for each day for the two weeks leading up to and including January 26, 2015.

Table 7: Number of Discoloured Water Complaints in the Vicinity of the Six Positive Sample Points

Sampling Location	Parameter	Jan 12, 2015	Jan 13, 2015	Jan 14, 2015	Jan 15, 2015	Jan 16, 2015	Jan 17, 2015	Jan 18, 2015	Jan 19, 2015	Jan 20, 2015	Jan 21, 2015	Jan 22, 2015	Jan 23, 2015	Jan 24, 2015	Jan 25, 2015	Jan 26, 2015
NE-01	# of Discoloured Water Calls							**1**	**2**		**1**	**>10**	**1**	**1**	**3**	**>10**
	# of Turnovers											1.4				0
NE-06	# of Discoloured Water Calls	**2**	**2**					**>10**		**5**	**1**			**4**		**7**
	# of Turnovers							11.4								
NE-07	# of Discoloured Water Calls							**>10**	**11**	**2**					**3**	
	# of Turnovers							4.4	3.9							
SE-03	# of Discoloured Water Calls															
	# of Turnovers															
SE-04	# of Discoloured Water Calls															
	# of Turnovers															
SW-07	# of Discoloured Water Calls		**1**				**1**			**1**		**>10**	**5**		**6**	**1**
	# of Turnovers											3.2				

An analysis of each of the sampling points identified in the above table follows:

- **Sample Point NE-01:** For eight of the 15 days examined, there were calls in the vicinity of the NE-01 sampling point. On six occasions, there were only three calls or less. On two occasions (January 22, 2015 and January 26, 2015), there were over 10 calls. Considering the occasions where there were over 10 calls for the January 22, 2015 occasion, it is estimated that the water would have been turned over 1.4 times before being sampled and for the January 26, 2015 occasion, the water would have been representative.
- **Sample Point NE-06:** For seven of the 15 days examined, there were calls in the vicinity of the NE-06 sampling point. On six occasions, there were only seven calls or less. On one occasion (January 18, 2015), there were over 10 calls. Considering the occasion where there were over 10 calls, January 18, 2015, it is estimated that the water would have been turned over 11.4 times before being sampled.
- **Sample Point NE-07:** For four of the 15 days examined, there were calls in the vicinity of the NE-07 sampling point. On two occasions, there were only three calls or less. On two occasions (January 18 and 19, 2015), there were over 10 calls. Considering the occasions where there were over 10 calls, for the January 18, 2015 occasion, it is estimated that the water would have been turned over 4.4 times before being sampled and for the January 19, 2015 occasion, it is estimated that the water would have been turned over 3.9 times before being sampled.
- **Sample Point SE-03:** For the 15 days examined, there were no calls in the vicinity of the SE-03 sampling point.

- **Sample Point SE-04:** For the 15 days examined, there were no calls in the vicinity of the SE-04 sampling point.
- **Sample Point SW-07:** For seven of the 15 days examined, there were calls in the vicinity of the SW-07 sampling point. On six occasions, there were only six calls or less. On one occasion (January 22, 2015), there were over 10 calls. Considering the occasion where there were over 10 calls, January 22, 2015, it is estimated that the water would have been turned over 3.2 times before being sampled.

4.9.3 Discussion

4.9.3.1 Analysis of Discoloured Water Complaints with Regards to the January 26, 2015 Positive Bacteriological Samples

For the six sites examined, there were a total of six occurrences in the two weeks prior to the January 26, 2015 positive samples where the discoloured water calls in the vicinity of the positive samples were greater than 10. Three of the six occurrences took place before January 19, 2015. On January 19, 2015, all six locations were sampled and none of them came back positive for TC or EC. It is therefore likely that these occurrences can be ruled out as having contributed to the positive samples.

Of the three occurrences that happened after the January 19, 2015 sampling, two of them occurred at sampling point NE-01 and one occurred at SW-07. For SW-07, the occurrence took place on January 22, 2015 and it is estimated that the water at this point would have turned over 3.2 times. It is therefore unlikely that the discolored water would have contributed to the positive sample. For NE-01, the occurrences took place on January 22, 2015 and January 26, 2015. For the January 22, 2015 occurrence, it is estimated that the water would have turned over only 1.4 times and for the January 26, 2015 occurrence, the water would have been representative as to what was in the system.

4.9.3.2 Analysis of the January 26, 2015 Discoloured Water Event

On January 26, 2015 there were greater than 10 discoloured water calls in the vicinity of sample site NE-01. On the same day, NE-01, along with five other sample locations tested positive for EC and/or TC. NE-01 is fed from the MacLean Pumping Station. Water from the MacLean Pumping Station flows north to NE-01 and NE-01 does not hydraulically feed any of the other five positive sample locations. The scenario of a single point contamination originating at NE-01 is therefore hydraulically impossible. NE-01, however, was the first sample taken on the sample collector's route so a possible scenario could be that NE-01 was truly a contaminated site and the sample collector inadvertently contaminated the five other samples with water obtained at the NE-01 site. The analytical data, however, does not support this hypothesis. NE-01 tested positive for 1 MPNU/ 100 mL of EC and 5 MPNU/ 100 mL of TC. NE-07 tested positive for 9 MPNU/ 100 mL of EC and 53 MPNU/ 100 mL of TC. In the case where one sample contaminates another, the original contamination would be diluted and therefore the readings should be lower, not higher. In addition to this, none of the 7 EC isolates from the 4 sample sites tested for genetic fingerprinting were similar to each other. In the situation where one sample was contaminating another, it is likely that identical genetic fingerprinting would be observed. For these reasons, the scenario where NE-01 was truly a contamination event and the five other samples were inadvertently contaminated by it is highly unlikely.

4.9.3.3 Analysis of the January 18, 2015 Discoloured Water Event

During the two weeks prior to the positive January 26, 2015 samples, there was one day, January 18, 2015, where a significant number of discoloured water complaints were received (615 Information Requests and 47 SRs). The incident was linked to the closure of a section of the Birds Hill feedermain by

City staff to undertake some nearby repair work. Model analysis of this incident revealed that it was likely that a large number of flow reversals and changes in velocity would have occurred, leading to the calls. Pressure data indicated pressures in the area as low as 42 psi (normally around 70 psi). This incident caused a significant number of discoloured water calls in the vicinity of two of the sample points (NE-06 and NE-07) which later tested positive for TC and EC. It was noted above, however, that both of these samples tested negative the day after the incident. In addition to this, the water would have turned over 11.4 times and 4.4 times for NE-06 and NE-07 respectively. This incident also produced a high number of complaints in the vicinity of other sample points (NW-05, WC-12) and these locations did not have positive results for EC or TC.

4.9.3.4 Historical Correlation between Discoloured Water Complaints and Positive Bacteriological Samples

Over the past few years, there have been many occurrences of discoloured water in the distribution system. The City has separately completed a thorough investigation of discolored water occurrences and causes which found no evidence of health concerns with observed discolored water events. Monthly SRs for the past three years were plotted against monthly occurrences of positive bacteriological samples to see if there was a correlation. As seen in **Figure 18**, no relation between SRs and positive samples could be drawn.

4.9.4 Conclusions

From the analysis described in this report, it is likely that only one sample point, NE-01, was under the influence of discoloured water at the time it was sampled (January 26, 2015). It is very unlikely that NE-01 was a single point source of contamination as it is not hydraulically connected to the other sample points that tested positive. In addition, it is unlikely that NE-01 was truly a contamination event and the five other samples were inadvertently contaminated by it. In this scenario, lower positive results along with similar genetic fingerprinting would have been anticipated. This was not the case.

It is unlikely that the January 18, 2015 incident which caused high levels of customer complaints can be tied to the six positive bacteriological samples on January 26, 2015. No positive results were observed when the samples site were sampled on January 19, 2015 and it is estimated that the water would have turned over 2.9 to 11.4 times (depending on the location of the site) between the incident and January 26, 2015.

No link could be found between historical discoloured water complaints and historical positive bacteriological samples.

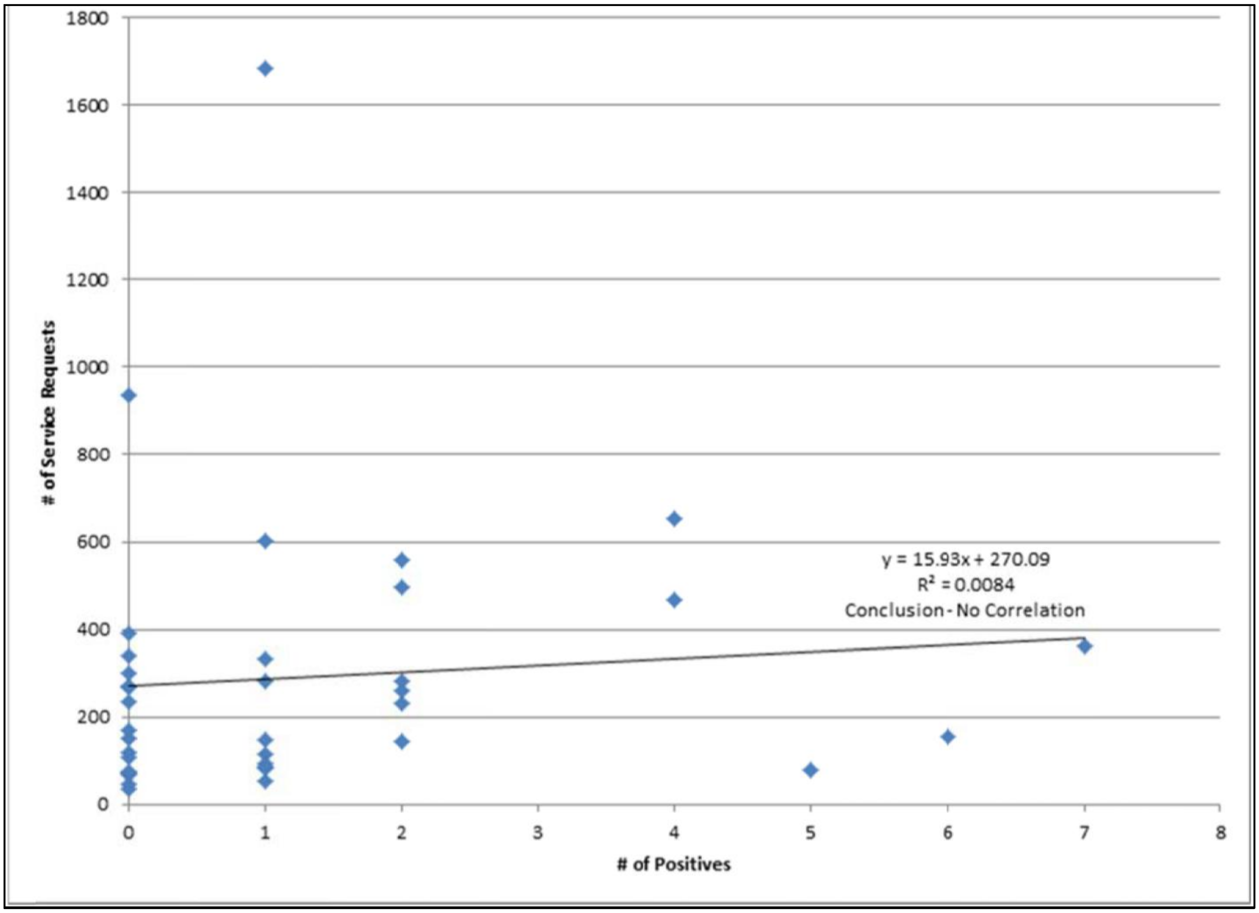


Figure 18: Monthly Service Requests vs Monthly Occurrence of Positive Bacteriological Samples

5. Scenario Development

During the February 27, 2015 team exercise, City staff and AECOM defined as many possible contamination scenarios that they could envision that might explain the TC and EC results from the January 26, 2015 event. The investigation started with a focus on the January 26, 2015 event as this event provided the most recent and complete data set, including interviews with staff and new audits of current procedures. The scenario development and analysis approach used for the January 2015 event was then applied to the May 2014 and October 2013 events as best as the data allowed.

The team first considered if a single point-source might have caused the event, including:

- The failure of a single back-flow preventer or air relief valve;
- Localized hydraulic surge/surface water contamination;
- Cross connection (from industry, private wells, etc.);
- Contamination originating in one of the major pumping stations or from the water treatment plant; and
- Distribution system maintenance operations.

The team next considered if simultaneous multiple point-source contamination sites caused by a system-wide hydraulic event could result in the TC and EC results observed on January 26, 2015. Such an event would include a hydraulic surge (short-duration rapid increase/decrease in pressure caused by an emergency pump shut-down or a valve being rapidly closed), or some other system-wide decreases in water pressure on that day. Scenarios considered included:

- Hydraulic surges resulting in multiple point-source contaminations at points of integrity loss in the distribution system (DS) (flooded air valve pits, DS leaks, faulty back-flow preventers, etc.);
- System-wide DS contamination due to biofilm growth, dislodged by a surge in pressure or flow; and
- System-wide disturbance of sediment in pipes that harbored microbial contaminants.

The team then considered if there were any other possible causes of the January 26, 2015 event that were not related to the quality of water in the distribution system, but were rather related to the sampling and analysis processes. These scenarios included:

- Faulty sample collection:
  - Poor sample location (aerator, swivel handle faucet, unsanitary surroundings, etc.);
  - Poor sample collection technique (hands not washed, dirty conditions in sample cooler, dropped caps during sampling, inadequate flushing prior to sampling, poor disinfection of sample tap, etc.); and
  - Intentional contamination of the samples.
- Faulty sample analysis:
  - Contamination of sample within the laboratory;
  - Failure to follow standard process for sample handling and analysis;
  - Improper hold-times prior to analysis;
  - Improper incubation times; and
  - Intentional contamination of the samples.

The team next revisited the possible scenarios listed above to see if the list above was exhaustive, and concluded that it was, but left open the option of discovering additional possible scenarios as the assessment progressed.

6. Analysis of Data Relevant to the January 26, 2015 Event

Having identified a list of possible scenarios that could explain the TC and EC results of January 26, 2015 the team next considered the available data and how those data tended to either support or refute each scenario. This exercise was conducted to identify what data were available, what additional data was needed, and which scenarios were deserving of more intensive investigation.

The data available for analysis were listed and to the extent possible presented for consideration, including:

- **Time and ratio-based patterns** of TC/EC/HPC/Chlorine data: How are the data sequenced in time?
- **Geographic patterns** of TC/EC/HPC/Chlorine data: How are the data distributed geographically?
- **Hydraulic p atterns** (flow paths, day and night): How do the flow patterns affect contaminant transport?
- **Chlorine die-off patterns**: How would the disinfecting characteristics of chlorine over a period of contact time impact the levels of TC/EC/HPC in the positive samples?
- **HPC patterns**: How do the HPC levels compare to the levels of TC/EC?
- **Operational patterns**: Do any operational activities correspond with the observed geographical and time-based patterns of the positive samples?
- **Public Heal th d ata**: Are there any public health records indicating a significant increase in Acute Gastrointestinal Illness (AGI) during the week following the January 26, 2015 event?

Each of the above datasets was considered with regards to how the characteristics of each dataset supported a given scenario, refuted the scenario, or was neutral to scenario (neither supporting nor refuting). The characteristics of each dataset related to this analysis are presented below.

6.1 Time and Ratio-based Patterns of TC/EC/HPC/Chlorine data

Distribution samples for TCR compliance prior to the January 26, 2015 event were typically collected every Monday of the week. Previous to January 26, 2015 these locations were last sampled on Monday January 19, 2015. Because of illness, one of the two sample collector's samples were delivered to and analyzed by the contract laboratory the following day (January 27, 2015). Only samples that were delivered to and analyzed by the lab on January 26, 2015, were reported as positive for TC/EC. The positive sample sites were re-sampled on January 27, 2015 and January 28, 2015 along with upstream and downstream samples. All of the samples collected on January 27 and 28, 2015 and the samples collected on January 26, 2015 but delivered to the laboratory on January 27, 2015 were negative for TC/EC.

This indicates that all sample sites were TC/EC negative 7 days prior to January 26, 2015 and TC/EC negative on January 27 and 28, 2015. In addition, non-compliance samples collected on January 20, 2015 were also negative for TC. Thus, any activity that resulted in the January 26, 2015 event likely happened between January 20 and January 27, 2015. In addition, those samples collected on January 26, 2015 but analyzed on January 27, 2015 were negative for TC/EC. This leads to the conclusion that the event of January 26, 2015:

- Did not impact the samples collected the previous week (January 19, 2015);

- Did not impact the samples collected on January 26, 2015 but which were analyzed on January 27, 2015; and
- Did not impact samples collected on January 27 and 28, 2015 for these sample sites.

This indicates that the positive TC/EC samples were all collected by a single sample collector, and that the positive samples were all received and analyzed at the laboratory on the same day (January 26, 2015). The number of positive TC samples collected and analyzed on that day was highly irregular (6 of 21 samples collected, or ~29%), compared to the January 2010-February 2015 database of 0.4% positive.

The ratio of TC samples that were EC positive was analyzed for the City 2010-2015 compliance database. Of the 44 samples that were TC positive prior to January 26, 2015, 3 were positive for EC (or ~7%). Of the 6 samples positive for TC on January 26, 2015, 5 were EC positive (~83%). This indicates that the ratio of positive TC/EC samples was highly irregular during the January 26, 2015 event.

The HPC data collected on compliance samples from January 1, 2010 through February 11, 2015 were analyzed for frequency of detection above detection limits for comparison to the January 26, 2015 event. Over the 5 year period, 10% of all compliance samples collected had HPC values reported above the detection limit of 10 CFU per mL. On January 26, 2015, 1 sample reported a HPC value of 10 CFU per mL, with the remaining 41 samples reported as <10 CFU per mL, or below the detection limit. Thus about 2% of the samples were below detection limit, compared to 10% for the entire dataset from January 2010-February 2015. This indicates that HPC values were typical of good bacterial water quality during the event of January 26, 2015.

Chlorine residual data from the 2010-2015 databases were analyzed and compared to data from the January 26, 2015 event. The average free chlorine residual in the entire database was 0.68 mg/L, compared to 0.78 mg/L for the 6 samples reported as TC positive on January 26, 2015, with the lowest reported value of 0.49 mg/L. Thus the free chlorine residuals for the TC positive samples of January 26, 2015 were indicative of good water quality.

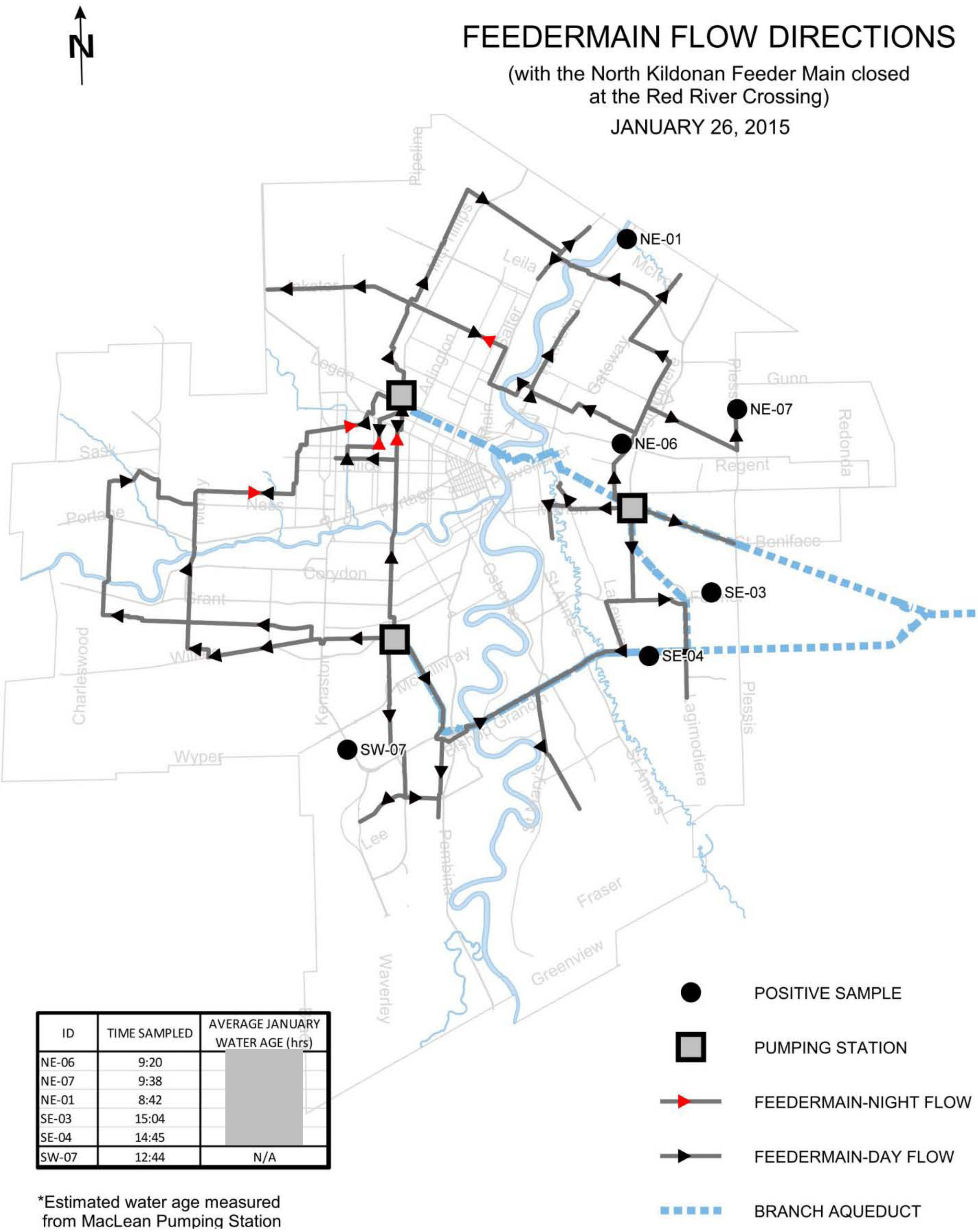
6.2 Geographic Patterns of TC/EC/HPC/Chlorine Data

The geographic spread of the positive TC samples collected on January 26, 2015 was analyzed as a function of potential contaminant location, which was used in conjunction with the time data to evaluate the single point-source and multiple point-source scenarios. In general, the positive sample locations were randomly dispersed through the distribution system, with positive samples and negative samples showing similar distributions. It was noted to the contiguous positive samples, such as sample locations SE-03 and SE-04, could possibly share a common flow path which has no negative samples in-between. These and other similarly aligned sample locations were closely scrutinized during the single and multiple point-source scenario evaluations and computer simulations.

Similarly, HPC and free chlorine residual data showed neither a geographic pattern consistent with elevated TC densities, nor any aberrations from normal.

6.3 Hydraulic Flow-Paths

Computer models (generated through EPANET) of the distribution system were used to generate flow paths and water age maps of the feedermain system. These models provided the base-maps against which the time characteristics of sample collection and TC detection were evaluated. The base map, showing samples from January 26, 2015, and primary flow paths on the feedermains, is provided in **Figure 19**.



ID	TIME SAMPLED	AVERAGE JANUARY WATER AGE (hrs)
NE-06	9:20	
NE-07	9:38	
NE-01	8:42	
SE-03	15:04	
SE-04	14:45	
SW-07	12:44	N/A

Figure 19: Computer Model Results Showing Flow Paths, Sample Locations, and Water Age

Water quality data were analyzed against the time of day sampled and the “water-age/time-of-travel” between locations where the positive TC samples were reported. This information was used to evaluate the pattern of contaminant spread from a single point-source and multiple point-source scenarios. In general, the time of travel analysis did not indicate that the single point-source would have been characterized by the appearance and disappearance of contamination within a day in sample locations with hydraulic travel times that are days apart.

6.4 Chlorine Die-Off Characteristics

In the event of contamination of a distribution system, it is typical to see free chlorine residuals decrease as the contamination consumes the chlorine residual. The typical pattern associated with sanitary contamination of a drinking water supply is to see free chlorine residuals decrease as levels of HPC, TC, and EC increase. Thus, the increased detections of TC and EC observed on January 26, 2015 should have been be associated with decreased free chlorine levels if a significant contamination in the DS occurred. As is indicated in the **Table 8** (condensed version of **Table 2**), the highest level of TC density was also associated with the highest free chlorine residual. These data were tested for correlation (**Figure 20**), and the relationship between free chlorine residual and TC density was found to be random, although the data tendency was towards higher chlorine residuals associated with higher TC levels. This finding is counter-indicative of a either a single point-source or a multiple point-source contamination event in the distribution system.

Table 8: Positive Samples Collected January 26, 2015

Sample Name	Free Chlorine (mg/L)	Turbidity (NTU)	EC (MPNU/ 100 mL)	TC (MPNU/ 100 mL)	HPC (CFU/mL)
SW-07	0.74	0.17	1	1	<10
SE-04	0.78	0.31	1	3	<10
SE-03	0.76	0.25	1	4	<10
NE-01	0.49	0.26	1	5	<10
NE-07	0.96	0.19	9	53	<10
NE-06	0.95	0.31	<1	1	<10

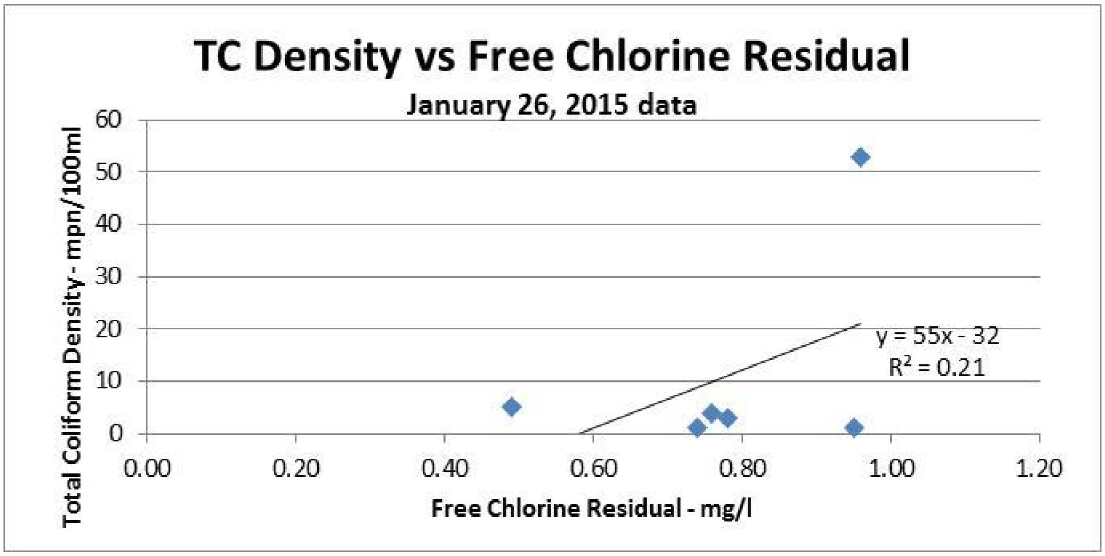


Figure 20: Correlation between TC Density and Free Chlorine Residual for Positive TC Samples of January 26, 2015.

Similar to the discussion on free chlorine above, elevated HPC counts are typically encountered prior to and in conjunction with TC positives samples (particularly in the case of biofilm development in water distribution systems), and are likewise found in sanitary contamination of water distribution systems. HPC levels on January 26, 2015 were low, and did not indicate any association with the samples reported as positive for TC.

6.5 Maintenance Operations

Distribution system maintenance operations (such as main leak/break repair, valve closures, hydrant operations, etc.) were reviewed to see if there was any activity that might be associated with the positive TC samples reported on January 26, 2015. Logs of all maintenance activities are provided in **Appendix E**, and the activities that had a potential for contamination are plotted on maps of the City in **Appendix E**. An example of one of these maps showing the watermain repairs for January 12-26, 2015 is shown in **Figure 5** in Section 4. There were no unusual maintenance activities reported for the 2 weeks prior to January 26, 2015. Of those routine maintenance items in the two days prior to January 26, 2015, none provided a pattern consistent with the location of the positive samples reported on January 26, 2015.

6.6 Public Health Data

In an acute, widespread sanitary contamination of a large public drinking water supply, it is reasonable to expect an increase in AGI case admissions at health clinics and hospitals. Another common metric is an increase in anti-diarrheal over-the-counter medications. The Winnipeg Regional Health Authority was contacted regarding any unusual increase in AGI cases following the January 26, 2015 event, and Lisa Richards (Medical Health Officer, WRHA) reported: "*I did indeed work with our epidemiology unit during both BWAs, and there was no unusual enteric activity for the reportable diseases*." This indicates that the event of January 26, 2015 was not associated with any observed increase in AGI in an epidemiologically targeted evaluation of available data.

6.7 Laboratory Protocol Review

AECOM reviewed the lab analysis process from sample receipt through incubation. Observations from this visit indicated an operating procedure following the HPC analysis that could affect the TC/EC analysis. Steps have been taken to reduce the risk of contamination from this process for all Winnipeg drinking water samples submitted to the lab. It is noted that the contract lab holds formal accreditation by the Canadian Association for Laboratory Accreditation (CALA) for 24 different microbiology test methods, and conducts bi-annual third party site audits and required twice-yearly participation in a formal proficiency test program. Routine cleaning practices, work area contamination monitoring, and method blanks are standard practice. The lab participates in performance testing samples each year for the tests used on the City of Winnipeg samples, and since the late 1990s, has consistently met accrediting agency criteria for demonstrating proficiency and maintenance of accreditation.

6.8 Scenario Analysis

Each of the potential sources of contamination implicated in the January 26, 2015 event was considered as a single point-source, a multiple point-source triggered by a single hydraulic event, or a sampling/lab analysis source. Each of these three scenarios was evaluated with a simple metric for fit to available data and patterns:

- The data pattern fits the scenario: +1
- The data pattern is neutral to scenario (neither supports nor contradicts): 0
- The data pattern contradicts scenario: -1

This analysis is not intended to be rigorous, but rather provides a systematic framework against which the 3 scenarios were discussed and summarized. The team also performed a sensitivity analysis on each of the valuations, adjusting the score based on a more critical interpretation of the data pattern based on uncertainties and less-likely explanations of data patterns. As an example, the random geographic pattern of positive samples could either fit the sample collection/lab scenario (+1), or noting that both were random, be neutral (0). This step was included to counter any bias the group might have, noting that only City staff and AECOM were involved in the analysis. A summary of the discussions used in each of the ratings is discussed below and summarized in **Table 9**, with the result of the sensitivity analysis shown in parentheses.

Time-based patterns: The TC/EC positives all appeared on one day, with all samples on the following day being negative. All other water quality parameters were normal.

- Single point-source: Considering that the 26 sample locations were as much as 17 to 68 hours from the most likely single point-source (MacLean Pumping Station), and that SW-07 is not fed from the MacLean Pumping Station, the temporal pattern does not match what would be expected from a single point-source. (-1);
- Multiple point-sources: Noting that a single hydraulic pulse or surge could disrupt flow patterns in the particular area served by the primary source, it is conceivable that several point sources could be triggered by a short pulse or pressure drop in the system. Residual chorine could then kill any TC/EC disturbed or introduced as a result of the surge, resulting in clean samples the next day. However, this does not explain the positive result at sample location SW-07, which is somewhat hydraulically isolated from the other positive samples. (+1)/(0); and
- Sampling/lab source: These would tend to be independent of any distribution system-based temporal variations and would appear random over the course of the sampling period, or could be sequential based on the time of sampling or time of analysis. (+1)/(0)

Geographical Patterns: The geographical pattern is one of random distribution over the entire area sampled, with negative samples dispersed in an equally random pattern.

- Single point-source: single point-source would be expected to follow a pattern from the point of contamination radially outward. This does not fit the spatial data pattern observed (-1);
- Multiple point-sources: A single pressure pulse could trigger multiple point-sources at points of integrity failure in the distribution system (flooded air relief vaults, faulty backflow preventers, leaking watermains, etc.) (+1); and
- Sample/lab source: These would tend to be independent of any distribution system based spatial variations and would appear random over the course of the sampling period. (+1)/(0)

Hydraulic Flow Patterns: Hydraulic flow paths are presented in **Figure 19**. The occurrence pattern of positive samples appears to be independent of flow paths.

- Single point-source: single point-source contamination would be expected to follow hydraulic flow paths, and be present in a consistent path between source and sample. This type of distribution was not observed. (-1);
- Multiple point-sources: multiple point sources would be expected to be independent of hydraulic flow patterns. With positive samples being independent, and multiple point-sources being independent, this pattern is neutral. (0); and
- Sample/lab source: Similar to the discussion for multiple point-sources, sample/lab sources would tend to be independent of any distribution system hydraulic patterns, and thus neutral. (0)

Chlorine residual patterns: Chlorine residuals were consistently high during the event, and variations in concentration were random across the monitoring area.

- Single point-source: Chlorine residuals would be expected to decrease at the point of contamination, with higher TC associated with lower chlorine residuals. Chlorine residuals observed were counter-indicative for this scenario. (-1);
- Multiple point-sources: Like a single point- source, chlorine residuals would be expected to decrease with proximity to contamination sources. Data are counter-indicative. (-1); and
- Sample/lab source: Sample/lab contamination would be independent of field-measured chlorine residuals, as samples are dechlorinated upon sampling. (+1)

HPC Patterns: The HPC patterns were consistent across all samples and were indicative of low bacterial levels in the distribution system.

- Single point-source: HPC levels are typically very high in the presence of environmental sources of TC and EC. The results are counter-indicative. (-1);
- Multiple point-sources: As with a single point- source, observed data are counter-indicative. (-1); and
- Sample/lab source: Contamination that occurs during sampling resulting in positive TC and EC levels would also likely result in elevated HPCs, and results are counter-indicative of this. However, lab contamination that occurred between the HPC analysis and the TC/EC analysis could explain high TC/EC levels with low HPC levels. This pattern would rate as a (-1) for sample contamination, and (+1) for lab contamination. (0)/(-1)/(+1)

Distribution System Operations/Maintenance Patterns: The maintenance activities data indicate no pattern between distribution system maintenance activities and the TC positive sample locations.

- Single point-source: Maintenance activity would be expected to coincide with positive sample locations. No association was observed. (-1)/(0);
- Multiple point-sources: Same as with single point-source. Although maintenance activities and positive samples were randomly distributed across the sampled area, there would be expected pairs between maintenance and positive sites. No association was observed (-1)/(0); and
- Sample/lab source: Contamination resulting from a sample or lab source would likely be independent of operation activities, thus matching the pattern of no relationship. (0)

Epidemiological Data for AGI: A waterborne disease outbreak would be expected if the source originated in the public water supply. There were no indications of waterborne disease outbreak as a result of the January 26, 2015 event, which is counter-indicative of the source originating in the public water supply.

- Single Point- Source: Any sanitary contamination from a single point-source that resulted in widespread detection of EC would be expected to be accompanied by increased AGI. These data are counter-indicative of that scenario. (-1);
- Multiple point-sources: Same observation as with single point-source. (-1); and
- Sample/lab source: Any contamination that occurs in the process of sampling or analysis would result in no public health impact, which is consistent with the epidemiological data. (+1)

Table 9: Scenario Analysis

Data Scenario	Time Pattern	Geo Pattern	Flow Path	Chlorine Residual	HPC Data	DS Ops Issues	AGI Data	TOTAL (Range)
Single Point Source	-1	-1	-1	-1	-1	-1(0)	-1	**-7** (-7/-6)
Multiple Point Sources	1/(0)	1	0	-1	-1	-1/(0)	-1	**-2** (-3/-1)
Sample/Lab Source	1/(0)	1/(0)	0	1	0 (-1/+1)	1(0)	1	**5** (6/1)

**Value in parenthesis indicates sensitivity analysis range.*

6.9 Scenario Analysis Discussion

The scenario analysis exercise was an attempt to consider and rank events that would support or refute the likely causes of the January 26, 2015 event, but cannot be used to prove or disprove any particular hypothesis. Instead, the data patterns are used to indicate which scenarios are least likely and which are most likely. The sensitivity ranges are intended to display the impact that bias might impart on the analysis. The scenario analysis team met (by conference call on March 20, 2015) and discussed the findings of this assessment. The following paragraphs summarize the analysis, and provide the background for the conclusion of this assessment.

Single Point Source: All data patterns are counter-indicative of a single point- source causing the pattern of TC/EC positives observed on January 26, 2015, and this is thus the least likely of the three scenarios. Any events that are solely point source and would not be dependent on a system hydraulic surge (such as cross connections and isolated maintenance activities) are thus highly unlikely to have caused the positive TC/EC detections.

Multiple Point Sources: For multiple points of system vulnerability to trigger at the same time and result in widespread contamination, the hydraulic event would have to extend over a period of time sufficient to transport the contaminant from the point of contamination into the pipeline. No significant pressure deviations were observed from any of the 11 pressure monitoring points in the distribution system. These pressure monitoring points "poll" every 2 minutes, and thus any surge would have to last less than 2 minutes to not be observed. Noting, however, that this polling interval is not synchronized, a system-wide hydraulic pulse would have had to occur for a duration of less than 2 minutes to elude detection by any monitor. Water-hammer related pressure surges travel at the speed of sound, and are typically measured in fractions of a second. Thus, any water-hammer surge would have likely had inadequate time to allow contamination into the pipe system for more than a second, which would exclude any contamination from service-line related sources (as there is too little time for the surge to allow backflow through any appreciable distance in the service line).

A water-hammer related surge would most likely be created by a power failure resulting in rapid pump shutdown and valve closure. These conditions were not experienced in the period prior to January 26, 2015, and no anomalies were observed in pressure readings in the week prior to the event. Further, it is unlikely that a surge possible of triggering contamination from several susceptible sources throughout a widespread area could occur without some type of observable system impact, such as several broken watermains. The wide range of EC genotypes observed in the positive samples, however, is consistent with varied contaminant sources. This scenario is considered highly unlikely; however, because the HPC, chlorine, and epidemiological data patterns do not fit this scenario, and no other operational data can be found that supports the hypothesis of a short-term hydraulic pulse triggering the contamination.

Sample/Lab Sources: All of the observed data patterns can be explained by contamination that occurred in either the sample collection/lab analysis processes. The wide variation in genotypes observed is consistent with one complex multiple strain contaminant source or several less-complex sources. It is also noted that sample location NE-07 (which had 9 positive EC cells on the QuaniTray) likewise displayed a complex mixture of genotypes (none of the 4 positive cells tested displayed similar genotypic strains of EC). Thus, the complexity of the contaminant source is not necessarily indicative of multiple point-sources, and can be explained by a single complex point-source.

It is difficult to differentiate between a possible contamination event that might have occurred in the sampling process versus the lab analysis process, with the following observations noted:

- **HPC data**: any contamination in the sampling process would be expected to result in elevated levels of HPC and TC/EC. This was not observed, with all 6 positive TC samples having normal levels of HPC. Noting that the lab process involves sequentially analyzing all samples for HPC as a batch, then pre-processing for TC/EC (adjusting volume in the water sample to 100 mL), and then analyzing for TC/EC, it is possible that any contamination occurring after the HPC analysis would match the observation of normal HPC levels with abnormal TC/EC levels.

- **Sample collector/lab analyst**: Samples positive for TC/EC were collected by the same sample collector and analyzed by the same lab analysts. Even though other samples collected by another sample collector on January 26, 2015 were negative, they were also analyzed on another day. Thus it is impossible to determine if the positive samples were a result of a different sample collector or a different day of analysis.

- **Genotypic Strains of EC**: None of the 7 EC isolates from the 4 sample sites tested for genetic fingerprinting were similar to each other. For this trend to result from sample collection, each of the 4 samples would have either been contaminated by a common complex source containing multiple EC genetic strains over the course of the day, or by 4 distinctly different sources over the course of the day (statistically unlikely). Noting that sample location NE-07 (with 9 positive EC cells in the QuantiTray, 4 of which were analyzed for genotype) none of those 4 genotypic strains similar indicates that the contamination in NE-07 contained a wide variety of EC strains. It is impossible to distinguish between multiple contamination events of a single complex source by a sample collector versus multiple contamination events in the lab from a single complex source (occurring between the HPC and TC/EC analyses).

- **Possible sources of contamination**: possible contamination sources of a complex mixture of EC strains include a common point of contact for the sample collector and a complex mixture from the lab.

Contamination during either the sample collection process or laboratory analytical process is the most likely of all scenarios considered. Independent reviewers are split on the likelihood of either, and data and records can be interpreted to support either. It is impossible, however, to prove or disprove either scenario based on the information available.

6.10 Scenario Analysis for Events of October 7, 2013 and May 26, 2014

The event of October 7, 2013 was very similar to the January 26, 2015 event with regards to water quality data and trends. Other than the data for TC/EC on this date, all other measured water quality parameters were normal, and repeat samples on the following two days were negative. Public health data for community-wide AGI were normal throughout the event. A hydraulic model of water flows representative of flow conditions on that day indicated that a single source of contamination was highly unlikely, noting non-contiguous positive samples and positive samples hydraulically isolated from each other. No aberrations in operations activities were noted that might have triggered a system-wide hydraulic pulse, thus minimizing the likelihood of a simultaneous multiple source scenario. In all regards, the event of October 7, 2013 very much resembled the event of January 26, 2015.

The event of May 26, 2014 involved only one sample, and thus the isolated single point source contamination scenario cannot be ruled out. The HPC/TC/EC density ratios (1390/210/11) resemble those that might be expected from an environmental source of contamination, which could have originated in the DS, the sample collection process, or the laboratory process. The chlorine residual and turbidity data were normal and not supportive of a scenario involving a DS contamination event, and repeat samples were negative. Community-wide AGI data were normal. At the time of the event, a review of system activity and monitoring data found no evidence or clear opportunity for distribution system contamination. The compilation of data suggests that this was a sampling or lab contamination event, but a short-term contamination event in the DS which was mitigated by the chlorine residual cannot definitively be ruled out.

7. Conclusions and Recommendations

7.1 Conclusions

The City of Winnipeg water system was reviewed in light of recent boil water advisories. The system and operations and maintenance procedures were found to be robust. While no significant issues were found, a number of recommendations for improvement were identified.

It is impossible to prove retrospectively what caused the January 26, 2015 event. Based on available data and a systematic analysis of all conceivable possibilities, it is very unlikely that the event of January 26, 2015 was indicative of a contamination of the public water supply. It is most likely that the cause of the positive samples was contamination introduced in the sampling or analytical process. A similar conclusion can be drawn from the data trends from the October 2013 event. The event of May 2014 involved only one sample, and thus the possibility of a localized contamination event cannot be definitively ruled out. The presence of a strong chlorine residual, low turbidity, and negative repeat samples, along with no indication of an increase in public health impact, however, favor a scenario where the positive sample was caused by sample collection or laboratory contamination.

7.2 Recommendations

Given the complexity of the water supply system, periodic reviews of the entire water system should be considered, such as valve pit inspections. Under provincial water regulations, a water system assessment must be conducted every five years. An annual review focussing on system water quality vulnerability is recommended. This review should be performed by City staff involving a cross section of appropriate employees most familiar with the processes as performed in the field, along with managers and supervisors.

Opportunities for improvement to the City's water system have been identified, and should be evaluated for prioritized implementation. **Appendix A** includes a listing of the detailed findings. A general summary of the major recommendations is as follows:

- Periodic evaluation of the water system SOPs and practices in the field should be conducted in order to reflect current standards and best practices. The City's operational procedures generally follow good industry practice.
- Periodic evaluation of operation and maintenance records that could be associated with a water system vulnerability.
- Remediation of minor contamination risks identified in the City's facilities, including reservoirs and valve chambers.
- A periodic review of vulnerabilities to the sampling points should be considered to ensure changes to plumbing are not affecting tested water quality. Such a review should be conducted as part of an annual assessment, and would likely require its own SOP.
- An evaluation of the City's quality management system should be conducted to improve sample collection, start to finish.
- Determining the business case for the creation of a microbiological laboratory within the City's facilities.
- Working with the third party analytical laboratory conducting water quality testing to identify and reduce the possibility of contamination at the laboratory.

Appendix A

- RTCR Review

A1 Summary of Recommendations

Appendix A.1 - Summary of Recommendations

Recommendation	Corrective Action	Timeline for Completion
General		
Periodic reviews of the entire water system should be considered.	An annual review focussing on system water quality vulnerability is recommended. This review should be performed by City staff involving a cross-section of appropriate employees most familiar with the processes as performed in the field, along with managers and supervisors.	Annual
Operations and Maintenance (O&M) and Standard Operating Procedures (SOP)		
The City’s operational procedures generally follow good industry practice.	Periodic evaluation of the water system SOPs must be continually conducted in order to reflect current standards and best practices.	Annual
Periodic evaluation of operation and maintenance records that could be associated with a water system vulnerability.	Assessment of hydrant operation and repair activities.	Annual
	Assessment of feedermain/watermain maintenance and repair activities.	Annual
	Assessment of environmental conditions (e.g. extreme temperatures, significant precipitation, high river levels).	As required
	Assessment of air relief valve and valve pit conditions.	Annual
	Assessment of reservoir access, operation and water levels.	Annual
	Assessment of distribution pressure monitoring and control.	Annual
	Assessment of high risk cross connections.	Annual
	Assessment of general security of water system assets.	Annual
Facility Vulnerability Assessments		
[redacted]	[redacted]	Sept 1, 2015
		Sept 1, 2015
		Dec 31, 2015
		Sept 1, 2015
		May 1, 2016
Water Sampling Locations		
A periodic review of vulnerabilities to the sampling points could be considered to ensure changes to plumbing are not affecting tested water quality. Such a review could be conducted as part of an annual assessment, and would likely require its own Standard Operating Procedure. The following sampling conditions should be	Check for (and replace as needed) sampling taps that don’t meet recommended characteristics, such as taps with non-removable aerators, swivel handles, and point-of-use attachments.	Sept 1, 2015
	Check for (and replace as needed) sampling taps on plumbing lines that do not contain backflow preventers or any form of service isolation.	Sept 1, 2015

Recommendation	Corrective Action	Timeline for Completion
avoided or remedied where possible:	Check for (and replace as needed) sampling taps on plumbing lines that contain backflow preventers that are non-inspectable and/or are not regularly inspected.	Sept 1, 2015
	Check for (and replace as needed) sampling tap on plumbing lines that contain in-line filters will no associated maintenance records and/or contain dormant piping.	Sept 1, 2015
	Check for (and replace as needed) sampling locations with conflicting uses, such as bathrooms and custodial closets.	Sept 1, 2015
	Check for (and replace as needed) sample bottles that are not kept in a sanitary environment.	Sept 1, 2015
	Check for (and replace as needed) the use of backflow preventers, including air-gap preventers that are not regularly monitored/ tested.	Sept 1, 2015
	Check for (and replace as needed) sampling points located in areas such as bathrooms, where a potential for bacterial cross-contamination with fecal coliform bacteria is greater than it needs to be.	Sept 1, 2015
	Check for (and replace as needed) sampling locations that are located far from the service connection within a given establishment.	Sept 1, 2015
The recorded time increment between sample collections on January 26, 2015 appeared to be inconsistent for some locations, given travel time between locations and flushing times required prior to sampling. Labelling of water samples should be conducted in a manner such that they are reflective of the time and location samples.	Given the time constraints that may be placed on operations staff, automated labelling/timestamps may be used to provide more accurate data. SOP should be revised.	Sept 1, 2015
Water sample volume required for each sampling location should be identified and noted on a collection sheet.	Water flushing prior to sample collection can be conducted using water volume flushed or by time of flushing. Parameters such as temperature can be used to inform appropriate flushing volumes/times.	Sept 1, 2015
Review of proper sampling protocols should be periodically conducted with operations staff to reduce the chance of operator error.	Conduct periodic reviews with a set timeline. Such reviews would need to include backup staff as well.	Annual
City Quality Control Procedures		
An evaluation of the City's quality control (QC) process may be conducted to improve sample collection, start to finish. This may include:	Receipt and storage of sample bottles away from potential contaminant sources.	Sept 1, 2015
	Assigning an order or analysis of water samples (cleanest to dirtiest) and scheduling field samples.	Sept 1, 2015
	Documentation of sampling and analytical processes as they are currently being performed.	Sept 1, 2015

Recommendation	Corrective Action	Timeline for Completion
	Development of a rigorous sample collection protocol (including flushing time and temperature, order of field analysis, handling the lid, documentation).	Sept 1, 2015
	At a minimum, annual updates and reviews of sampling and analytical processes, focusing on deviations from established procedures, changes in procedures, and new or previously undiscovered vulnerabilities.	Annual
	Consideration for collecting/analyzing samples more days of the week (e.g. 4 days with 10 samples per day would likely be better/more protective than one day with 40 samples), and at key points from source into the distribution system daily. The sampling schedule would require amendment of to the Water Treatment Plant Operating Licence.	Dec 31, 2015
	Re-evaluation of sample locations (representative of distribution system, cleanliness, availability for recheck). Consideration may be given to using City facilities as sample collection points.	Sept 1, 2015
	Disinfection of sample taps; consider the best method for sample tap being used (dip-disinfection may be better for taps with aerators on, swab/spray may be better for aerators off).	Sept 1, 2015
	Defining transit protocols for water samples (e.g. types of coolers, types of vehicles, time of day for sampling).	Sept 1, 2015
	Defining storage protocols for water samples (e.g. types of coolers, plus anomalies for overnight storage prior to analysis).	Sept 1, 2015
Development of an in-house general testing facility within the City's facilities. Most bacteriological samples are negative, and QuantiTray at contract lab provides quantification of any positive samples. The City should consider setting up a QC activity that initially involves presence/absence (P/A) testing of some or all bacteriological samples. This would not need to be certified (bacteriological samples come from contract lab), but should be operated according to certification standards to the extent possible.	Requirements are modest: approximately 4 feet of clean countertop for 30 minutes per day, analyst time less approximately 30 minutes per day, in a relatively clean room (sterility not required, but limited airborne dust and clean conditions are important).	May 1, 2016, for completion of business case
	Non-regulatory testing could be moved to this facility.	May 1, 2016, for completion of business case
External Laboratory Procedures		
Working with the third party analytical laboratory conducting water quality testing may aid in reducing possibility of contamination. This may include:	Modifying sample receipt procedures; perhaps isolating bacteriological samples from all others.	Sept 1, 2015
	Sample labeling, documentation and order of analysis, including technique used in sample prep for analysis and Chain-of-Custody sign-off between analysis (such as decant vs pour-off).	Sept 1, 2015

Recommendation	Corrective Action	Timeline for Completion
	Improved volume adjustment protocol (consider combining volume adjustment with the HPC prep step, using sterile 10 mL pipette to bring volume down to 100 mL, and using this same extracted volume for the HPC plate (1 mL HPC volume recommended over 0.1 mL). This reduces the number of times the sample bottle is opened after sampling from 3 to 2, reduces the number of steps in TC prep from 2 to 1 requires no additional apparatus (only a fresh sterile disposable pipette is used for HPC extraction and volume adjustment).	Sept 1, 2015
	Pour-off volume adjustment for TC analysis is not recommended, as this step can increase potential for contamination from sink splash.	Sept 1, 2015
	Consider increasing sample volume for HPC to 1 mL (currently set at 0.1 mL).	Sept 1, 2015

A2 Facilities Review Sheets (RTCR Guidance Forms)

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

System Name: **City of Winnipeg Public Water System**	Source Water: **Shoal Lake**
System Type: **Public Water System**	Population Served (in 2013): **699,346**
City, Province: **Winnipeg, Manitoba**	
Country: **Canada**	
Assessment Submission Final Report Due Date: April **30, 2015**	

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
1	**EVALUATE SAMPLE SITE - NE-01** [redacted] *Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians -* [redacted]					
a.	What is the condition of the tap? (Provide comments)	Faucet is tight; aerator doesn't come off; taps don't leak.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No		
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV)	No		
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	Work order sent to install backflow preventer after the water meter; hose bibb tap at eye wash to be cut and capped.				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	Yes	[redacted]	Work order was sent to owner on Feb. 3, 2015 to have all outstanding items corrected.
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes, when?	✓	COW (MZ, AK, KW, AV)	No		
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)	[redacted]	[redacted]
j.	Other comments on sample site?	[redacted]				
2	**EVALUATE SAMPLE SITE - NE-06** [redacted] Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians - [redacted]					
a.	What is the condition of the tap? (Provide comments)	Aerator comes off; taps don't drip; faucet and taps are tight.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No	No plumbing changes in 7 months.	

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV)	Yes	One clogged drain.	Drain has been unclogged. Issue was resolved on Jan.12, 2015.
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	As of March 5/2015, based on all visual piping - none				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	No	None on site as of Mar. 5, 2015.	No testable backflow prevention devices on site. Non required at this time (March 5, 2015). Non testable devices in place and visually OK.
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	✓	COW (MZ, AK, KW, AV)	No		
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)	[redacted]	[redacted]
j.	Other comments on sample site?	[redacted]				
3	**EVALUATE SAMPLE SITE - NE-07** [redacted] - Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians - [redacted]					
a.	What is the condition of the tap? (Provide comments)	Taps don't drip; faucet is very loose; aerator doesn't come off.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No	[redacted]	
e.	Have there been any plumbing breaks or failure? If yes when?	✓	COW (MZ, AK KW AV)	No		
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	[redacted]				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	Yes	Refer to answer in 3. f).	Letter sent to owner on Feb. 2, 2015 to have backflow preventers tested. Work completed on Feb. 27, 2015.
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	No				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)	[redacted]	[redacted]
j.	Other comments on sample site?	[redacted]				
4	**EVALUATE SAMPLE SITE - SE-03** [redacted] *- Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians -* [redacted]					

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
a.	What is the condition of the tap? (Provide comments)	Taps don't drip; faucet is tight.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No		
e.	Have there been any plumbing breaks or failure? If yes when?	✓	COW (MZ, AK KW AV)	Yes	[redacted]	Plumber was hired and fixed it.
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	[redacted]				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	No	Non testable devices look okay.	
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	No				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)	[redacted].	
j.	Other comments on sample site?	[redacted]				
5	**EVALUATE SAMPLE SITE - SE-04** [redacted] -[redacted]				*Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians*	
a.	What is the condition of the tap? (Provide comments)	Aerator doesn't come off; taps don't drip; faucet assembly is tight.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No		
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV)	No		
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	[redacted]				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	No	No testable devices on site, non testable devices visually look ok.	
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	✓	COW (MZ, AK, KW, AV)	No	Nothing brought to owner's attention.	

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)	[redacted] .	
j.	Other comments on sample site?	[redacted]				
6	**EVALUATE SAMPLE SITE - SE-07** [redacted] *Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians -* [redacted]					
a.	What is the condition of the tap? (Provide comments)	[redacted]				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No	Changed hot water tank recently.	
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV)	Yes	[redacted]	[redacted]
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	No premise isolation; non testable devices are in place; [redacted]				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	Yes	[redacted]	[redacted]
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes, when?	No				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)		
j.	Other comments on sample site?	[redacted]				
7	**EVALUATE SAMPLE SITE - SE-08** [redacted] *- Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians -* [redacted]					
a.	What is the condition of the tap? (Provide comments)	Taps don't drip; faucet is tight; faucet doesn't swivel; aerator doesn't come off.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted] .				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	Yes	[redacted]	
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV)	Yes	[redacted]	Maintenance Department reviewed and determined that small drip not a concern.

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	[redacted]				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	No	All testable devices are in compliance.	
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	Not before meter. After meter, hot water pump wasn't working so they had to shut water off to fix pump. Likely occurred before January.				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)		
j.	Other comments on sample site?	[redacted]			[redacted]	
8	**EVALUATE SAMPLE SITE - SW-07** [redacted] *- Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians -* [redacted]					
a.	What is the condition of the tap? (Provide comments)	[redacted]				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV, GV)	No		
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV, GV)	No		
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	[redacted]				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV, GV)	No	[redacted]	
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes, when?	No				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV, GV)	Point of Use (POU)	[redacted]	
j.	Other comments on sample site?	Accessible				
9	**EVALUATE SAMPLE SITE - SW-12 (** [redacted] *- Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory Technicians -* [redacted]					
a.	What is the condition of the tap? (Provide comments)	No drips; faucet is tight; aerator comes off.				

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW, AV)	No	Added Filter system in January, 2015	
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW, AV)	No		
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	As of Mar. 5, 2015, based on all visual piping - none				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW, AV)	No	As of Mar. 5, 2015 - none on site	Moderate hazard building does not have any testable devices. Non testable devices visibly look okay.
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	No				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW, AV)	Point of Use (POU)	[redacted]	
j.	Other comments on sample site?	[redacted]				
10	**EVALUATE SAMPLE SITE - SE-05 (**[redacted] Technicians - [redacted]				Completed by COW Cross Connections/BFP Inspector - MZ & AK and Analytical Services Laboratory	
a.	What is the condition of the tap? (Provide comments)	Aerator comes off; faucet and taps are tight; separate hot and cold.				
b.	What is the location of the tap? (Provide comments)	[redacted]				
c.	What is the regular use of the connection? (Provide comments)	[redacted]				
d.	Have there been any plumbing changes or construction? If yes, when and what was the repair or change?	✓	COW (MZ, AK, KW)	No	None recently.	
e.	Have there been any plumbing breaks or failure? If yes, when?	✓	COW (MZ, AK, KW)	No		
f.	List any identified cross connections after the service connection or in premise plumbing. (Provide comments)	None				
g.	Were all of the backflow prevention operational and maintained?	✓	COW (MZ, AK, KW)	No	No testable devices on site; moderate hazard building; non testable visually look okay.	
h.	Were there any low pressure events or changes in water pressure after the service connection or in the premise plumbing? If yes when?	None				
i.	Are there any treatment devices after the service connection or in premise? (Circle response, if applicable)	Point of Entry (POE)	COW (MZ, AK, KW)	Point of Use (POU)	Filter system for product use downstream of sampling sink.	

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
j.	Other comments on sample site?					
11	**SAMPLE PROTOCOL FOLLOWED AND REVIEWED**					
a.	Sample protocol followed and reviewed	✓	SH	Potential	See Report Section 4.8 for details, and Lipinsky report in Appendix B.2.	
b.	Flush tap, remove aerator, no swivel, fresh sample bottles, sample storage acceptable	✓	SH	Potential	See Report Section 4.8 for details, and W. Lipinsky report in Appendix B.2.	
12	**PUMPING STATION - MACLEAN** - *Inspected by AECOM, form filled in by AECOM/City of Winnipeg. Note, Mcphillips Pumping Station and Reservoir was not included in this assessment as hydraulically it could not have played a role in the positive samples that were obtained.*					
a.	Are there any sanitary defects in the pump station?	✓	AECOM (CN)	Potential		
b.	Are pump(s) operable?	✓	AECOM (CN)	No		
c.	Last pump maintenance/service date.	✓	COW (MH)	No		
13	**PUMPING STATION - W. D. HURST** - *Inspected by AECOM, form filled in by AECOM/City of Winnipeg*					
a.	Are there any sanitary defects in the pump station?	✓	AECOM (CN)	Potential	Located feed off of main distribution line, was unable to confirm whether piping had BFPV.	All of the tie-ins for the backflow devices that service the gensets are located in the subbasement. The station meets all backflow requirements. (KWr)
b.	Are pump(s) operable?	✓	AECOM (CN)	No		
c.	Last pump maintenance/service date. (Respond if applicable)	✓	COW (MH)	No		
14	**STORAGE FACILITIES - MACLEAN RESERVOIR** - *Inspected by AECOM, form filled in by AECOM/City of Winnipeg*					
a.	Are the overflow and vents properly screened?	✓	AECOM (CN)	No		

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
d.	Could the physical condition of tank be a source contamination?	✓	AECOM (CN)	No	Visible Inspection of the interior not possible as both reservoirs filled with water	
e.	Is the Vent turned down and maintain an approved air gap at the termination point?	✓	AECOM (CN)	No		
f.	Does the Drain/overflow line terminate a minimum of 12" air gap?	✓	AECOM (CN)	No		
g.	If present, Is the Pressure tank maintaining an appropriate minimum pressure?	N/A	N/A	N/A		
h.	Is proper O&M being performed?	✓	COW (DM)	No		
i.	Was there any observed physical deterioration of tank?	✓	AECOM (CN)	No		
j.	Were there any observed leaks?	✓	AECOM (CN)	No		
k.	Is there any evidence of intentional contamination at the storage tank?	✓	AECOM (CN)	No		
l.	Have there been any facility maintenance? painting/coating) If yes, when?	✓	COW (DM)	No		
m.	Is facility maintenance occuring per appropriate schedule?	✓	COW (DM)	No		
n.	Does the tank "float" on the distribution system or are there separate inlet and outlet lines?	✓	AECOM (CN)	No	Separate Inlet/Outlet	
o.	What is the measured chlorine residual (total/free) of the water exiting the storage tank today?	✓	COW (CD)	No	Chlorine Residual as of March 16 2015: Free = 1.17 mg/L Total = 1.34 mg/L	
q.	Other comments on the storage system					

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
15	**STORAGE FACILITIES - WILKES RESERVOIR** - *Inspected by AECOM, form filled in by AECOM/City of Winnipeg*					
a.	Are the overflow and vents properly screened?	✓	AECOM (CN)	No		
b.						
c.						
d.	Could the physical condition of tank be a source contamination?	✓	AECOM (CN)	No	Visible Inspection of the interior not possible as all reservoirs filled with water	
e.	Is the Vent turned down and maintain an approved air gap at the termination point?	✓	AECOM (CN)	No		
f.	Does the Drain/overflow line terminate a minimum of 12" air gap?	✓	AECOM (CN)	No		
g.	If present, Is the Pressure tank maintaining an appropriate minimum pressure?	N/A	N/A	N/A		
h.	Is proper O&M being performed?	✓	COW (DM)	No	Inspection of Wilkes West and East reservoir structure and roof has resulted in a capital project on both reservoirs for deficiencies	
i.	Was there any observed physical deterioration of tank?	✓	AECOM (CN)	No		
j.	Were there any observed leaks?	✓	AECOM (CN)	No		
k.	Is there any evidence of intentional contamination at the storage tank?	✓	AECOM (CN)	No		
l.	Have there been any facility maintenance? painting/coating) If yes, when?	✓	COW (DM)	No	October 2011 repairs to Wilkes East Reservoir leaks on the floor level with gasketed plates	
m.	Is facility maintenance occurring per appropriate schedule?	✓	COW (DM)	No		
n.	Does the tank "float" on the distribution system or are there separate inlet and outlet lines?	✓	AECOM (CN)	No	Separate Inlet/Outlet	
o.	What is the measured chlorine residual (total/free) of the water exiting the storage tank today?	✓	COW (CD)	No	Chlorine Residual as of March 16, 2015: Free = 1.10 mg/L Total = 1.25 mg/L	

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
16	**DISTRIBUTION SYSTEM** - Completed by City of Winnipeg					
a.	List any identified cross connections in the vacinity of of the positive TC sample site.	✓	COW (LM/MZ)	Potential	The locations that had positive bacteriological samples along with four other locations that were deemed to be high risk and have potential to create a bacteriological cross contamination were examined.	The results of this investigation along with the corrective actions can be found in Appendix C1.
b.	Air relief valves: Is the valve vault subject to flooding ?		COW (LM)	Potential	14 air chambers or valve pits that were previously identified as having water and that were in the vicinity of the positive bacteriological sample sites from the January 27, 2015 and October 8, 2013 boil water advisories were inspected.	The results of this investigation along with the corrective actions can be found in Appendix C2.
c.	Is the distribution system secured to prevent unauthorized access?	✓	COW (ZB)	No	Access to the distribution sytem is controlled and regulated as per industry standards.	
d.	Are the backflow prevention devices within a 500m radius of the positive sample site operational and maintained?	✓	COW (LM/MZ)	Potential	The locations that had positive bacteriological samples along with two other locations that did not were investigated. For each sample point, the backflow records were inspected for establishments that were located within a 500 m radius of the sample point.	The results of this investigation along with the corrective actions can be found in Appendix C1.
e.	Are there any ground wells in the City limits?	✓	COW (LM/JMc)	No	There are 99 non domestic licensed ground wells in the City of Winnipeg. In order for a cross connection to occur, an illegal connection from the well to the City of Winnipeg watermain system would be required. Of those 99 wells, over two thirds (71 wells) are located on the west side of the Red River. With respect to the 10 sample locations that tested positive that are under investigation, there are 9 wells located in the upstream vicinity of SW-07, there are 2 wells in the combined upstream location of SW-05, SW-07, and SW-08, and there is one well in the vicinity of NE-04. There are several wells that are in the upstream location of other sampling points that did not test positive, both on the east and west sides of the Red River. This information is neutral. The location of the wells neither supports nor refutes the contamination of the distribution system by ground wells. See Appendix D1.	

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
f.	What are the pipe properties of the areas upstream of the positive samples?	✓	COW (LM/JMc)	No	Refer to Appendix D1. **NE-01:** Predominately asbestos cement pipes (75%) and PVC pipes (17%). Approximately 70% of the pipes are 1970 vintage, remaining are from 1980's-1990's. **SE-03:** Predominately PVC pipes (79%) and asbestos cement pipes (17%). Approximately 65% are 1980's vintage and approximately 35% are 1990's vintage. **SE-04:** 93% of pipes are PCV, remainder are mostly copper. ~50% are 1980's vintage, ~20% are 1990's vintage and ~30% are ~2000's vintage. **SE-05, SE-07 and SE-08:** Predominately PVC pipes (57%), asbestos cement pipes (29%) and unknown (10%). Mostly 1970-1980's vintage with areas from the 1990's. SE-07 had one pipe in the upstream area that was abandoned in 2014 as it was installed prior to development and was no longer needed. **SW-07**: Predominately PVC (75%) and asbestos cement (17%). Approximately half of the pipes are of 1970 vintage and half are less than 25 years old. **SW-12:**Predominately PVC (52%) with some areas of cast iron (27%), and asbestos cement (16%). PVC pipe is 1980 - 1990 vintage, cast iron is 1960 vintage and asbestos cement is predominately 1960's vintage. SW-12 has one pipe in the upstream area that will be renewed in 2015 due to the number of breaks and the fact that Public Works was renewing the pavement. **NE-06, NE-07**: sites are next to feedermain offtakes. Feedermains are concrete. Feedermain at NE-06 was installed in 1962 and feedermain at NE-07 was installed in 1977	
17	**HAVE ANY OF THE FOLLOWING OCCURRED AT RELEVANT FACILITIES PRIOR TO THE COLLECTION OF TC SAMPLES ON OCTOBER 7, 2013? SPECIFICALLY DURING THE 2 WEEKS FROM SEPTEMBER 23, 2013 - OCTOBER 7, 2013, UNLESS OTHERWISE STATED** - *Completed by City of Winnipeg*					
a.	Were there any operation and maintenance activities that could have introduced total coliforms? (valve work and misc. daily work)	✓	COW (ZB)	No	Valve work and miscellaneous daily work for two weeks preceding the October 7, 2013 event were plotted on a map of the City. There were 10 work operations during this time, randomly spread throughout the system. There were no incidents where work was performed in the upstream vicinity of the positive bacteriological samples. See Appendix D1.	
b.	Have there been any interruptions in the treatment process?	✓	COW (DM)	No		
c.	Has the system lost pressure to less than 5 psi?	✓	COW (JMc)	No	See Appendix D8	

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	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
d.	Have there been any vandalism and/or unauthorized access to facilities?	✓	COW (ZB)	No		
e.	During the 2013 incident, have there been any analytical results or any additional samples collected, including source samples which were positive (not for compliance)?	✓	COW (CD)	Potential	The only other positives during the two (2) weeks before and the week of the incident were in samples collected at Pre-WTP locations.	No re-sampling occurred as this is typical of raw surface water. Samples collected in the WTP process and after WTP (DBPS 1&2) were all negative for bacteria.
f.	Have there been any community illness suspected of being waterborne (e.g., Does the community public health official indicate that an outbreak has occurred)	✓	COW (JMc)	No	See Winnipeg Regional Health Authority Medical Officer of Health Letter in Appendix B4	
g.	Did the water system have any Corrective Action Reports (CAR) for Total Coliforms in the Distribution System in the past 12 months? If yes, when.	✓	COW (CD)	Potential	In the past 12 months of this incident there were 17 CAR for Coliforms in the distribution system. Four (4) of the CAR's were Total Coliforms greater than 10.	Each CAR was corrected based on the non-compliance requirements which included re-sampled the postive site until all re-samples were negative. The corrective action was addressed in each situation within 3 days of the incident depending on the type of non-compliance incident.
h.	What was the most recent date on which satisfactory total coliform samples were taken?	✓	COW (CD)	No	3 of the 4 sampling sites that tested positive on Oct. 7, 2013 have had satisfactory total coliform samples since Oct. 8, 2013. SW07 had satisfactory total coliform results from Oct. 8 2013 to Jan 26 2015.	
i.	Have there been any hydrant operations including firefighting events, flushing, metered operation, sheared hydrant, etc.	✓	COW (ZB)	Potential	Hydrant operations including firefighting events, flushing, metered operation, and sheared hydrants for two weeks preceding the October 7, 2013 event were plotted on a map of the City. There were 11 hydrant operations during this time, randomly spread throughout the system. There were no incidents where hydrant operations were performed in the upstream vicinity of the positive bacteriological samples. See Appendix D1.	
j.	Other comments on records and maintenance?					
18	**HAVE THERE BEEN ANY RECENT TREATMENT OR OPERATIONAL CHANGES PRIOR TO THE COLLECTION OF TC SAMPLES ON OCTOBER 7, 2013? SPECIFICALLY DURING THE 2 WEEKS FROM SEPTEMBER 23, 2013 - OCTOBER 7, 2013** - *Completed by City of Winnipeg*					
a.	Have any inactive sources recently been introduced into the system (e.g., auxiliary systems)?	✓	COW (DM)	No		
b.	Have there been any new sources introduced into the system?	✓	COW (DM)	No		

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
c.	Is there empirical evidence of any potential sources of contamination (high turbidity, loss of disinfection)?	✓	COW (CD)	No	Turbidity and chlorine data for both compliance and non-compliance samples for two weeks preceding the October 7, 2013 event were reviewed. The highest turbidity level of 1.54 NTU was observed on September 23, 2013 at sample location SW05. The lowest free chlorine level of 0.24mg/L was observed on September 23, 2013 at sample location NE09. See Appendix D6.	
19	**HAVE ANY OF THE FOLLOWING OCCURRED TO THE DISTRIBUTION SYSTEM PRIOR TO THE COLLECTION OF TC SAMPLES ON <u>OCTOBER 7, 2013</u>? SPECIFICALLY DURING THE 2 WEEKS FROM SEPTEMBER 23, 2013 - OCTOBER 7, 2013, UNLESS OTHERWISE STATED** - *Completed by City of Winnipeg*					
a.	System pressure: Is there evidence that the system experienced low or negative pressure? If yes, when?	✓	COW (JMc)	No		
b.	Have there been any water main breaks or repairs? If yes, when?	✓	COW (ZB)	No	Water main breaks and repairs for two weeks preceding the October 7, 2013 event were plotted on a map of the City. There were 44 water main breaks and repairs during this time, randomly spread throughout the system. There were three incidents where water main breaks and repairs were performed in the upstream vicinity of the positive bacteriological sample sites, all in the upstream location of sample sites SE-05, SE-07, SE-08. Sample sites SE-05, SE-07, SE-08 are not hydraulically connected to the remaining positive bacteriological sample site SW-07. See Appendix D1.	In 2014, the Standard Operating Proceedure for watermain repairs was amended to include disinfection of tools.
c.	Was there any scheduled flushing of the distribution system? If yes, when?	✓	COW (ZB)	No	The City's 2013 watermain flushing program finished on August 9, 2013 and therefore was unlikely to cause an issue. See Appendix D4.	
d.	Is there any evidence of intentional contamination in the distribution system?	✓	COW (ZB)	No		
e.	Could the use of river water for irrigation have contributed to the event?	✓	COW (LM/JMc)	No	In order for a cross connection to occur, an illegal connection to the City of Winnipeg watermain system would be required. For the October 7, 2013 event, the likelihood of people using water for irrigation greatly diminishes. In addition to this the October 7, 2013 event had positive sample locations that were hydraulically disconnected from each other. There would have had to be 2 separate sources of contamination that contributed to the event. This is highly unlikely.	
20	**HAVE ANY OF THE FOLLOWING ENVIRONMENTAL EVENTS OCCURRED PRIOR TO THE COLLECTION OF TC SAMPLES ON <u>OCTOBER 7, 2013</u>? SPECIFICALLY DURING THE 2 WEEKS FROM SEPTEMBER 23, 2013 - OCTOBER 7, 2013** - *Completed by City of Winnipeg*					
a.	Has there been heavy rainfall?	✓	COW (JMc)	No	Notable rainfall: Sept. 28, 2013 a total of 26.6mm of rainfall within 12 hours (well below a 2 year event rainstorm). This is typical for this time of year. See Appendix D9.	

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	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
b.	Has there been any rapid snow melt or flooding?	✓	COW (JMc)	No	See Appendix D10.	
c.	Have there been changes in avaliable source water (e.g., significant drop in water table, well levels, reservoir capacity, etc.)	✓	COW (JMc)	No		
d.	Have there been any Interruptions to electrical power?	✓	COW (JMc)	No		
e.	Have there been any extremes in heat or cold?	✓	COW (JMc)	No	See Appendix D11.	
21	**HAVE ANY OF THE FOLLOWING OCCURRED AT RELEVANT FACILITIES PRIOR TO THE COLLECTION OF TC SAMPLES ON MAY 26, 2014? SPECIFICALLY DURING THE 2 WEEKS FROM MAY 12, 2014 - MAY 26, 2014, UNLESS OTHERWISE STATED** - *Completed by City of Winnipeg*					
a.	Were there any operation and maintenance activities that could have introduced total coliforms? (valve work and misc. daily work)	✓	COW (ZB)	No	Valve work and miscellaneous daily work for two weeks preceding the May 26, 2014 event were plotted on a map of the City. There were 65 work operations during this time, randomly spread throughout the system. There were no incidents where work was performed in the upstream vicinity of the positive bacteriological samples. See Appendix D1.	
b.	Have there been any interruptions in the treatment process?	✓	COW (DM)	No		
c.	Has the system lost pressure to less than 5 psi?	✓	COW (JMc)	No	See Appendix D2.	
d.	Have there been any vandalism and/or unauthorized access to facilities?	✓	COW (ZB)	No		
e.	During the 2014 incident, have there been any analytical results or any additional samples collected, including source samples which were positive (not for compliance)?	✓	COW (CD)	Potential	There were three positive samples during the two (2) weeks preceding May 26, 2014 incident. These positive samples were collected at Pre-WTP locations on May 12, 2014, May 19, 2014, and May 26, 2014.	No re-sampling occurred as this is typical of raw surface water. Samples collected in the WTP process and after WTP (DBPS 1&2) were all negative for bacteria.
f.	Have there been any community illness suspected of being waterborne (e.g., Does the community public health official indicate that an outbreak has occurred.)	✓	COW (JMc)	No	See Winnipeg Regional Health Authority Medical Officer of Health Letter in Appendix B4.	
g.	Did the water system have any Corrective Action Reports (CAR) for Total Coliforms or E. Coli in the Distribution System in the past 12 months? If yes, when.	✓	COW (CD)	Potential	In the past 12 months of this incident there were 18 CAR for Coliforms in the distribution system. Four (4) of the CAR's included TC greater than 10 and 2 CAR included the presence of EC.	Each CAR was corrected based on the non-compliance requirements which included re-sampled the postive site until all re-samples were negative. The corrective action was addressed in each situation with in 3 days of the incident depending on the type of non-compliance incident.
h.	What was the most recent date on which satisfactory total coliform samples were taken?	✓	COW (CD)	No	Date: May 27, 2014 - Present. SW-12 has had satisfactory total coliform samples since May 27, 2014.	

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
i.	Have there been any hydrant operations including firefighting events, flushing, metered operation, sheared hydrant, etc.	✓	COW (ZB)	Potential	Hydrant operations including firefighting events, flushing, metered operation, and sheared hydrants for two weeks preceding the May 26, 2014 event were plotted on a map of the City. There were 11 hydrant operations during this time, randomly spread throughout the system. There were no incidents where hydrant operations were performed in the upstream vicinity of the positive bacteriological samples. See Appendix D1.	
k.	Other comments on records and maintenance?					
22	**HAVE THERE BEEN ANY RECENT TREATMENT OR OPERATIONAL CHANGES PRIOR TO THE COLLECTION OF TC SAMPLES ON <u>MAY 26, 2014</u>? SPECIFICALLY DURING THE 2 WEEKS FROM MAY 12, 2014 - MAY 26, 2014** - *Completed by City of Winnipeg*					
a.	Have any inactive sources recently been introduced into the system (e.g., auxiliary systems)?	✓	COW (DM)	No		
b.	Have there been any new sources introduced into the system?	✓	COW (DM)	No		
c.	Is there empirical evidence of any potential sources of contamination (high turbidity, loss of disinfection)?	✓	COW (CD)	No	Turbidity and chlorine data for both compliance and non-compliance samples for two weeks preceding the May 26, 2014 event were reviewed. The highest turbidity level of 2.49 NTU was observed on May 20, 2014 at sample location SW10. The lowest free chlorine level of 0.15 mg/L was observed on May 13, 2014 at sample location SE10. See Appendix D6.	
23	**HAVE ANY OF THE FOLLOWING OCCURRED TO THE DISTRIBUTION SYSTEM PRIOR TO THE COLLECTION OF TC SAMPLES ON <u>MAY 26, 2014?</u> SPECIFICALLY DURING THE 2 WEEKS FROM MAY 12, 2014 - MAY 26, 2014, UNLESS OTHERWISE STATED** - *Completed by City of Winnipeg*					
a.	System pressure: Is there evidence that the system experienced low or negative pressure? If yes, when?	✓	COW (JMc)	No	See Appendix D2.	
b.	Have there been any water main breaks or repairs? If yes, when?	✓	COW (ZB)	No	Water main breaks and repairs for two weeks preceding the May 26, 2014 event were plotted on a map of the City. There were 57 water main breaks and repairs during this time, randomly spread throughout the system. There were no incidents where water main breaks and repairs were performed in the upstream vicinity of the positive bacteriological samples site. See Appendix D1.	
c.	Was there any scheduled flushing of the distribution system? If yes, when?	✓	COW (ZB)	No	The City's 2014 watermain flushing program started on July 5, 2014 and therefore was unlikely to cause an issue. See Appendix D4.	
d.	Is there any evidence of intentional contamination in the distribution system?	✓	COW (ZB)	No		

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	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
e.	Could the use of river water for irrigation have contributed to the event?	✓	COW (LM/JMc)	No	In order for a cross connection to occur, an illegal connection to the City of Winnipeg watermain system would be required. For the May 26, 2014 event, the sample location that tested positive is in close proximity to the Red River. There were some abnormally hot days leading up to the incident (32.7°C on May 24, 2014) however, there was 8mm of rain on May 25, 2014, the day prior to the positive sample being taken.	
24	**HAVE ANY OF THE FOLLOWING ENVIRONMENTAL EVENTS OCCURRED PRIOR TO THE COLLECTION OF TC SAMPLES ON MAY 26, 2014? SPECIFICALLY DURING THE 2 WEEKS FROM MAY 12, 2014 - MAY 26, 2014** - *Completed by City of Winnipeg*					
a.	Has there been heavy rainfall?	✓	COW (JMc)	No	Notable Rainfall Events: May 19-20, 2014 - 41.3mm in 48hrs. Approx. 5-yr event. May 25, 2014 - less than 1 yr event. This amount of rainfall is typical for this time of year. See Appendix D9.	
b.	Has there been any rapid snow melt or flooding?	✓	COW (JMc)	Potential	On May 12 the River was at James 15.3 ft and on May 26 the river was at James 13.1 ft. This is typical for this time of year. See Appendix D10	
c.	Have there been changes in avaliable source water (e.g., significant drop in water table, well levels, reservoir capacity, etc.)	✓	COW (JMc)	No		
d.	Have there been any Interruptions to electrical power?	✓	COW (JMc)	No		
e.	Have there been any extremes in heat or cold?	✓	COW (JMc)	Potential	May 24, 2014 had high of +32.7°C. See Appendix D11.	
25	**HAVE ANY OF THE FOLLOWING OCCURRED AT RELEVANT FACILITIES PRIOR TO THE COLLECTION OF TC SAMPLES ON JANUARY 26, 2015? SPECIFICALLY DURING THE 2 WEEKS FROM JANUARY 12, 2015 - JANUARY 26, 2015, UNLESS OTHERWISE STATED** - *Completed by City of Winnipeg*					
a.	Were there any operation and maintenance activities that could have introduced total coliforms? (valve work and misc. daily work)	✓	COW (ZB)	No	Valve work and miscellaneous daily work for two weeks preceding the January 26, 2015 event were plotted on a map of the City. There were 63 work operations during this time, randomly spread throughout the system. There was one incident where work was performed in the upstream vicinity of the positive bacteriological samples, sample point SE-04. SE-04 is not hydraulically connected to the six other positive bacteriological samples. See Appendix D1.	
b.	Have there been any interruptions in the treatment process?	✓	COW (DM)	No		
c.	Has the system lost pressure to less than 5 psi?	✓	COW (JMc)	No	See Appendix D2.	

City of Winnipeg Revised Total Coliform Rule Level 2 Assessment Form

	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
d.	Have there been any vandalism and/or unauthorized access to facilities?	✓	COW (ZB)	No		
e.	During the 2015 incident, have there been any analytical results or any additional samples collected, including source samples which were positive (not for compliance)?	✓	COW (CD)	Potential	There were three positive samples during the two (2) weeks preceding January 26, 2015 incident. These positive samples were collected at Pre-WTP locations on January 12, 2015, January 19, 2015, and January 26, 2015.	No re-sampling occurred as this is typical of raw surface water. Samples collected in the WTP process and after WTP (DBPS 1&2) were all negative for bacteria.
f.	Have there been any community illness suspected of being waterborne (e.g., Does the community public health official indicate that an outbreak has occurred)	✓	COW (JMc)	No	See Winnipeg Regional Health Authority Medical Officer of Health Letter in Appendix B4.	
g.	Did the water system have any Corrective Action Reports (CAR) for Total Coliforms or E. Coli in the Distribution System in the past 12 months? If yes, when.	✓	COW (CD)	Potential	In the past 12 months of this incident there were 3 CAR for Coliforms in the distribution system. One (1) of the CAR's included TC greater than 10 and 1 CAR included the presents of EC.	Each CAR was corrected based on the non-compliance requirements which included re-sampled the postive site until all re-samples were negative. The corrective action was addressed in each situation within 3 days of the incident depending on the type of non-compliance incident.
h.	What was the most recent date on which satisfactory total coliform samples were taken?	✓	COW (CD)	No	Date: Jan. 27, 2015 - Present. SW-12 has had satisfactory total coliform samples since May 27, 2014.	
i.	Have there been any hydrant operations including firefighting events, flushing, metered operation, sheared hydrant, etc.	✓	COW (ZB)	No	Hydrant operations including firefighting events, flushing, metered operation, and sheared hydrants for two weeks preceding the January 26, 2015 event were plotted on a map of the City. There were 16 hydrant operations during this time, randomly spread throughout the system. There was one incident where a hydrant operation was performed in the upstream vicinity of the positive bacteriological samples, smaple point NE-01. NE-01 is not hydraulically connected to the five other positive bacteriological samples. See Appendix D1	
j.	Other comments on records and maintenance?					
26	**HAVE THERE BEEN ANY RECENT TREATMENT OR OPERATIONAL CHANGES PRIOR TO THE COLLECTION OF TC SAMPLES ON JANUARY 26, 2015? SPECIFICALLY DURING THE 2 WEEKS FROM JANUARY 12, 2015 - JANUARY 26, 2015** - *Completed by City of Winnipeg*					
a.	Have any inactive sources recently been introduced into the system (e.g., auxiliary systems)?	✓	COW (DM)	No		
b.	Have there been any new sources introduced into the system?	✓	COW (DM)	No		

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	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
c.	Is there empirical evidence of any potential sources of contamination (high turbidity, loss of disinfection)?	✓	COW (CD)	No	Turbidity and chlorine data for both compliance and non-compliance samples for two weeks preceding the January 26, 2015 event were reviewed. The highest turbidity level of 0.90 NTU was observed on January 19, 2015 at sample location NW06. The lowest free chlorine level of 0.16 mg/L was observed on January 13, 2015 at sample location SW02. See Appendix D6.	
27	**HAVE ANY OF THE FOLLOWING OCCURRED TO THE DISTRIBUTION SYSTEM PRIOR TO THE COLLECTION OF TC SAMPLES ON <u>JANUARY 26, 2015?</u> SPECIFICALLY DURING THE 2 WEEKS FROM JANUARY 12, 2015 - JANUARY 26, 2015, UNLESS OTHERWISE STATED** - *Completed by City of Winnipeg*					
a.	System pressure: Is there evidence that the system experienced low or negative pressure? If yes, when?	✓	COW (ZB)	Potential	On Jan. 18, 2015 the [redacted] distribution monitoring stations recorded minimum pressures of 41.59 psi and 47.13 psi respectively. These stations are in proximity of the Birds Hill Feedermain and the pressure drop is attributed to the closure of the Feedermain. See Appendix D2.	
b.	Have there been any water main breaks or repairs? If yes, when?	✓	COW (ZB)	No	Water main breaks and repairs for two weeks preceding the January 26, 2015 event were plotted on a map of the City. There were 16 water main breaks and repairs during this time, randomly spread throughout the system. There was one incident where a water main break or repair was performed in the upstream vicinity of a positive bacteriological sample, sample site SW-07. Sample site SW-07 is not hydraulically connected to the remaining five positive bacteriological sample sites. See Appendix D1.	
c.	Was there any scheduled flushing of the distribution system? If yes, when?	✓	COW (ZB)	No	The City's 2015 watermain flushing program has not started yet and therefore did not cause an issue. See Appendix D4.	
d.	Is there any evidence of intentional contamination in the distribution system?	✓	COW (ZB)	No		
e.	Could the use of river water for irrigation have contributed to the event?	✓	COW (LM/JMc)	No	In order for a cross connection to occur, an illegal connection to the City of Winnipeg watermain system would be required. For the January 26, 2015 event all of the rivers were frozen over. This information eliminates the possibility of this mode of contamination for this event.	
28	**HAVE ANY OF THE FOLLOWING ENVIRONMENTAL EVENTS OCCURRED PRIOR TO THE COLLECTION OF TC SAMPLES ON <u>JANUARY 26, 2015?</u> SPECIFICALLY DURING THE 2 WEEKS FROM JANUARY 12, 2015 - JANUARY 26, 2015** - *Completed by City of Winnipeg*					
a.	Has there been heavy rainfall?	✓	COW (JMc)	No	See Appendix D9.	
b.	Has there been any rapid snow melt or flooding?	✓	COW (JMc)	No	See Appendix D10.	
c.	Have there been changes in avaliable source water (e.g., significant drop in water table, well levels, reservoir capacity, etc.)	✓	COW (JMc)	No		

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	Questions	Reviewed? (Check if completed or type N/A)	Reviewer	Issue(s) Found? (Yes/No)	Issue Description	Corrective Action Taken (Including Date)
d.	Have there been any Interruptions to electrical power?	✓	COW (JMc)	No	McPhillips Pumping Station had a power failure on Jan. 16, 2015. However, The gas engines were still able to run and the minimum pressure at the station during this event was 65.75 psi, therefore this was unlikely to cause an issue.	
e.	Have there been any extremes in heat or cold?	✓	COW (JMc)	No	-27.1°C on Jan 12, 2015 was the coldest temperature during this time period. The next coldest was -21.6°C on Jan 13, 2015. Both of these temperatures are typical for January. See Appendix D11.	

The Following Individuals are the Reviewers who Contributed to this Assessment:

Initials	Reviewer	Title
SH	Stephen Hubbs P.E.	Technical Expert, Former Head of Water Quality and Production for the Louisville Water Company
CN	Chad Neiser, P. Eng.	Project Engineer, Manitoba Water Business Line, AECOM
ZB	Zeljko Bodiroga, P. Eng.	Water Distribution Engineer, City of Winnipeg
DM	David Minor, P. Eng.	Water Treatment Operations Engineer, City of Winnipeg
LM	Linda McCusker, P. Eng.	Water Planning and Projects Delivery Branch Head, City of Winnipeg
JMc	Jessica McCombe P. Eng.	Project Engineer, Water Planning and Project Delivery Branch, City of Winnipeg
MH	Mark Hoeppner	Water Services Supervisor of Facilities Maintenance, City of Winnipeg
CD	Courtney Diduck	Analytical Services Branch Head, City of Winnipeg
MZ	Mike Zilinski	Senior Cross Connections/BFP Inspector, City of Winnipeg
AK	Allan Karsin	Cross Connections/BFP Inspector, City of Winnipeg
DS	Dave Sinclair	Cross Connections/BFP Inspector, City of Winnipeg
		Senior Laboratory Technician, City of Winnipeg
		Laboratory Technician, City of Winnipeg
		Laboratory Technician, City of Winnipeg
KWr	Kris Wright	Maintenance Pumber, City of Winnipeg

Appendix B

- Sampling and Laboratory Assessment Reference Documents

B1 BWA Timeline Point Form

BWA Timeline - Sampling Assessment – Laboratory Assessment

March 17, 2014- SOP 18 Bacteriological Monitoring & Sampling Program was updated

Updated sampling SOP 18 for Bacteriological Monitoring & Sampling Program was approved by the Supervisor of Analytical Services. The follow items were updated and changed and were implemented by staff as a result of 2013 BWA.

- Routine Sampling Procedure (added the following)
  - Step 2, "Remove aerator…"
  - Step 12, "Invert and mix the sample at least three times."
  - Step 13, Rinse the aerator before reattaching.
- Routine Requirements
  - Table1, No.4, "10% of the treated or distributed water" & respond "immediately".
- Corrective Action Plan, Response Priority 2,
  - Change corrective action response (from as soon as possible) too immediately.
- Re-sampling Procedure, (added);
  - Step 10, "Clean, disinfect and rinse the removed aerator …"

January 27, 2015-

Courtney Diduck, Analytical Services Branch Head verbally spoke to the sampling technician that performed the sampling on January 26, 2015 in which positive bacteria results were found. A discussion was done to determine if anything was abnormal that day or if technician remembers doing something different before any of the sites that were positive during their route. Nothing unusual at the sites was reported.

January 28, 2015-

Courtney Diduck, Analytical Services Branch Head meets again with technician who took all of the positive samples and reviews sampling procedures. Some deviations from procedures were noted.

February 2, 2015-

Courtney Diduck, Analytical Service Branch Head met with all City of Winnipeg water sampling technicians and reviewed the sample procedures and protocols.

February 3, 2015 at ALS with Health, ODW, Cadham Labs -City - Courtney Diduck, Gerry Levesque, Renee Grosselle

Walk through tour of the process once samples reach the lab, including initial receipt of samples, QA/QC checks on bottles; receipt of samples on Monday Jan. 26, 2015, processing of samples – analytical method, lab tracking and control, process/flow through. Cadham Labs requests taking our samples to proceed with genotyping of E.coli.

February 11, 2015 – City of Winnipeg Sampling Audit – W. Lipinsky (CALA certified Assessor)

Reviewed sampling procedures with technician in the field. Inspection of the laboratory's area related to sampling supplies and preparation and interview with sampling technicians and supervisory staff.

February 13, 2015 – City of Winnipeg Sampling Audit – Debrief W. Lipinsky and City

W. Lipinsky provided a review of the audit and explained the recommendations and requested feedback for final report.

February 17, 2015 - ALS visit by M. Brodsky (CALA certified Assessor)

Audited contract laboratory and reviewed and observed sample handling and preparation from receipt log-in to analysis. Conducted a detailed review of and observed the contract lab's method SOPs and analytical procedures for bacteriological analysis, including sample receipt and handling of samples to the final reporting of the results. Observed the performance of and interviewed all the analysts who were actually responsible for processing these samples on January 26 and 27, 2015.

February 20, 2015 – QA Training Session/Meeting was held with all of ASB

Meeting to discuss the sampling audit finding was discussed. A determination on how to move forward with the recommendation and action items was discussed. Decisions were made on some of the items.

February 23 – March 13, 2015 – Review of Backflow devices located within 500 m of positive locations

Backflow and cross-connection inspectors reviewed a list of facilities located within 500 m of the positive locations with backflow devices. Locations with devices that were past due for inspection were issued enforcement documents/work orders.

February 25, 2015 – Sampling review and ALS visit – Steve Hubbs and Courtney Diduck

S. Hubbs conducted a field inspection and followed samples from sample collection, transfer to the contract laboratory, through the analytical process, and into the incubator. A few deficiencies and non-standard technique identified.

March 2-16, 2015 – Inspected and reviewed 9 sampling sites - City (Technician and Cross Connection Inspectors)

Inspected and reviewed sampling sites for things such as conditions of the tap and location. Identified any issues or areas for improvement. Inspected for cross connections and backflow prevention devices and identified any corrective actions if deficiencies were found.

March 2-6, 2015 – Inspected 4 high risk facilities

Inspected 4 high risk facilities in the area of concern. Inspected premise devices for backflow prevention at the facilities, issued work orders for any violations observed.

March 4-5, 2015– Technician inspected all drinking water sampling locations for aerators

Inspected all compliance and non-compliance drinking water sampling locations for the presence of aerators. Recorded if aerators were present and if they could be removed.

March 13-27, 2015- Study of Potential Contamination in Sampling was performed

Different scenarios and sampling conditions were created to study of potential for bacteriological contamination and ruggedness of bacteriological sampling procedure. The investigation found in situations where contamination was most likely to occur positive results were not achieved. Further studies will be conducted to help determine sources in the sampling procedure for contamination.

March 25-27, 2015- PT Bacteriological samples were submitted

As recommended by the assessor (W. Lipinsky) PT (blind) samples were submitted to the contract laboratory. Further investigation on other PT samples that are more representative of Water Distribution system is being examined. This procedure will be implemented on a regular basis once an ideal PT sample is found.

April 1- 30, 2015- Revised SOP # 18 - Bacteriological Monitoring & Sampling Program

Based on the recommendations from the Sampling Assessment from February 11, 2015, the current SOP was reviewed and updated to include all action items and most of the recommended item that could be address over the short time frame. Revised SOP will be given to staff and staff will be re-trained on all revisions which will be completed by April 30, 2015.

B2 BWA Audit report Summaries

BWA - Sampling Assessment – Laboratory Assessment – Audit Reports

The City of Winnipeg engaged two external experts to conduct audits on the sampling protocols of the City of Winnipeg and analytical procedures of the contract laboratory (ALS). Consultants were selected based on their expertise and experience with CALA accreditation and auditing laboratories.

W. Lipinsky inspected the laboratory's area related to sampling supplies and preparation. W. Lipinsky was chief chemist at Manitoba Hydro in Selkirk with 33+ years of lab experience. He is a CALA certified assessor, and on the CALA advisor panel, with 15 years' experience as an assessor. M. Brodsky audited the contract laboratory. M. Brodsky is an Environmental Microbiologist for more than 42 years. He served the Chief of Environmental Microbiology for the Province of Ontario, Ministry of Health, and Laboratory Services Branch. He is also a lead auditor/assessor in microbiology for the Canadian Association for Laboratory Accreditation (CALA) and is Vice-chair of the CALA Board of Directors.

The third party report observations and findings are summarized below.

SAMPLING PROCEDURES

February 11, 2015 – City of Winnipeg Sampling Audit – W. Lipinsky

Reviewed the sampling procedures on February 11, which included:

- Water sampling procedures and related documents
- Staff training records
- Sampling supplies, procurement and storage
- Inspection of the laboratory's area related to sampling supplies and preparation
- Interview with sampling technicians and supervisory staff
- Sample registration, worksheet and label preparation, and data entry
- Observation of on-site sampling by the laboratory technician, at the six locations which had positive coliform results on January 26, 2015.
- Observation of sample bottle handling and transport to contract laboratory
- Review of coliform test records

The laboratory is accredited for its testing of drinking water and maintains an effective quality management system. W. Lipinsky observed that the laboratory has an excellent system of sample identification, together with labelling, worksheet generation and data entry. Sample integrity was maintained as per approved SOP's up to the point of delivery at the contract laboratory.

The laboratory has an approved documented sampling procedure, which instructs the technicians on how to correctly take water samples. Technicians with several years of testing and sampling experience were interviewed. They are fully aware of the significance of their work and the importance of proper sampling.

In addition to interviews with sampling staff and Supervisory staff, an interview was conducted with the technician who sampled all of the positive samples. The technician is a qualified and trained drinking water sampler and is aware of the procedures and importance of water testing. The technician was unable to identify anything that could have resulted in potential contamination on January 26, 2015 and indicated that it was another routine sampling day. The cleaning of the steering wheel was identified as a deficiency that was not always followed by the technician and other technicians using the shared vehicles.

On-site field sampling indicated that the water taps and sinks at the sampling sites appeared to be suitable and clean. However, they were in public places and the presence of coliforms in the sampling environment was unknown.

Mr. Lipinsky states that based on the observations during the assessment, there is a low probability that positive results would have occurred as a result of contamination at the time of sampling. The low probability is supported by the amount of testing done in 2014, by which samplers and historically based on current sampling procedures and protocols and low positive samples reported.

To ensure that the probability of contamination during sampling continues to be low, a number of continual improvement items have been recommended to the City of Winnipeg. Although a few documentation and quality system deficiencies were noted, the impact of these deficiencies for the potential of coliform contamination during sampling is minimal.

LABORATORY ASSESSEMENT

February 17, 2015 - ALS visit by M. Brodsky

- Audited the contract laboratory on February 17, focusing on the HPC by APHA 9215B, and E. coli and Total Coliform by Quanti-tray (IDEXX).
- Reviewed and observed sample handling and preparation from receipt log-in to analysis.
- Conducted a detailed review of and observed the contract lab's method SOPs and analytical procedures for bacteriological analysis, including sample receipt and handling of samples to the final reporting of the results.
- Included a trace of tests for the dates/samples in question.
- Observed the performance of and interviewed all the analysts who were actually responsible for processing these samples on January 26 and 27, 2015.

Mr. Brodsky noted that their analytical and QC records indicated that the laboratory followed sample handling, preparation and analytical protocols and procedures as per their Quality Management System. Historical records indicated all staff were adequately trained and competent to do the analyses. Methods were well documented and met all prescribed requirements and protocols were being followed at the time of the inspection.

Mr. Brodsky concludes that it is beyond the scope of the investigation to determine the source of this contamination, but based on the findings from the audit of the contract lab, the positive findings were validated and supported by ALS quality management system.

B3 Sample Collection and Laboratory Protocol-ORIGINAL

Sample Collection and Laboratory Protocol

Data considered above focuses on scenarios where the positive TC samples from January 26 originated from some form of contamination of the public water supply. Another consideration is that the positive samples resulted from a contamination event during the sampling or analysis processes. As an element of this assessment, the sampling and analytical protocol typical of that on January 26 was reviewed in detail. Findings during these reviews are provided below.

Sampling Protocol Review

On February 25, 2015, the consultant met with the sample collector at sample location NE-07 at approximately 10:00 am. This was an unannounced review, and the sample collector was met at the 4th of 14 sample stops. The consultant rode with the sample collector to the end of the route, and followed the samples into the laboratory for analysis.

The sample protocol followed was consistent, but there were several areas of improvement that were noted during the review:

- Many sample taps had aerators which could not be removed by the sample collector. This included "tamper proof" aerators which required a special tool for removal (which the sample collector did not have. Microbiological sampling from taps with aerators attached is not recommended.
- Inability to remove aerators affects the amount of water flowing from the faucet, and thus extends flushing time required to clear the service line back to the main. Temperature stability was used as an indication when the sample line had been adequately flushed. COW should considered a volumetric requirement for flushing at each sample location, with sample collectors checking flowrates at max flush volume to assure the flush time and volume is adequate to clear the sample line.

Laboratory Protocol Review

Samples were received at a common reception desk for all samples arriving at the laboratory. Samples from COW were labeled, arranged by sample ID number, analyzed for HPC, prepared for analysis by Colilert QuantiTray technique for TC and EC, placed into QuantiTrays, and incubated. After the samples were processed for HPC, the labels were stamped noting HPCs had been completed, and transferred to the Colilert prep bench. At this point, any excess water above the 100 ml mark on the sample bottle was decanted using a vacuum tube. Samples were then transferred to the bench where the Colilert media was added, and the QuantiTray was sealed. Sealed QuantiTrays were placed in an incubator.

The overall technique of the 4 lab personnel involved in the analytical process was methodical and clean. Areas for improvement were observed and are noted below:

- The order of analysis was the order provided by COW on the chain of custody sheet. The samples should be ordered from "cleanest" to "least clean", based on the source of the sample. Under this protocol, raw water samples and construction-related samples would be numbered to be at the end of the analytical protocol, reducing the possibility that the cleaner samples are contaminated by less clean samples.
- COW drinking water samples may be analyzed in a batch with samples from other sources. COW should request that their samples be run as a separate batch, isolated from any other samples of unknown source.
- The vacuum decantation step used to adjust the volume of sample in the sample bottle after HPC analysis and before EC/TC analysis is not standard protocol and should not be used on COW samples. This technique increases the risk of contamination between the HPC step and the TC/EC step in the analytical process.
- The chain of custody sheet (or similar formal documentation) should be initialed by the analyst at the end of each analytical step in the process to allow retrospective analysis of results.

B4 Recommendations for Improvement - Hubbs 4-16-2015

RECOMMENDATIONS FOR IMPROVEMENT – Hubbs, 4-16-2015 (not prioritized)

SAMPLING and ANALYSIS

1. Evaluate sampling process for QC improvement, start to finish
    a. Receipt and storage of sample bottles (away from potential contaminant sources)
    b. Scheduling-sample field notes/sheets, COC, assigned order for analysis (cleanest to dirtiest)
    c. Consider collecting/analyzing samples more days of the week (4 days with 10 samples per day is better/more protective than one day with 40 samples)
    d. Transit: coolers, vehicle, time of day
    e. Sample locations: representative of DS, cleanliness, availability for recheck. Consider using City employee homes as sample collection points.
    f. Sample taps: routine use, representative of DS, potential for contamination, aerators
    g. Sample tap disinfection: consider best method for sample tap being used. (dip-disinfection may be better for taps with aerators on, swab/spray may be better for aerators off)
    h. Sample collection protocol (flushing time and temperature, order of field analysis, handling the lid, documentation)
    i. Storage after sampling (cooler, plus anomalies for overnight storage prior to analysis)
    j. Other suggestions (monitor DS more frequently – Monday to Thursday sampling (10 per day), and at key points from source into DS daily.)
2. Work with analytical lab to reduce possibility of contamination
    a. Receipt procedures-perhaps isolating TCR samples from all others
    b. Sample labeling, documentation and order of analysis, including technique used in sample prep for analysis and COC sign-off between analysis (such as decant vs pour-off)
    c. Improved volume adjustment protocol (consider combining volume adjustment with the HPC prep step, using sterile 10 ml pipette to bring volume down to 100ml, and using this same extracted volume for the HPC plate (1 ml HPC volume recommended over 0.1 ml). This reduces the number of times the sample bottle is opened after sampling from 3 to 2, reduces the number of steps in TC prep from 2 to 1 requires no additional apparatus (only a fresh sterile disposable pipette is used for HPC extraction and volume adjustment).
    d. Pour-off volume adjustment for TC analysis is not recommended, as this step can increase potential for contamination from sink splash.
    e. Consider increasing sample volume for HPC to 1ml (currently set at 0.1 ml).
3. QC testing at City facilities
    a. Most TCR samples are negative, and QuantiTray at contract lab provides quantification of any positive samples. The City should consider setting up a QC activity that initially involves presence/absence (P/A) testing of some or all TCR samples. This would not need to be certified (TCR samples come from contract lab), but should be operated according to certification standards to the extent possible. Requirements are modest: approximately 4 feet of clean countertop for 30 minutes per day, analyst time less approximately 30 minutes per day, in a relatively clean room (sterility not required, but limited airborne dust and clean conditions are important). Unit cost per analysis is approximately $2, and set-up costs can range from $500 to $5000.
    b. Non-regulatory testing could be moved to this facility (main breaks, flushing, etc.)
4. Other
    a. Potential contaminant exposure risk from flooded automatic air relief valves should be evaluated.

B5 Appendix on Sampling Audit - Recommendations and City Response

Appendix B.5: Lipinsky's Sampling Audit: Recommendations, Action Items, and City Response (From Lipinski Report on Sampling)

		Type
3	**Management Review** **Quality System** **Requirement** Top management ensures that the integrity of the management system is maintained when changes to the management system are planned and implemented **Observation/Recommendation** Impact of changes should be studied. These changes could include sampling method and other method revisions, and assignment of staff to multiple activities of which some may be incompatible. **Action taken/Implementation** This item is currently **already included in the City of Winnipeg's Quality Manual** and is **addressed yearly** in the Quality Manual. This will be discussed again in **October/November 2015** at yearly at Quality Management meeting as per CALA accreditation requirement.	**R**
4	**Management Review** **Sub-Contracting** **Requirement** Subcontractors are competent and maintain records of competent subcontractors used. **Observation/Recommendation** Besides reviewing the accreditation of a sub-contract laboratory, consider an on-site assessment and/or submission of blind proficiency check samples or splitting samples between laboratories. Of extreme importance in microbiological testing is the separation of drinking water samples from high bacteria level samples throughout the sample reception, storage and testing phases at the contract laboratory. **Action taken/Implementation** **The ASB has already submitted control samples** to the contract laboratory, and has incorporated this into the routine work. Do to the sensitivity of the samples; this will be done **on a bi-weekly basis.** Since these are submitted as blind samples, the contract lab will not be aware of what samples are controls. (Eight controls have already been submitted.). The control schedule as to when samples will be submitted is **included in the revised SOP which will come into effect no later than April 30, 2015. Sample treatment requirement** will be addressed in the upcoming contract to address how we require the contract lab to handle our samples as well as yearly on-site assessment will be conducted by City staff or delegate party. This will be **in effect by June 30, 2015.**	**R**

5	**Management Review** **Supplies** **Requirement** There are policies and procedures related to procurement of supplies and services, and reception and storage of supplies with associated records.	**A**

	Observation/Recommendation There are no records related to the reception of microbiological sample bottles from the contract laboratory, which should include a lot identification as well as traceability to cleanliness records. The sampling procedure also refers to keeping sample bottles in a box within a plastic bag. In practice, sample bottles were observed in a drawer.	
	Action taken/Implementation **The laboratory has purchased the necessary supplies for "bagging" the clean sample bottles** and have selected a procedure for documenting the "Lot ID" of the sample bottles. ALS has not submitted the COC with the sample bottles, so we will therefore download them ourselves. The Lot IDs will be included on the ALS Chain of Custody forms. **The procedure for documenting** this is included in the revised SOP **which will come into effect no later than April 30, 2015.**	
7	**Quality Management — Internal Audits** **Requirement** Internal audits and method document reviews are periodically conducted to verify operations comply with all elements of the quality system and requirements of ISO/IEC 17025:2005; ensure that internal audits follow a predetermined schedule and procedure **Observation/Recommendation** The laboratory has focused on performing internal audits on in-house testing as well as other elements of their quality system. There were no records of an internal audit of the sampling method used to collect samples that are sent to a contract laboratory. An internal audit is required for all laboratory processes.	**A**
	Action taken/Implementation The assessor conducted the audit of the Sampling SOP so another audit is not required until the revision is complete and a timeline is determined for how often non-accredited methods require re-view or auditing. **This item will be brought forward in our yearly Quality Management** meeting to discuss how this item will be resolved and implemented. **Implement is 1 to 3 years.**	

9	**Technical Management** **Test Method** **Requirement** The laboratory selects test methods that are in latest international, regional or national standards (unless it is not appropriate or possible); the standard shall be supplemented with additional details to ensure consistent application. **Observation/Recommendation** The laboratory is following a sampling procedure based on Manitoba Government sampling requirements. It is recommended that the laboratory consider the procedure in Standard Methods 9060a as a continual improvement item. Standard Methods 9060a requires a cold water tap to be run for 2-3 minutes before sampling. If the tap cleanliness is unknown, the faucet has to be disinfected, both inside and outside, and then having the water run an additional 2-3 minutes after treatment. As well, if sampling from a mixing faucet, run hot water for 2 minutes and then cold water for 2-3 minutes before collecting a sample.	**R**
	Action taken/Implementation Based on **our internal study, the hot water has no "positive" effect.** Since hot water tanks are prone to bacterial contamination and growth (if the temperature is too low), running the hot water can introduce more HPC. The cold water flushing is most effective. We continue to clean the faucets with a disinfection technique based on standard method. Our method currently includes a 3 minute run; we also use the temperature to help us determine water stability and to help determine that the water is from the watermain. **The procedure for instructing this is included in the revised SOP which will come into effect no later than April 30, 2015.**	
10	**Technical Management** **Validation** **Requirement** Method validation includes records of validation, the procedure used, and a statement that the method is fit for the intended use. **Observation/Recommendation** Consider the use of replicate samples and field blanks for microbiological water sampling. As well, consider studying worse case scenarios involving no disinfection of faucets and hands or pre-sampling water flow.	**R**
	Action taken/Implementation **We will be implementing more field duplicate sampling and** also be adding **additional Quality Control samples** when doing retesting. Field blanks studies will also be examined and will be added if found to be effective different studies of environmental conditions that will be conducted. A study was conducted, on the worse case scenarios involving no disinfection and more information will need to be collected for more validation of the method. It was determined that in worst case simulations, positive samples were hard to come by. This will be evaluated further when discussions occur on auditing/reviewing as discussed under item 7. **This is a continual improvement item** that will always be on going with every review and audit.	
11	**Technical Management** **Method** Procedures for sampling are available at the location where required	**A**

	Observation/Recommendation Sampling method documentation was not available in the field.	
	Action taken/Implementation A short condensed version will be supplied to all technicians when sampling in the field. To be implemented by April 30th 2015. The addition of our new LIMS system and mobile technology will allow for more documents to be available for technician use in the field. This is in our 3 year plan.	
12	**Technical Management** **Handling Samples** **Requirement** For sample handling, verify that there are documented procedures specified to protect the integrity of the sample from time of sampling to sample processing (including pre and post analysis storage) including, but not limited to: use of sterile approved sample containers **Observation/Recommendation** Unused sample bottles are handled by a number of people without any special precautions (sanitized hands, clean gloves). They are removed from the shipment box, placed into drawers, and placed into coolers without any cleanliness precautions. The use of gloves, Zip-Lock type of bags or other measures should be considered to protect the cleanliness integrity of the bottles. Samplers should also not be engaged in any activities, prior to drinking water sampling, that might contaminate their person or clothing.	**R**
	Action taken/Implementation See item 3 and item 5 as to how this will be addressed.	

13	**Sampling Method Review**	A
	Requirement All necessary successive steps in the test procedure are adequately documented in the test method	
	Observation/Recommendation The use of spray isopropyl disinfectant and paper towel wipe down is not specifically documented. The documented procedure requires that the sampling point be swabbed with an alcohol solution or sanitary wipes saturated with alcohol. This recently replaced the immersing of the faucet into a cup of methanol. Standard Methods 9060a requires that the faucet be disinfected both inside and out, which is achieved by immersing the faucet into a cup of alcohol.	
	Action taken/Implementation This item has been **addressed in the updated revised SOP** in which the use of 70% isopropyl or ethanol will be used by immersing the faucet into a cup of this solution for a minimum of 10 second and no swabbing will be performed. This technique will allow for proper disinfection of both the inside and outside of the tap. The procedure for instructing this is included in the revised SOP **which will come into effect no later than April 30, 2015.**	
14	**Sampling Method Review**	A
	Requirement All necessary successive steps in the test procedure are adequately documented in the test method	
	Observation/Recommendation The cleaning of coolers and ice packs is documented to be done regularly without a specific frequency. In practice, coolers are cleaned immediately before use in the field. Ice packs are not cleaned before use.	
	Action taken/Implementation **The laboratory will use zip-lock bags for the freezer packs**, which creates a physical barrier and separation that is more effective than cleaning. Documentation and check list have been developed to implement these items above and are addressed in the revised SOP and related SWI which will come into effect **no later than April 30, 2015.**	
15	**Sampling Method Review**	A
	Requirement All necessary successive steps in the test procedure are adequately documented in the test method or supporting documentation.	
	Observation/Recommendation Sampling sites, in terms of buildings, are documented. However, specific sinks at the sampling sites are not documented.	
	Action taken/Implementation **The sink inventory is being done** and more information is being collected on the site and alternate sites. There will be a complete list of exact locations for sampling at each location. This is currently being collected **and will be completed by December 2015.**	
16	**Sampling Method Review**	A
	Requirement All necessary successive steps in the test procedure are adequately documented in the test method	

	Observation/Recommendation Sampling site NE01 is identified in Appendix B as an [redacted] when in fact it is a [redacted] All locations should be reviewed for accuracy.	
	Action taken/Implementation Corrected in the updated revised SOP appendix that's in effect by no later than April 30, 2015.	
17	**Sampling Method Review**	**A**
	Requirement All necessary successive steps in the test procedure are adequately documented in the test method	
	Observation/Recommendation Vehicle steering wheels are being cleaned with a sanitary wipe on each sampling trip. Vehicle seats are to also be free of contamination and cleaned regularly, however this does not appear to be done regularly. The phrase "Free of contamination' should be clarified and a cleaning log should be maintained.	
	Action taken/Implementation The wording will be revised. The procedure is to wipe down the dust. The steering wheel is contaminated from normal use and has no effect on sample contamination when proper handling procedures are followed. **This item has been addressed in the revised SOP that comes into effect no later than April 30, 2015.**	

18	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** It is recommended that the conditions of the sampling point (for example, the use of the sink) be noted if they had changed from the previous sampling. This could be addressed by the use of a checklist item, possibly supported with photographs. The cleanliness of the sampling area, including the tap and the sink also has to be assessed and recorded. Also include recording of other environmental conditions that could impact testing.	R
	Action taken/Implementation See item 15 as a picture of the sinks will be collected in collecting the information about the sample sinks. Effective December 2015. As for the observation documentation, what is expected to be documented has been noted in the revised SOP which will come into effect no later than April 30, 2015.	
19	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** It is recommended that a check for hot water entering into the sample through the tap be performed.	R
	Action taken/Implementation Covered by the Cross-connection section in Compliance Branch. The establishments must follow the plumbing codes, (check valves, back-flow preventers, etc.), so there is very little chance of hot water entering the system. This can only be determined by a licensed plumber. Sampling personnel check for a "leaking tap/faucet", which indicates that a valve isn't closing properly or that a seal is worn. If this is occurring, it is reported to the owner, and a different sink/tap is used and noted in the job or sample comment. Also a procedure is in place when if a sink tap is found to be leaking and no other location is available; the procedure and instructions for this is included in the revised SOP which will come into effect no later than April 30, 2015.	
20	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** The sampling procedure states that fingers should not touch the inside of the sample bottle lid, but there is no mention of not touching the inside of the bottle neck which is a RTCR and Standard Methods 9060a requirement. In practice, the sampling technician was careful not to touch any internal surface.	A
	Action taken/Implementation This is noted in the revised SOP which will come into effect no later than April 30, 2015.	

21	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** The recording into LIMS of the non-removal of the aerator has recently been put into effect but this requirement to record the non-removal is not documented in method. The non-removal is recorded on the worksheet as specified in the sampling method documentation.	A
	Action taken/Implementation **The laboratory has purchased several tools to assist with the removal of the aerators.** The new practice is to remove the aerator. There are only a few cases, where the owner has disallowed the removal or they have permanently glued it on. How to deal with these cases are stated in the revised SOP which will come into effect **no later than April 30, 2015.**	

22	**Sampling Method Review** **Requirement** The test procedure and all supporting work instructions are performed as documented **Observation/Recommendation** The sampling method states that hands should be being washed/sanitized prior to the handling of sampling equipment and testing equipment. In practice, a hand sanitizer is being applied in the vehicle before the start of the sampling route. It is recommended that hands should be cleaned after the chlorine test and just before water sample is taken at every sample point. The use of a clean pair of disposable gloves at each sample point would also be acceptable.	R
	Action taken/Implementation There is no requirement in the strict EPA guidelines or Standard Methods for sanitizing the hands at every location before sampling. Cleanliness is part of the GLP. Our studies, where the sample bottles were purposely contaminated with wastewater, all came back negative! The sampling personnel are highly educated and knowledgeable staff, some are microbiologists. It is expected of them that they wash their hands prior to sampling. All gloves are intended as safety protection for the person, and not to prevent contamination. This would only introduce another source for possible contamination in the field. **This item will not be implemented as other disinfection and sanitation procedures are in the revised SOP which will come into effect no later than April 30, 2015.**	
23	**Sampling Method Review** **Requirement** The test procedure and all supporting work instructions are performed as documented **Observation/Recommendation** A field log book is not used during sampling as indicated in the sampling method. Data is only recorded on LIMS worksheets.	A

	Action taken/Implementation **There is no requirement to use a "logbook".** The requirement is that "abnormal", unusual and non-conforming information is documented and included in the final report, via the LIMS. A logbook is one way of doing it, but not the only way. **Wording is been updated** in the revised SOP which will come into effect no later than **April 30, 2015.**	
24	**Sampling Method Review** **Requirement** The test procedure and all supporting work instructions are performed as documented **Observation/Recommendation** The sample hold time in the procedure, "Sample ID, Preservation and Holding Times, SWI# 17-03", for bacteriological testing is stated as 48 hours whereas the MB ODW Guideline has a required hold time of 24 hours. In practice samples are dropped off at the testing laboratory the same day.	**A**
	Action taken/Implementation **Clarification as to required hold times has been updated in the SOP and SWI** to indicate what is required under our procedure. Standard Methods is the required time that needs to be met which is 24hours for TC& EC and 30 hours for HPC. These times will be followed for sample integrity. The required time under MB ODW Guidelines will be followed as best as possible and is used as what we operate under. **This is in the revised SOP which will come into effect no later than April 30, 2015.**	

Section 2 - Management System Review Checklist

	Section	ISO 17025 Clause	Requirement	Requirement Met: Yes	Requirement Met: No	Requirement Met: Comment	Action Items
1	Organization	Place of Staff in Organization Objectives 4.1.5k	Verify that laboratory staff are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives of the management system	✓		Very knowledgeable, competent and dedicated staff	
2	Organization	Laboratory Supervision 4.1.5g	Verify that the laboratory provides adequate supervision of personnel for testing activities	✓			
3	Quality System	Planned Changes 4.2.7	Verify that top management ensures that the integrity of the management system is maintained when changes to the management system are planned and implemented	✓		The laboratory Quality Manual has a number of references to change management.	
4	Document Control	Availability 4.3.2	Verify that the current authorized test method and supporting work instructions are available	✓			
5	Document Control	Availability 4.3.2.2	Verify that all quality documentation (including instructions, standards, manuals and reference data) is available where required		✓	Sampling and testing procedures are not available in the field	Section 1 Item 11
6	Subcontracting of Tests	Competency 4.5.1,	Verify that that subcontractors are competent and maintain records of competent subcontractors used	✓		In addition to reviewing contract lab accreditation, consider submitting proficiency testing samples	
7	Supplies	Policies and Procedures 4.6.1	Document policies and procedures related to: • procurement of supplies and services • reception and storage of supplies • sufficient information to establish an audit trail		✓	There are no records related to the reception of sample bottles from the contract laboratory. The procedure also refers to keeping bottles in a box within a plastic bag. Bottles were observed in a drawer.	Section 1 Item 5 & 12
8	Control of Records	Technical Records4.13.2	Verify that the laboratory retains technical records of: • all original observations • sufficient information to establish an audit trail • personnel responsible for the sampling	✓		The laboratory has an excellent LIMS for tracking all data related to sampling and testing	
9	Control of Records	Recording 4.13.2.2	Verify that observations, data and calculations are recorded at the time they are made and be identifiable to the specific task	✓			
10	Internal Audits	Internal Audit Requirements 4.14	Verify that internal audits are periodically conducted to verify operations comply with all elements of the quality system and requirements of 17025:2005;		✓	There were no internal audit records for the sampling procedure	Section 1 Item 7

Section 3 - Technical System Review Checklist

	Section	ISO 17025 Clause	Requirement	Requirement Met			
				Yes	No	Comment	Action
11	Personnel	Qualifications 5.2.1	Verify that personnel performing specific tasks are qualified on the basis of education, training, experience and/or demonstrated skills.	✓			
12	Personnel	Employees 5.2.3	Verify that personnel are employed by the laboratory, and verify that personnel are supervised, competent and work in accordance with the quality system.	✓			
13	Personnel	Authorized Personnel 5.2.5	Verify that management has authorized specific personnel to perform specific sampling, testing and operate particular types of equipment	✓			
14	Personnel	Records 5.2.5	Verify that the laboratory maintains readily-available records for all technical personnel for: • competence, and date confirmed • educational and professional qualifications; • training, skills and experience.	✓			
15	Accommodation/ Environmental Conditions	Technical Requirements 5.3.1	Verify that technical requirements for accommodation and environmental conditions that can affect results are documented.	✓			
16	Accommodation/ Environmental Conditions	Facility 5.3.1	Verify that the laboratory or off-site facility accommodation and environmental conditions do not compromise the quality of results.	✓			
17	Accommodation/ Environmental Conditions	Monitoring 5.3.2	Verify that the laboratory monitors, controls and records environmental conditions, where applicable.	✓			
18	Accommodation/ Environmental Conditions	Incompatible Activities 5.3.3	Verify that there is effective separation between areas of incompatible activity, and that measures are taken to prevent cross-contamination	✓			
19	Accommodation/ Environmental Conditions	Storage	Verify that all supplies are stored under appropriate conditions and in a manner that satisfies requirements for safety, security, separation of incompatible materials, and ease of retrieval.	✓			

21	Methods and Validation	Method Selection 5.4.2	Verify that the laboratory selects methods that: • meet the needs of the customer • are appropriate for the test • are in latest international, regional or national standards (unless it is not appropriate or possible); the standard shall be supplemented with additional details to verify consistent application	✓		The laboratory is currently following the sampling procedures as specified by the Manitoba Government. As a continual improvement item, consider Standard Methods 9060a sampling procedure.	
22	Methods and Validation	Method Procedure	Verify that all necessary successive steps in the procedure are appropriate: • sample containers; • storage conditions; • holding time.	✓		The samples are collected in the appropriate sample bottle and are kept cool in a cooler with ice packs. The samples are dropped off at the contract laboratory upon the completion of sampling. The procedure should include the requirement not to touch the inside of the sample bottle. In practice, the samples were being taken correctly.	

23	Methods and Validation	Conduct of Testing 5.4.1	Verify that the test procedure and all supporting work instructions are performed as documented.		✓	The Manitoba Government sampling procedures are being followed, however, there are some inconsistencies in the documented method: - The use of spray isopropyl disinfectant and paper towel wipe down is not documented - Ice packs are not cleaned - specific sinks at a site are not identified - Site NE01 is not identified correctly - Vehicle cleaning is not done regularly - The recording of non-removal of the aerator into LIMS is not documented - A field logbook is no longer being used	Section 1- Item 13, 14, 15, 16, 17, 18, 21 ,23
24	Methods and Validation	Published Reference Methods (or Standard Methods) 5.4.2	For published reference methods (or standard methods), verify that the laboratory has: • confirmed that it can properly operate standard methods; • repeated the confirmation if the standard method changed.	✓		The laboratory is following the Manitoba Government sampling procedure.	

25	Methods and Validation	Method Validation 5.4.5	Verify that the method validation includes records of validation and the procedure used.	NA	NA	It is recommended that the robustness of the sampling be validated. This would involve determining the level of bacterial contamination in the sampling areas as well as determining the importance of the various sampling precautions to prevent contamination.	
26	Traceability	Calibration Program 5.6.1, 5.6.2	Verify that the testing laboratory has a calibration program for its measurement and test equipment	✓		Thermometer using in sampling has required traceability record.	
27	Sampling	Procedures and Plan5.7.1	Verify that procedures for sampling are available at the location where required, and include: • a sampling plan • factors to be controlled to verify the validity of the results • withdrawal and preparation of samples.	✓			
28	Sampling	Records 5.7.3	Verify that the laboratory has procedures for recording sampling data and operations; records to include: • sampling procedure • sampler identification • environmental conditions (if relevant) • sampling location;	✓			
29	Handling of Test Items	Procedures 5.8.1, 5.8.4	Document procedures for test item management: • transportation • receipt • handling and preparation • protection • storage	✓			
30	Handling of Test Items	Identification 5.8.2	Verify that the laboratory has a system for identifying test items	✓			
31	Handling of Test Items	Facilities 5.8.4	Verify that the laboratory has appropriate facilities to maintain item integrity, and the protection of secured items	✓			
32	Handling of Test Items	Environmental Conditions 5.8.4	Verify that required environmental conditions for items are maintained, monitored and recorded, as appropriate.	✓			
33	Handling of Test Items	Handling Instructions 5.8.4	Verify that any handling instructions provided with the test item are followed.	✓			

B.6 ATL Site Inspection Feb 25, 2015

ATL visit, February 25, 2015: Steve Hubbs, Courtney Diduck

Noting that a potential scenario for the January 26 event included sample contamination between the HPC step and the TC QuantiTray step, the COW samples collected on February 25 were followed from sample collection through transfer to the contract laboratory (ATL), through the analytical process, and into the incubator. Each step from when the sample was delivered to ATL is described below:

1. We (Hubbs and Diduck) were met at the lab by supervisor 1, and introduced us to Linda Neimor (ATL National Quality Manager, Canada). We were briefly interviewed after the samples were received by the lab, and were asked to sign a confidentiality agreement (attached). We proceeded to the lab area, and were met with supervisor 2, who accompanied us on the visit. Supervisor 3, who was responsible for the microbiology section of the lab, was introduced briefly as she was leaving for the day.
2. Samples were placed on the counter at the reception desk and the Chain of Custody (COC) form was signed. These samples were then placed on a cart by the ATL staff #1 for logging into the ATL Laboratory Information Management System (LIMS). The cart also contained other samples, and the COW samples were isolated on the cart separately.
3. The COC form was taken by ATL staff #2 and labels were prepared based on information provided on the COC.
4. Labels were placed on the individual sample bottles by ATL staff #2 while bottles remained in the cart. The bottles were ordered in sequence according to the order provided on the COC form.
5. ATL staff #2 delivered the cart to HPC analysis bench where ATL staff #3 started the analysis for HPC.
   5.1. ATL staff #3 arranged HPC "pour plates" onto a freshly disinfected bench and double-checked the number of plates needed for the analysis, including the QC plates.
   5.2. Plates were numbered, after which the staff #3 applied disinfectant to gloved hands.
   5.3. The first sample bottle in the sequence was opened and a 0.1 ml aliquot was removed from the sample bottle and placed into the corner of each plate using a micropipette with disposable tips. The pipette tip was discarded, and the analyst repeated the process for each sample.
   5.4. QC plates were included at the start and end of the sequence, and duplicates were included from randomly selected samples.
   5.5. HPC media in a flask was removed from a nearby warm water bath, the exterior of the flask was dried with a paper towel, the mouth of the flask was flamed, and media was poured into a tilted plate away from the sample aliquot.
   5.6. The plate was swirled and left to sit on the bench until the media had solidified. The flask mouth was flamed and replaced in the warm water bath. (From this point on the HPC plates were no longer followed.)
   5.7. The sample bottle labels were each stamped to indicate that the HPC analysis on this sample had been completed, and each sample was placed back onto the cart and taken to an adjacent bench for TC QuantiTray preparation.
6. ATL staff #4 received the cart and aligned the samples for analysis by the IDEXX QuantiTray technique.

6.1. The lab bench was cleared and a disinfectant was applied to the surface, and the analyst applied disinfectant to gloved hands.

6.2. Sample bottles were placed in line parallel with the front of the bench and visually inspected for volume (compared against the 100 ml mark on the bottle). (See picture 5).

6.3. At this time, a step that I am not familiar with was executed. Any sample bottle that had been overfilled was decanted off to the 100 ml mark using an aspirator as follows:

6.3.1. A large Erlenmeyer flask (4 liter) was attached to a suction source at the upper horizontal port of the flask, with a drain line at the bottom. A length of flexible suction hose (estimated at about 1.5 meter in length and 1 cm outer diameter, long enough to reach each sample bottle in the sequence) was attached to the top opening through a rubber stopper (See picture 5). The flask contained approximately 700 ml (below the 1 liter mark) of discolored water.

6.3.2. For any sample bottle that was overfilled, the analyst would take a glass tube shaped to a tip (estimated at approximately 15 cm long and 0.5 cm diameter) from a glass beaker partially covered with aluminum foil, place the glass tip into the end of the suction hose, remove the lid from the sample container, suction out the excess water from the sample, replace the lid, and discard the tip into another beaker. This process was repeated for each sample that was overfilled. It is estimated that approximately half of the sample bottles required this step.

6.3.3. After each decantation, and after the glass tube was removed, the suction hose was placed on the bench. A small amount of water was observed “gurgling” in the hose and not reaching the Erlenmeyer flask. At one time the suction hose slipped off of the bench and hung vertically over the front of the bench (Indicated in picture 5. Uncropped picture more clearly shows this condition).

6.3.4. After this process was completed, the supervisors were asked if this was a standard technique. Both supervisors indicated that the analysts were allowed to use this technique, or to simply pour off the excess into a sink.

6.3.5. I advised the supervisors at this point that this was a process I was unfamiliar with, and that the process looked like a contamination risk. I also suggested that the suction hose should be discarded and the Flask cleaned.

6.3.6. NOTE: Estimating that less than 10% of sample was decanted (10 ml) from each sample containers, as many as 70 samples (of unknown source) had been decanted in a similar manner since the Erlenmeyer flask had been emptied. The suction hose was discolored with what appeared to be biological growth (biofilm) (see picture 5).

6.4. The samples from the decantation step were lined up on a bench immediately across from the preparation bench top. ATL staff #5 applied disinfectant to the bench top and to gloved hands.

6.4.1. QuantiTrays were removed from an upper shelf of the bench and counted. Additional trays were stored in a nearby case stocked with only QuantiTrays. (see picture 6).

6.4.2. The first sample bottle in the sequence was opened, the a tray was picked up, “squeezed” open by placing a thumb on the backing tab, and the sample was poured in. The tray was immediately placed into one of two sealers.

6.4.3. Step 6.4.2.was repeated until all trays were sealed. The trays were stacked in groups of about 10, and placed on the bench near the sealers.

6.4.4. When all samples were sealed, the trays were placed on the cart and moved to the incubator where they were placed on a shelf separate from other samples.

7. Exit interview. After the process was completed (roughly 50 minutes from reception desk to incubator), we met again with Linda Neimor. She asked for our observations, and I noted that the primary item I observed to be atypical was the decantation step between the HPC analysis and the QuantiTray TC/EC analysis. I showed her the pictures and a short video that I had taken during the visit. We agreed to amend the confidentiality agreement to include pictures and videos. She stated that the decantation step was not a standard procedure. Other minor issues were discussed (thumb on the QuantiTray tab). Discussing the overall event of January 26, Neimor noted that the contamination, containing several different genotypes of EC, had to come from somewhere, to which we all agreed.
8. On the drive between the ATL lab and the North Plant, I decided that we should ask ATL to run a QC check on the decantation /suction apparatus, specifically on the suction hose to which the glass tubes were attached. Upon reaching the North Plant, Courtney called the ATL lab, and was told the process was already under QC review.
9. In an email string over the next 14 hours, I recommended that any QC review should include the step of running sterile water through the vacuum tube to determine if the tube and the attached biofilm could have been the source of the contamination on January 26. Note that the time stamp on Hubbs emails below are logged as Eastern time zone (subtract 1 hour for Winnipeg time). The sequence below is chronologically correct.

-------- Original message --------
From: Steve Hubbs
Date:02/25/2015 6:27 PM (GMT-05:00)
To: linda.neimor
Cc:
Subject: Decant suction tube.
hi linda this is Steve Hhbbs. Regarding our discussion today, would you please run a TC and EC on a sterile sample of water run through the suction tube In the decant system for collect analysis system.

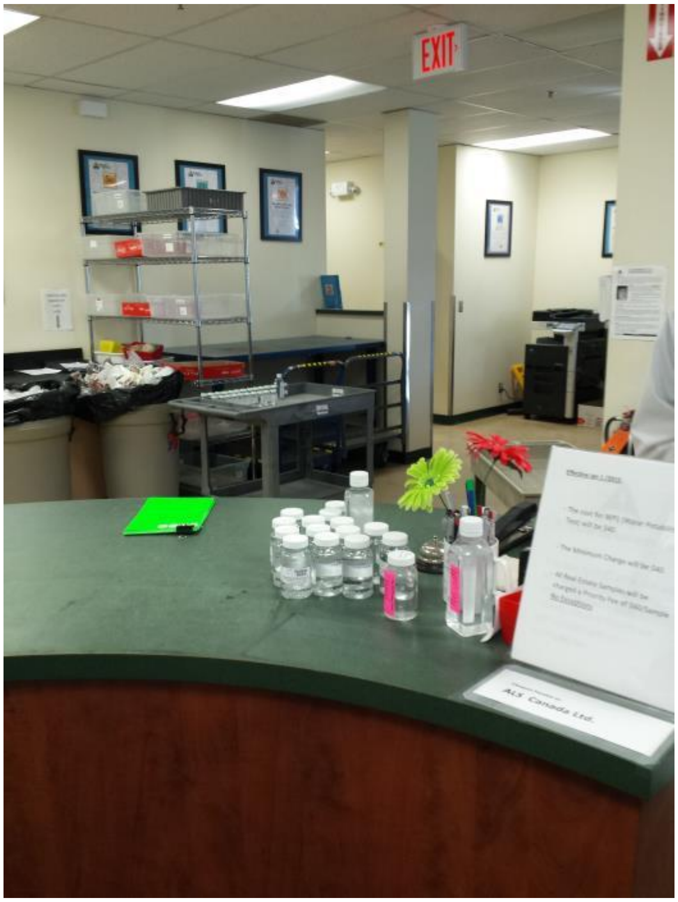
-------- Original message --------
From: Linda Neimor
Date:02/25/2015 5:36 PM (GMT-06:00)
To: Steve Hubbs >
Cc: Kayla Harold Barb Bayer
Subject: RE: Decant suction tube.
I have already asked for a series of blanks to be prepared by overfilling sample bottles with sterile water and then reducing the volume to 100 mLs using this apparatus.
That will be more indicative of sample treatment and possible impacts.
Regards,
Linda
Linda Neimor

-------- Original message --------
From: Steve Hubbs
Date:02/25/2015 9:58 PM (GMT-05:00)
To: Linda Neimor
Cc:
Subject: RE: Decant suction tube.
I was just thinking that the material in the tube should be checked to see if it is a possible source. The gurgling in the tube could be such that back flow might only happen only if the tube were extended vertically down as might happen if dropped...which might not occur except under unusual circumstances. If the tube is free of TC/EC this becomes an unlikely source. If present it might be a potential source.
Steve

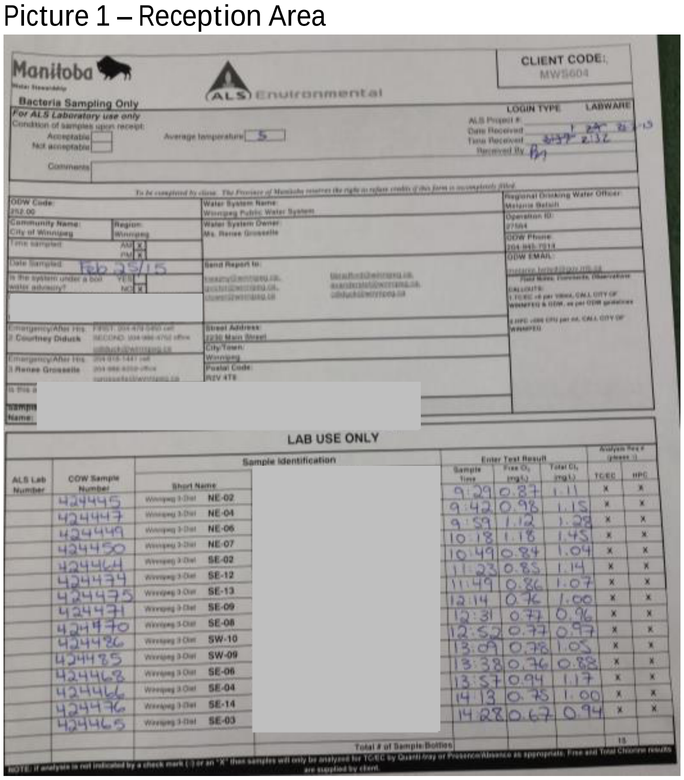
-------- Original message --------
From: Linda Neimor
Date:02/26/2015 7:16 AM (GMT-05:00)
To: Steve Hubbs
Cc:
Subject: Re: Decant suction tube.
Yes, that's why I asked for the study. It's not so much what is in the tube, but if it in some way can contaminate the samples in the way it was being used.
Linda Neimor

-------- Original message --------
From: Steve Hubbs
Date:02/26/2015 8:52 AM (GMT-05:00)
To: Linda Neimor
Cc:
Subject: Re: Decant suction tube.
I still feel strongly that you should check what is in the tube. It is difficult to simulate all operating conditions that occur in the process of analyzing thousands of samples.

-------- Original message --------
From: Linda Neimor
Date:02/26/2015 9:13 AM (GMT-05:00)
To: "Steve Hubbs
Cc:
Subject: pictures
Hi Steve,
I only received the picture of the suction tube.
Can you resend the picture of opening the trays?
Thanks
Linda



Picture 1 – Reception Area



Manitoba

Bacteria Sampling Only

ALS Environmental

CLIENT CODE:
MWS604

For ALS Laboratory use only

Condition of samples upon receipt:
Acceptable
Not acceptable

Average temperature 5

LOGIN TYPE | LABWARE

ALS Project #:
Date Received
Time Received 2:32
Received By

Comments

ODW Code: 252.00

Water System Name: Winnipeg Public Water System

Regional Drinking Water Officer

Community Name: City of Winnipeg

Region: Winnipeg

Water System Owner:

Operation ID: 27594

ODW Phone

ODW EMAIL:

Time sampled AM X PM X

Date Sampled Feb 25/15

Send Report to:

Is the system under a boil water advisory? YES NO X

CALLOUTS:

Street Address: 2230 Main Street

City/Town: Winnipeg

Postal Code: R2V 4T8

LAB USE ONLY

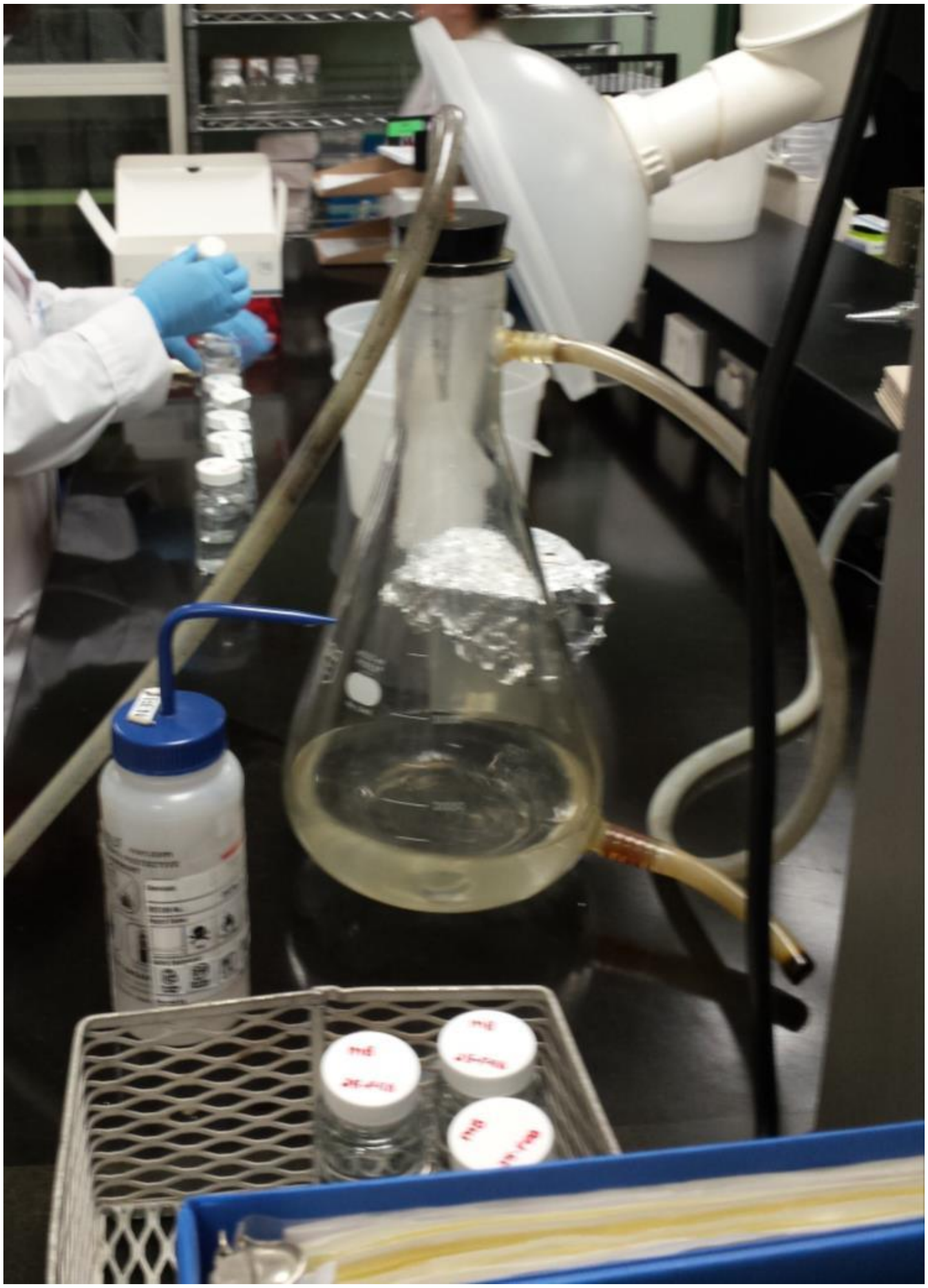
ALS Lab Number	COW Sample Number	Short Name	Sample Time	Free Cl_2 (mg/L)	Total Cl_2 (mg/L)	TC/EC	HPC
	424445	NE-02	9:29	0.87	1.11	x	x
	424447	NE-04	9:42	0.98	1.15	x	x
	424449	NE-06	9:59	1.12	1.28	x	x
	424450	NE-07	10:18	1.18	1.45	x	x
	424464	SE-02	10:49	0.84	1.04	x	x
	424474	SE-12	11:23	0.85	1.14	x	x
	424475	SE-13	11:49	0.86	1.07	x	x
	424471	SE-09	12:14	0.76	1.00	x	x
	424470	SE-08	12:31	0.77	0.96	x	x
	424486	SW-10	12:52	0.77	0.97	x	x
	424485	SW-09	13:09	0.78	1.05	x	x
	424468	SE-06	13:38	0.76	0.88	x	x
	424466	SE-04	13:57	0.94	1.17	x	x
	424476	SE-14	14:13	0.75	1.00	x	x
	424465	SE-03	14:28	0.67	0.94	x	x

Total # of Sample Bottles 15

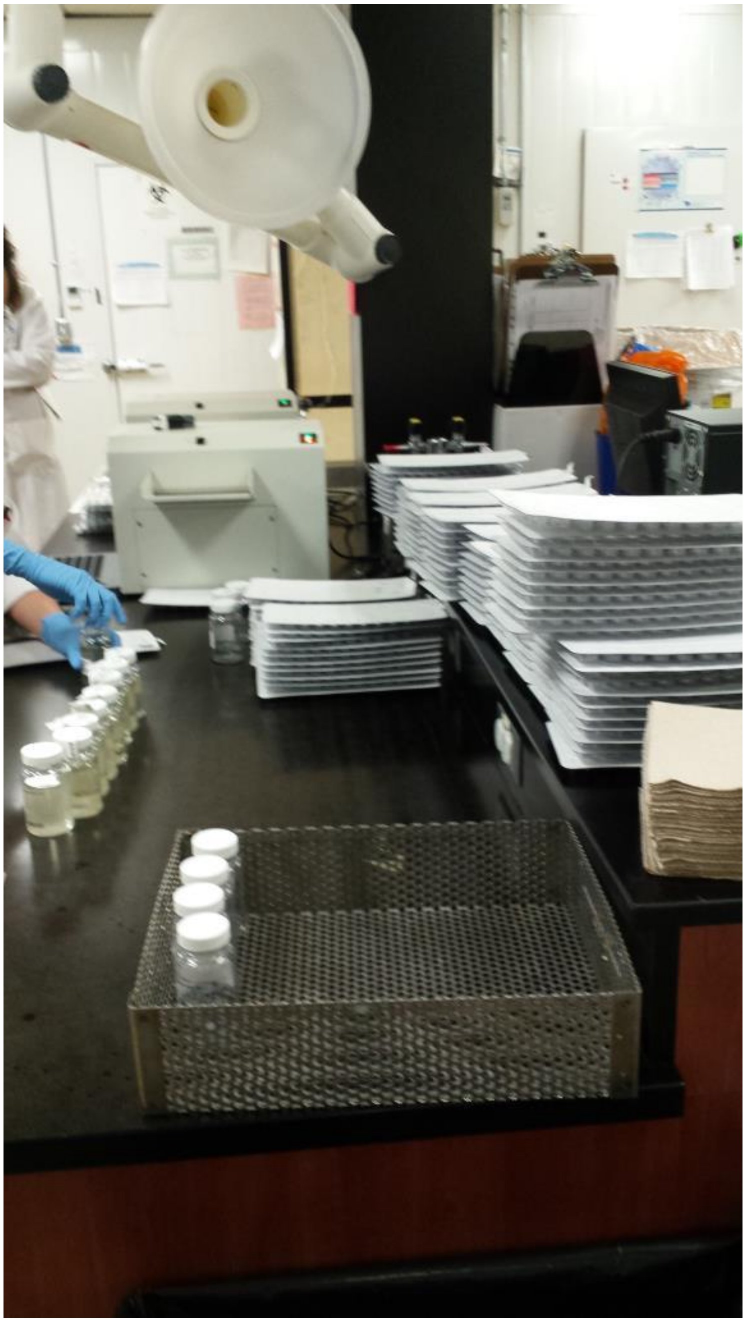
Picture 2 – Chain of Custody form

Picture 3 – Prep for HPC analysis

Picture 4 – HPC plates cooling prior to inverting



Picture 5 – Decanting step for QuantiTray analysis



Picture 6 – Preparation for QuantiTray pouring

Picture 7 – Walk-in Incubator

ALS

AUDITOR CONFIDENTIALITY AGREEMENT

Dated: 25-Feb-15 (day-month-year)

Between: ALS Canada Ltd., Winnipeg location

Address: 12-1329 Niakwa Rd. East ("ALS"), and

Individual: Stephen A. Hubbs/Courtney Diduck ("Auditor")

Representing: City of Winnipeg

Address: 2230 Main St. ("Auditing Company")

Audit Period: 25-Feb-15 to 25-Feb-15 (day-month-year, including preparation)

1. All information provided by ALS or accessed by the Auditor during his/her inspection of ALS facilities and premises at 12-1329 Niakwa Rd. East, or communicated in any other way by ALS to the Auditor is confidential to ALS, may only be used in accordance with this agreement, and may not be disclosed by the Auditor to any person, except:

   a. To employees of the Auditing Company who have agreed to maintain the confidentiality of the information in accordance with this agreement; or

   b. To employees of ALS; or

   c. With the written consent of ALS; or

   d. If the information is, at the date of this Agreement, lawfully in the possession of the Auditor through sources other than ALS; or

   e. If required by law; or

   f. If strictly and necessarily required in connection with legal proceedings relating to this agreement; or

   g. If the information is generally publically available other than as a result of breach of confidence by the Auditor.

2. This Agreement will be governed by and interpreted in accordance with the substantive laws of Canada, exclusive of any rules with respect to conflicts of laws, and the Parties submit to the exclusive jurisdiction of the courts of Canada for any dispute in relation with this Agreement.

3. The Auditor acknowledges that ALS has provided him/her with printed ( ) and/or electronic ( ) copies of the following documents in order to conduct this audit. The Auditor agrees to destroy all copies of these documents after the purpose of the audit has been completed.

+ still photos and videos of samples being processed, plates and trays. 25-Feb-15

ALS

SIGNED by or on behalf of the Auditor:

Signature of Auditor

Stephan Hubbs / Courtney Didock.

Name

Engineer

Title

SIGNED for and on behalf of ALS Canada Ltd.:

Signature of authorized person

Kayla Harold.

Name

Quality Systems Coordinator.

Title

Appendix C

- External Reports

C1 Dr. J. Bullard (Associate Medical Director, Cadham Provincial Laboratory)

Manitoba

Memorandum

Date: February 26, 2015

To: Shirley Dzogan
Laboratory and Special Contracts Negotiator,
Office of Drinking Water,
Conservation and Water Stewardship

Lee-Ann Hemphill
Biology Manager,
ALS Life Sciences Division/Environmental

Dr. Lisa Richards
Medical Officer of Health,
Winnipeg Regional Health Authority

Renee Groselle
Manager of Environmental Standards,
City of Winnipeg

Courtney Diduck
Analytical Services Branch Head,
City of Winnipeg

From: Dr. Jared Bullard, MD FRCPC
Associate Medical Director,
Cadham Provincial Laboratory

Telephone: (204) 945-1306

Subject: **Final Report (Revised 2015/02/26)—City of Winnipeg Positive Water Samples Submitted for Bacterial Culture & Identification**

Six Colilert Quanti-trays, representing the six positive water samples from the City of Winnipeg (sampling date January 26th, 2015), were received at Cadham Provincial Laboratory on Thursday, February 5th, 2015 (L1570974-1, -4, -5, -9, -10, -17) for bacterial culture, identification, and genetic fingerprinting by pulsed field gel elcetrophoresis(PFGE – *E.coli* isolates only). Colilert Quanti-trays detect the presence of both coliforms and *E. coli* based on the biochemical detection of two enzymes – β-galactosidase (colorimetric test) and β-glucuronidase (fluorometric test). Coliforms will be positive for β-galactosidase only, whereas E. coli will be positive for both enzymes.

All wells flagged as Total Coliform (TC) positive and *Escherichia coli* (EC) positive had their contents aspirated, concentrated, planted to bacteriologic culture media, and organisms isolated were identified. A minimum of two negative wells per tray were also tested in the same manner. Additionally, a Quality Control (QC) tray (labelled Positive control 03Feb) was received on Wednesday, February 11th, 2015. The *E. coli* isolates from the water samples, as well as the QC strain, were run by PFGE and compared against each other.

See attachments for tray mapping, CPL sampling results, and PFGE images.

Summary of CPL Results:

- There were no organisms recovered from any of the negative tray wells that were sampled.
- Total Coliforms – coliforms only were recovered from all wells in all six trays that flagged as positive for coliforms.
- *Escherichia coli*:
  - In four of the five trays positive for EC, *E. coli* was recovered from all wells that flagged as positive for *E. coli*.
  - In the fifth tray, although no *E. coli* was recovered from the single well that flagged as EC positive, two types of coliforms were recovered. Neither of the organisms are documented in literature to produce β-glucuronidase, thus should not have been able to cause the well to fluouresce. Biochemical tests on these organisms in the Microbiology Laboratory at CPL confirmed that both organisms were β-glucuronidase negative.
  - It is possible that any *E. coli* that may have been present had been overgrown by the coliforms present to the point where it was undetectable or that any *E. coli* originally present was no longer viable.
  - One tray had three different colonial morphotypes of *E. coli* isolated.
- Genetic fingerprinting using pulsed field gel electrophoresis (PFGE) was performed on all *E. coli* isolates (7) as well as the control strain (8 isolates tested in total)
- PFGE results indicate that all 8 isolates, 7 from water samples as well as the QC strain, were genetically different (PFGE image analysis confirmed by the National Microbiology Laboratory).

In Conclusion:
Testing at CPL confirmed, for all but one sample, the preliminary results reported by ALS Laboratories. Additionally, genetic fingerprinting of the *E. coli* isolates has demonstrated that all isolates are genetically different, both from each other and from the Quality Control strain used by ALS. The isolation of 7 different *E. coli* strains is inconsistent with a common source lab error or systematic lab contamination. The combination of one collector, positive samples from one side of the city and no other unexpected positive flagged trays that day, in addition to multiple genotypes of E. coli (likely suggesting multiple sources rather than a single source) suggests, on a balance of probabilities, a pre-analytical issue (including, but not exclusive to, collection, source sampling or handling) rather than an analytical or post-analytical issue. The inability to recover *E. coli* from one of the samples does not necessarily indicate that the original result was incorrect – while that is a possibility, it is also possible that the organism was present in very low numbers and overgrown by other organisms present, or that the organism was no longer viable by the time samples were received and processed at CPL.

Dr. Jared Bullard, MD FRCPC
Associate Medical Director,
Cadham Provincial Laboratory

Colilert Quanti-Tray Map

L1570974-1

	1	2	3	4	5
A			\		
B		\	\	x	
C			\		
D					
E					
F				o	
G					
H					
I	o				
J					
K					

L1570974-9

	1	2	3	4	5
A			x		
B				o	
C					\
D			\		
E			\		
F					
G	o				
H					
I					
J					
K	\				

L1570974-4

	1	2	3	4	5
A					
B			\		
C					
D					
E					
F					
G		o			
H					
I					
J				o	
K					

L1570974-10

	1	2	3	4	5
A					
B		\		\	
C			x		
D					o
E					
F					
G					
H			o		
I					
J					
K					

L1570974-5

	1	2	3	4	5
A			\		
B	\	o	\	x	\
C	\	o	o	o	o
D	x	\	\	\	x
E	o	\	\	o	\
F	o	\	x	\	\
G	\	\	o	o	x
H	\	o	x	o	o
I	\	\	o	o	o
J	\	\	o	\	x
K	\	o	x	\	\

L1570974-17

	1	2	3	4	5
A			x		
B					
C		o			
D					
E					
F					
G					
H					
I					
J					o
K					

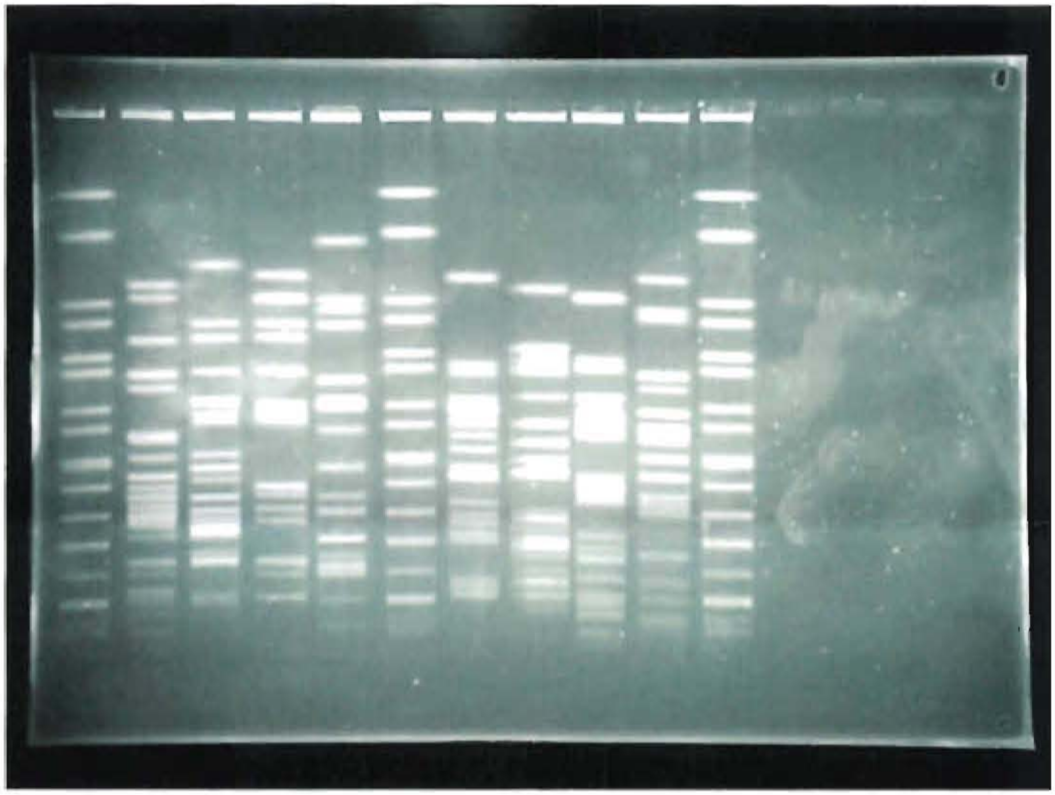
Legend: \ = coliform X = E coli O = negative well sampled

CPL Results

Tray	Well	Colilert Quanti-Tray Result	CPL Culture Result
L1570974-1	A-1	TC +	Coliforms x2
	B-2	TC +	Coliforms x3
	B-3	TC +	Coliforms x3
	B-4	EC +	Coliforms x2 (*Morganella, Klebsiella*) No *E. coli* recovered
	C-3	TC +	Coliforms x2
	F-4	Negative	No growth
	I-1	Negative	No growth
L1570974-4	B-3	TC +	Coliforms x3
	G-2	Negative	No growth
	J-4	Negative	No growth
L1570974-5	A-1	TC +	Coliforms x2
	B-1	TC +	Coliforms x2
	B-2	Negative	No growth
	B-3	TC +	Coliforms x2
	B-4	EC +	***E. coli* (hemolytic)**
	B-5	TC +	Coliform x1
	C-1	TC +	Coliform x1
	C-2	Negative	No growth
	C-3	Negative	No growth
	C-4	Negative	No growth
	C-5	Negative	No growth
	D-1	EC +	***E. coli* (flat)**, coliform x1
	D-2	TC +	Coliform x1
	D-3	TC +	Coliform x1
	D-4	TC +	Coliform x1
	D-5	EC +	*E. coli* (flat)
	E-1	Negative	No growth
	E-2	TC +	Coliforms x2
	E-3	TC +	Coliforms x2
	E-4	Negative	No growth
	E-5	TC +	Coliforms x2
	F-1	Negative	No growth
	F-2	TC +	Coliforms x2
	F-3	EC +	*E. coli* (flat)
	F-4	TC +	Coliform x1
	F-5	TC +	Coliforms x2
	G-1	TC +	Coliform x1
	G-2	TC +	Coliform x1
	G-3	Negative	No growth
	G-4	Negative	No growth
	G-5	EC +	*E. coli* (flat), coliform x1
	H-1	TC +	Coliforms x2
	H-2	Negative	No growth

	H-3	EC +	***E. coli* (mucoid)**, coliform x1
	H-4	Negative	No growth
	H-5	Negative	No growth
	I-1	TC +	Coliform x1
	I-2	TC +	Coliforms x2
	I-3	Negative	No growth
	I-4	Negative	No growth
	I-5	Negative	No growth
	J-1	TC +	Coliform x1
	J-2	TC +	Coliform x1
	J-3	Negative	No growth
	J-4	TC +	Coliform x1
	J-5	EC +	E. coli (flat)
	K-1	TC +	Coliforms x2
	K-2	Negative	No growth
	K-3	EC +	***E. coli* (flat)**, coliform x1
	K-4	TC +	Coliform x1
	K-5	TC +	Coliform x1
L1570974-9	A-3	EC +	***E. coli* (flat)**
	B-4	Negative	No growth
	C-5	TC +	Coliforms x2
	D-3	TC +	Coliform x1
	E-3	TC +	Coliform x1
	G-1	Negative	No growth
	K-1	TC +	Coliform x1
L1570974-10	B-2	TC +	Coliforms x2
	B-4	TC +	Coliforms x2
	C-3	EC +	***E. coli* (flat)**
	D-5	Negative	No growth
	H-3	Negative	No growth
L1570974-17	A-1	EC +	***E. coli* (flat)**, coliform x1
	C-2	Negative	No growth
	J-5	Negative	No growth
E. coli isolates in **bold** type were tested by PFGE.			

PFGE Image



Sample Lanes (From Left to Right)

1. *Salmonella braenderup* (Control)
2. L1570974-5 B4 *E. coli*
3. L1570974-5 D1 *E. coli*
4. L1570974-5 H3 *E. coli*
5. L1570974-5 K3 *E. coli*
6. *Salmonella braenderup* (Control)
7. L1570974-10 C3 *E. coli*
8. L1570974-9 A1 *E. coli*
9. L1570974-17 A1 *E. coli*
10. *E. coli* ALS QC strain
11. *Salmonella braenderup* (Control)

C2 W. Lipinsky, (Assessor, Canadian Association for Laboratory Accreditation)

C2a Lipinsky Report

Assessment of City of Winnipeg
Drinking Water Sampling Activities
For Bacteriological Testing

Executive Summary

March 9, 2015

Introduction

The following report summarises the assessment of the City of Winnipeg's drinking water sampling program for bacteriological monitoring. W. Lipinsky, a CALA (Canadian Association for Laboratory Accreditation) assessor, reviewed the sampling procedure on February 11, 2015.

The assessment was carried out to determine compliance with the following standards and guidance documents related to water sampling:

- Manitoba Water Stewardship Office of Drinking Water and Office of the Chief Medical Officer of Health water sampling instructions for microbiological testing
- Standard Methods for the Examination of Water and Wastewater APHA/AWWA
- EPA Revised Total Coliform Rule Assessments (RTCR) Guidance Manual
- ISO 17025 General Requirements for the Competence of Testing Laboratories

Scope of Audit

The entire sampling process was reviewed and included the following areas:

- Water sampling procedure and related documents
- Staff training records
- Sampling supplies, procurement and storage
- Inspection of the laboratory's area related to sampling supplies and preparation
- Interview with sampling technicians and supervisory staff
- Sample registration, worksheet and label preparation, and data entry
- Observation of on-site sampling by the laboratory technician, at the six locations which had positive coliform results on January 26, 2015.
- Observation of sample bottle handling and transport to contract laboratory
- Review of coliform test records

Summary of Observations

The drinking water samplers are laboratory technicians with the City of Winnipeg Environmental Standards Division Laboratory. The laboratory is ISO 17025 accredited for its testing of drinking water and maintains an effective quality management system. There is an approved documented sampling procedure, which instructs the technicians on how to correctly take water samples.

It was observed, at the six sampling sites, that the technician sampled the drinking water in accordance with the requirements of Manitoba Water Stewardship Office of Drinking Water and the Office of the Chief Medical Officer of Health water sampling procedures. The technicians who were interviewed had chemical technology certificates with several years of testing and sampling experience. They were dedicated and aware of the significance of their work and the importance of proper sampling. The water taps and sinks at the sampling sites appeared to be suitable and clean. However, they were in public places and the presence of coliforms in the sampling environment was unknown.

The laboratory was observed to have an excellent system of sample identification, together with labelling, worksheet generation and data entry. Sample integrity was maintained up to the point of delivery at the contract laboratory.

A few documentation and quality system deficiencies were noted. The impact of these deficiencies for the potential of coliform contamination during sampling was quite small.

In 2014, there were 3,191 drinking water samples, which had been taken by laboratory sampling technicians. Only one of these samples tested positive for E. Coli.

Conclusion and Recommendations

Based on the observations during the assessment, there is a low probability that positive results would have occurred as a result of contamination at the time of sampling. The low probability of contamination during sampling is supported by test results noted during the 2014 collection of samples, in which there was only one positive E. Coli sample.

To ensure that the probability of contamination during sampling continues to be low, a number of continual improvement items have been recommended to the City of Winnipeg laboratory.

Assessment Report
Of
City of Winnipeg
Drinking Water Sampling Activities
For Bacteriological Testing

Assessor: Walter Lipinsky

Assessment Date: February 11, 2015

Report Version: April 20, 2015

This report is divided into four sections:

Section 1 – Assessment Findings and Recommendations Summary
Section 2 – Management System Review Checklist
Section 3 – Technical System Review Checklist
Section 4 – Laboratory Technician II Interview

Section 1 – Assessment Findings and Recommendations Summary

Review Sections: ISO 17025 Management Review, Technical Review, Sampling Method Review
Finding Type: A-Action required **R**-Recommendation **C**-Comment

		Type
1	**Management Review** — **Organization** **Requirement** The laboratory provides adequate supervision of personnel for sampling activities **Observation/Recommendation** Effective supervisory structure in place	**C**
2	**Management Review** — **Organization** **Requirement** Laboratory staff is aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives of the management system **Observation/Recommendation** Very knowledgeable, competent and dedicated staff	**C**
3	**Management Review** — **Quality System** **Requirement** Top management ensures that the integrity of the management system is maintained when changes to the management system are planned and implemented **Observation/Recommendation** Impact of changes should be studied. These changes could include sampling method and other method revisions, and assignment of staff to multiple activities of which some may be incompatible.	**R**
4	**Management Review** — **Sub-Contracting** **Requirement** Subcontractors are competent and maintain records of competent subcontractors used. **Observation/Recommendation** Besides reviewing the accreditation of a sub-contract laboratory, consider an on-site assessment and/or submission of blind proficiency check samples or splitting samples between laboratories. Of extreme importance in microbiological testing is the separation of drinking water samples from high bacteria level samples throughout the sample reception, storage and testing phases at the contract laboratory.	**R**

5	**Management Review** **Supplies** **Requirement** There are policies and procedures related to procurement of supplies and services, and reception and storage of supplies with associated records. **Observation/Recommendation** There are no records related to the reception of microbiological sample bottles from the contract laboratory, which should include a lot identification as well as traceability to cleanliness records. The sampling procedure also refers to keeping sample bottles in a box within a plastic bag. In practice, sample bottles were observed in a drawer.	**A**
6	**Management Review** **Records** **Requirement** The laboratory maintains procedures for data management. **Observation/Recommendation** The laboratory has an excellent implementation of a LIMS (Laboratory Information Management System) for registering samples, printing labels and worksheets, result entry and reporting.	**C**
7	**Quality Management** **Internal Audits** **Requirement** Internal audits and method document reviews are periodically conducted to verify operations comply with all elements of the quality system and requirements of ISO/IEC 17025:2005; ensure that internal audits follow a predetermined schedule and procedure **Observation/Recommendation** The laboratory has focused on performing internal audits on in-house testing as well as other elements of their quality system. There were no records of an internal audit of the sampling method used to collect samples that are sent to a contract laboratory. An internal audit is required for all laboratory processes.	**A**
8	**Technical Management** **Facilities** **Requirement** There is effective separation between areas of incompatible activity, and that measures are taken to prevent cross-contamination **Observation/Recommendation** Effective safeguards are in place to ensure that wastewater and drinking water testing activities are adequately separated to prevent contamination of drinking water samples.	**C**

9	**Technical Management — Test Method** **Requirement** The laboratory selects test methods that are in latest international, regional or national standards (unless it is not appropriate or possible); the standard shall be supplemented with additional details to ensure consistent application. **Observation/Recommendation** The laboratory is following a sampling procedure based on Manitoba Government sampling requirements. It is recommended that the laboratory consider the procedure in Standard Methods 9060a as a continual improvement item. Standard Methods 9060a requires a cold water tap to be run for 2-3 minutes before sampling. If the tap cleanliness is unknown, the faucet has to be disinfected, both inside and outside, and then having the water run an additional 2-3 minutes after treatment. As well, if sampling from a mixing faucet, run hot water for 2 minutes and then cold water for 2-3 minutes before collecting a sample.	**R**
10	**Technical Management — Validation** **Requirement** Method validation includes records of validation, the procedure used, and a statement that the method is fit for the intended use. **Observation/Recommendation** Consider the use of replicate samples and field blanks for microbiological water sampling. As well, consider studying worse case scenarios involving no disinfection of faucets and hands or pre-sampling water flow.	**R**
11	**Technical Management — Method** Procedures for sampling are available at the location where required **Observation/Recommendation** Sampling method documentation was not available in the field.	**A**
12	**Technical Management — Handling Samples** **Requirement** For sample handling, verify that there are documented procedures specified to protect the integrity of the sample from time of sampling to sample processing (including pre and post analysis storage) including, but not limited to: use of sterile approved sample containers **Observation/Recommendation** Unused sample bottles are handled by a number of people without any special precautions (sanitized hands, clean gloves). They are removed from the shipment box, placed into drawers, and placed into coolers without any cleanliness precautions. The use of gloves, Zip-Lock type of bags or other measures should be considered to protect the cleanliness integrity of the bottles. Samplers should also not be engaged in any activities, prior to drinking water sampling, that might contaminate their person or clothing.	**R**

13	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** The use of spray isopropyl disinfectant and paper towel wipe down is not specifically documented. The documented procedure requires that the sampling point be swabbed with an alcohol solution or sanitary wipes saturated with alcohol. This recently replaced the immersing of the faucet into a cup of methanol. Standard Methods 9060a requires that the faucet be disinfected both inside and out, which is achieved by immersing the faucet into a cup of alcohol.	**A**
14	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** The cleaning of coolers and ice packs is documented to be done regularly without a specific frequency. In practice, coolers are cleaned immediately before use in the field. Ice packs are not cleaned before use.	**A**
15	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method or supporting documentation. **Observation/Recommendation** Sampling sites, in terms of buildings, are documented. However, specific sinks at the sampling sites are not documented.	**A**
16	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** Sampling site NE01 is identified in Appendix B as an [redacted] when in fact it is a [redacted]. All locations should be reviewed for accuracy.	**A**
17	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** Vehicle steering wheels are being cleaned with a sanitary wipe on each sampling trip. Vehicle seats are to also be free of contamination and cleaned regularly, however this does not appear to be done regularly. The phrase "Free of contamination' should be clarified and a cleaning log should be maintained.	**A**

18	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** It is recommended that the conditions of the sampling point (for example, the use of the sink) be noted if they had changed from the previous sampling. This could be addressed by the use of a checklist item, possibly supported with photographs. The cleanliness of the sampling area, including the tap and the sink also has to be assessed and recorded. Also include recording of other environmental conditions that could impact testing.	**R**
19	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** It is recommended that a check for hot water entering into the sample through the tap be performed.	**R**
20	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** The sampling procedure states that fingers should not touch the inside of the sample bottle lid, but there is no mention of not touching the inside of the bottle neck which is a RTCR and Standard Methods 9060a requirement. In practice, the sampling technician was careful not to touch any internal surface.	**A**
21	**Sampling Method Review** **Requirement** All necessary successive steps in the test procedure are adequately documented in the test method **Observation/Recommendation** The recording into LIMS of the non-removal of the aerator has recently been put into effect but this requirement to record the non-removal is not documented in method. The non-removal is recorded on the worksheet as specified in the sampling method documentation.	**A**

22	**Sampling Method Review** **Requirement** The test procedure and all supporting work instructions are performed as documented **Observation/Recommendation** The sampling method states that hands should be being washed/sanitized prior to the handling of sampling equipment and testing equipment. In practice, a hand sanitizer is being applied in the vehicle before the start of the sampling route. It is recommended that hands should be cleaned after the chlorine test and just before water sample is taken at every sample point. The use of a clean pair of disposable gloves at each sample point would also be acceptable.	**R**
23	**Sampling Method Review** **Requirement** The test procedure and all supporting work instructions are performed as documented **Observation/Recommendation** A field log book is not used during sampling as indicated in the sampling method. Data is only recorded on LIMS worksheets.	**A**
24	**Sampling Method Review** **Requirement** The test procedure and all supporting work instructions are performed as documented **Observation/Recommendation** The sample hold time in the procedure, “Sample ID, Preservation and Holding Times ‚SWI# 17-03”, for bacteriological testing is stated as 48 hours whereas the MB ODW Guideline has a required hold time of 24 hours. In practice samples are dropped off at the testing laboratory the same day.	**A**

Section 2 - Management System Review Checklist

	Section	ISO 17025 Clause	Requirement	Requirement Met		
				Yes	No	Comment
1	Organization	Place of Staff in Organization Objectives 4.1.5k	Verify that laboratory staff are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives of the management system	✓		Very knowledgeable, competent and dedicated staff
2	Organization	Laboratory Supervision 4.1.5g	Verify that the laboratory provides adequate supervision of personnel for testing activities	✓		
3	Quality System	Planned Changes 4.2.7	Verify that top management ensures that the integrity of the management system is maintained when changes to the management system are planned and implemented	✓		The laboratory Quality Manual has a number of references to change management.
4	Document Control	Availability 4.3.2	Verify that the current authorized test method and supporting work instructions are available	✓		
5	Document Control	Availability 4.3.2.2	Verify that all quality documentation (including instructions, standards, manuals and reference data) is available where required		✓	Sampling and testing procedures are not available in the field
6	Subcontracting of Tests	Competency 4.5.1,	Verify that that subcontractors are competent and maintain records of competent subcontractors used	✓		In addition to reviewing contract lab accreditation, consider submitting proficiency testing samples
7	Supplies	Policies and Procedures 4.6.1	Document policies and procedures related to: • procurement of supplies and services • reception and storage of supplies • sufficient information to establish an audit trail		✓	There are no records related to the reception of sample bottles from the contract laboratory. The procedure also refers to keeping bottles in a box within a plastic bag. Bottles were observed in a drawer.
8	Control of Records	Technical Records4.13.2	Verify that the laboratory retains technical records of: • all original observations • sufficient information to establish an audit trail • personnel responsible for the sampling	✓		The laboratory has an excellent LIMS for tracking all data related to sampling and testing
9	Control of Records	Recording 4.13.2.2	Verify that observations, data and calculations are recorded at the time they are made and be identifiable to the specific task	✓		
10	Internal Audits	Internal Audit Requirements 4.14	Verify that internal audits are periodically conducted to verify operations comply with all elements of the quality system and requirements of 17025:2005;		✓	There were no internal audit records for the sampling procedure

Section 3 - Technical System Review Checklist

				Requirement Met		
	Section	**ISO 17025 Clause**	**Requirement**	**Yes**	**No**	**Comment**
11	Personnel	Qualifications 5.2.1	Verify that personnel performing specific tasks are qualified on the basis of education, training, experience and/or demonstrated skills.	✓		
12	Personnel	Employees 5.2.3	Verify that personnel are employed by the laboratory, and verify that personnel are supervised, competent and work in accordance with the quality system.	✓		
13	Personnel	Authorized Personnel 5.2.5	Verify that management has authorized specific personnel to perform specific sampling, testing and operate particular types of equipment	✓		
14	Personnel	Records 5.2.5	Verify that the laboratory maintains readily-available records for all technical personnel for: • competence, and date confirmed • educational and professional qualifications; • training, skills and experience.	✓		
15	Accommodation /Environmental Conditions	Technical Requirements 5.3.1	Verify that technical requirements for accommodation and environmental conditions that can affect results are documented.	✓		
16	Accommodation /Environmental Conditions	Facility 5.3.1	Verify that the laboratory or off-site facility accommodation and environmental conditions do not compromise the quality of results.	✓		
17	Accommodation /Environmental Conditions	Monitoring 5.3.2	Verify that the laboratory monitors, controls and records environmental conditions, where applicable.	✓		
18	Accommodation /Environmental Conditions	Incompatible Activities 5.3.3	Verify that there is effective separation between areas of incompatible activity, and that measures are taken to prevent cross-contamination	✓		
19	Accommodation /Environmental Conditions	Storage	Verify that all supplies are stored under appropriate conditions and in a manner that satisfies requirements for safety, security, separation of incompatible materials, and ease of retrieval.	✓		

21	Meth ods and Validation	Method Selection 5.4.2	Verify that the laboratory selects methods that: • meet the needs of the customer • are appropriate for the test • are in latest international, regional or national standards (unless it is not appropriate or possible); the standard shall be supplemented with additional details to verify consistent application	✓		The laboratory is currently following the sampling procedures as specified by the Manitoba Government. As a continual improvement item, consider Standard Methods 9060a sampling procedure.
22	Meth ods and Validation	Method Procedure	Verify that all necessary successive steps in the procedure are appropriate: • sample containers; • storage conditions; • holding time.	✓		The samples are collected in the appropriate sample bottle and are kept cool in a cooler with ice packs. The samples are dropped off at the contract laboratory upon the completion of sampling. The procedure should include the requirement not to touch the inside of the sample bottle. In practice, the samples were being taken correctly.
23	Meth ods and Validation	Conduct of Testing 5.4.1	Verify that the test procedure and all supporting work instructions are performed as documented.		✓	The Manitoba Government sampling procedures are being followed, however, there are some inconsistencies in the documented method: - The use of spray isopropyl disinfectant and paper towel wipe down is not documented - Ice packs are not cleaned - specific sinks at a site are not identified - Site NE01 is not identified correctly - Vehicle cleaning is not done regularly - The recording of non-removal of the aerator into LIMS is not documented - A field logbook is no longer being used

24 Methods and Validation	Published Reference Methods (or Standard Methods) 5.4.2	For published reference methods (or standard methods), verify that the laboratory has: • confirmed that it can properly operate standard methods; • repeated the confirmation if the standard method changed.	✓		The laboratory is following the Manitoba Government sampling procedure.
25 Methods and Validation	Method Validation 5.4.5	Verify that the method validation includes records of validation and the procedure used.	NA	NA	It is recommended that the robustness of the sampling be validated. This would involve determining the level of bacteria contamination in the sampling areas as well as determining the importance of the various sampling precautions to prevent contamination.
26 Traceability	Calibration Program 5.6.1, 5.6.2	Verify that the testing laboratory has a calibration program for its measurement and test equipment	✓	T	hermometer using in sampling has required traceability record.
27 Sampling	Procedures and Plan5.7.1	Verify that procedures for sampling are available at the location where required, and include: • a sampling plan • factors to be controlled to verify the validity of the results • withdrawal and preparation of samples.	✓		
28 Sampling	Records 5.7.3	Verify that the laboratory has procedures for recording sampling data and operations; records to include: • sampling procedure • sampler identification • environmental conditions (if relevant) • sampling location;	✓		
29 Handling of Test Items	Procedures 5.8.1, 5.8.4	Document procedures for test item management: • transportation • receipt • handling and preparation • protection • storage	✓		
30 Handling of Test Items	Identification 5.8.2	Verify that the laboratory has a system for identifying test items	✓		
31 Handling of Test Items	Facilities 5.8.4	Verify that the laboratory has appropriate facilities to maintain item integrity, and the protection of secured items	✓		

32	Handling of Test Items	Environmental Conditions 5.8.4	Verify that required environmental conditions for items are maintained, monitored and recorded, as appropriate.	✓		
33	Handling of Test Items	Handling Instructions 5.8.4	Verify that any handling instructions provided with the test item are followed.	✓		

C2b Lipinsky Report – Sampler Collector Interview

Section 4 – Laboratory Technician II Interview

Laboratory Technician II Interview	**2015/02/11 by Walter Lipinsky**

Interview Summary

The technician is an experienced drinking water sampler and laboratory technician. The technician is aware of the importance of taking drinking water samples correctly in order to prevent contamination. The technician was unable to identify anything that could have resulted in potential contamination on January 26, 2015. For all intents and purposes, it was another routine sampling day
The departures from the required sampling procedure included the cleaning of the steering wheel (when used) and the checking and cleaning of the vehicle to ensure that it is free of contamination. The technician cleaned the steering wheel, however, only when other staff that might have been exposed to coliforms in their activities used the vehicle. Other samplers are not doing the checking and cleaning of the vehicle as well.

Background Questions

How and by whom were you trained?	
How long have you been sampling?	
Do you wear any special clothing that is reserved for sampling drinking water?	City of Winnipeg jacket
What was worn the day of sampling Jan 26, 2015?	City of Winnipeg jacket and jeans.
Was your clothing and your person exposed to any potential sources of coliform before taking drinking water samples that you are aware of?	No
Was there anything different on January 26, 2015 during the drinking water sampling activities?	No

Sampling Procedure Specific Questions

Note: Sampling procedure in field not observed

	Yes	No	Comment
Preparation before leaving lab			
Steering wheel disinfected	✓	✓	The sampling procedure states that the steering wheel must be cleaned each time the vehicle is used. In practice, the steering wheel is only cleaned by the technician if the vehicle was previously used by other sewage treatment plant staff.
Seats and sample storage areas cleaned regularly		✓	Required in sampling procedure
Check to confirm vehicle free of contamination		✓	Required in sampling procedure
Clean cooler	✓		
Clean ice packs		✓	Ice packs are stored in freezer but are not cleaned before use as documented in the

			sampling procedure
Sample Site			
Visual inspection for cleanliness and suitability of the tap and sink. Check if there is anything incompatible in area	✓		
Were cleanliness findings recorded	✓		Senior Technician is notified if there are any issues
Check for conditions that may have changed at the sample site since the last sample collection,	✓		
Chlorine Test and Sampling Procedure			
Wash/sanitize hands prior to handling sampling and testing equipment	✓		Hands are sanitized in vehicle once at the beginning of the sampling route
Remove aerator, if present	✓		Some aerators can not be removed. Their non-removal is recorded on the worksheet
Swab the sample point with 70% alcohol or wipes		✓	The technician immersed the faucet end into a container of methanol instead of swabbing as directed in the sampling procedure.
Open the cold water valve and run for a min of 3 minutes	✓		
Check the water temperature until stable and record	✓		
Reduce water flow to reduce spilling and splashing	✓		
Perform chlorine test	✓		
Are hands washed/sanitized before water sampling?		✓	Hands are only sanitized at the beginning of the sampling route as per instructions in the sampling procedure
Is sample bottle seal checked	✓		
Is presence of sodium thiosulphate checked		✓	This is not a requirement in the sampling procedure
Fill sample bottle, cap and mix	✓		The technician was aware not to touch any of the internal surfaces of the bottle and cap
Attach sample label and update COC	✓		
Is sample properly identified on label and sampling form	✓		
Place sample into cooler	✓		

C3 M. Brodsky (Assessor, Canadian Association for Laboratory Accreditation)

C3a 1st Brodsky Report

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February 17, 2015

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Report on Internal Audit of ALS Laboratories

Introduction

On January 27, ALS Environmental Laboratory in Winnipeg reported the enumeration of Total coliforms and E.coli (using the IDEXX Quanti-tray method) from 6 widely distributed drinking water samples collected from the distribution system and submitted by the City of Winnipeg. A boil water advisory was issued, but subsequently rescinded when follow up samples indicated no further evidence of contamination. The question of the reliability of the results was raised and I was hired by the City of Winnipeg to investigate the laboratory to determine if ALS could have been complicit in erroneously issuing false positive results. ALS is accredited by the Canadian Association for Laboratory Accreditation for both their Quality Management System and many analytical methods including Heterotrophic Plate Count by APHA 9215B, and E. coli and Total Coliform by Quanti-tray (IDEXX).

I have been an Environmental Microbiologist for more than 42 years. I served as the Chief of Environmental Microbiology for the Province of Ontario, Ministry of Health, Laboratory Services Branch, from 1982-1999. I am a Past President of the Ontario Food Protection Association (OFPA), The International Association for Food Protection (IAFP) and AOAC International. I serve as Chair for the AOAC Expert Review Committee for Microbiology, as a scientific reviewer in Microbiology for the AOAC OMA and the AOAC Research Institute, as a reviewer for Standard Method for the Examination of Water and as a chapter editor on QA for the Compendium of Methods in Microbiology. I am also a lead auditor/assessor in microbiology for the Canadian Association for Laboratory Accreditation (CALA) and is Vice-chair of the CALA Board of Directors.

Executive Summary

Using CALA's A24 Microbiology Checklist as guide, I audited the laboratory on February 17, focusing my attention on the HPC by APHA 9215B, and E. coli and Total Coliform by Quanti-tray (IDEXX). I reviewed and observed sample handling and preparation from receipt log-in to analysis. I conducted a detailed review of and observed the contract lab's method SOPs and analytical procedures for bacteriological analysis, including sample receipt and handling of samples to the final reporting of the results. I also included a trace of tests for the dates/samples in question. I observed the performance of and interviewed all the analysts who were actually responsible for processing these samples on January 26 and 27, 2015. As indicated by the appended copy of the A24 checklist and the Trace of Tests, all records indicate that the ALS procedural protocols as required by their Quality System were followed and that the results of the samples tested were accurate.

Summary of Observations

As per A24, sample handling met all the requirements of ISO/IEC 17025:2005. Sample receipt and handling were thoroughly documented and the protocols followed adhered to ALS Quality Management System specifications. The method used was current and documentation was complete. The validated method had been performance-verified by ALS and historical PT results indicated no non-conformances. Media and method QC was thoroughly documented as defined by the method SOP and met all prescribed requirements. Stock cultures were appropriately maintained and controlled. QC of labware and supplies met all accreditation and lab-defined specifications and all materials were in sufficient quantities and appropriately stored. The data entry into and reports generated by the LIMS system was appropriately controlled and suitably verified.All protocols for sample preparation were followed meticulously as prescribed, by the staff who processed samples while I was observing. As attested by the Trace of Tests, historical records indicated all staff were adequately trained and competent to do the analyses. QC records for all related analytical activities, including monitoring for cross-contamination, were well documented.

Conclusion

My observations of their analytical and QC records indicated that the laboratory followed sample handling, preparation and analytical protocols and procedures as per their Quality Management System. The evidence I examined indicated that the samples in question were not contaminated with coliforms and E. coli by cross-contamination in the laboratory. It is beyond the scope of my investigation to determine the source of this contamination, but, in my opinion, based on the findings from this audit, ALS was justified in reporting their positive findings.

M. H. Brodsky

CALA
Laboratory Accreditation

CALA TRACE OF TESTS REPORT

LABORATORY ALS Environmental DATES January 26, 2015

TEST REPORT ID/UNIQUE SAMPLE ID L1570974 (1-21) ASSESSOR INITIALS MHB

RECORDS RELATING TO:	A02-Rating Guide	Clause in ISO/IEC 17025	CHECKED
1. Field supplies provided to the client	B.06.03 Sampling Records	5.7.3	✓
2. Test Requisition Form including o transcribed sampling data o (e.g., sample type, sampling method, location, dates	B.07.02 Identification of Test &/or Calibration Items	5.8.2	✓
3. Sample reception including o documented sample deficiencies (e.g., as related to collection, preservation, container, temp. on arrival, damage in transit, time in transit, etc.) o special handling requirements (e.g., pre-treatment, storage, holding times, etc.) o unique sample ID	B.07.01 B.07.02 B.07.03 Handling of Test &/or Calibration Items 1.Procedures 2.Identification 3.Deficiencies	5.8.1 5.8.2 5.8.3	✓
4. Chain of Custody, if applicable	B.07.02	5.8.2	✓
5. Sample pre-treatment, if applicable (e.g., filtration, sieving, homogenization, subsampling, etc.)	B.07.05 Environmental Conditions	5.8.4	✓
6. Sample storage, if applicable	B.07.04 Facilities	5.8.4	✓
7. Original test data including all calculations and associated QC data (also analyst name, test method ID, sample ID, test organism lot no. date, equipment ID, etc.)	A.13 Control of Records	4.13.1 4.13.2	Time read and verified Should be indicated ✓
8. Data validation (includes checking transcription errors and comparison with expected ranges or relationships)	A.13 Control of Records	4.13.1 4.13.2	Any changes should be justified ✓
9.Test Report showing: o flags qualify results if data is absent or non-conforming (e.g., due to conduct of testing, sample history, method performance, interference, or data validation, or if original sample was diluted, etc.) o appropriate reporting of low level data o appropriate use of significant digits	B.09.01 B.09.02 Reporting the Results 1.Test Results 2.Interpretation	5.10.2 5.10.6 5.10.8 5.10.3	✓

o other information, as per section 5.10 of ISO/IEC 17025			
10.Test Report Authorization	B.09.01	5.10.2j	✓
11. Sample disposal, if applicable	B.07.01	5.8.1	✓
12. Data storage and/or disposal, if applicable	A.13.01 Control of Records	4.13.1	✓
13. Training records of analyst(s) who performed test	B.01.07 Records of Technical Personnel	5.2.5	✓
14. PT only: CARs for any PT failures	Program Requirement	Program Requirement	✓

A24 – CALA Checklist for Microbiology
Revision 4.0 – April 7, 2014

Laboratory Name: ALS Environmental

Appendix Name: Colilert

Appendix Number: NA-TM-1300 V02

Assessor: Michael Brodsky

Date: January 26, 2015

CALA
Laboratory Accreditation

CALA CHECKLIST FOR MICROBIOLOGY

Item	ISO/IEC17025 Clause	Requirement	Observations Yes	 No	 Not applicable
01		**SAMPLING AND SAMPLE HANDLING**			
01.01	5.7, 5.8	Customers are informed of the sampling protocol and acceptance criteria, and there are written criteria for sample rejection (e.g., poor condition, physical deterioration, incorrect temperature, deficient labeling, etc.)	☑	☐	☐
01.02	5.7, 5.8	There are any special sampling and handling instructions depending on the matrix or reference method (where appropriate).	☑	☐	☐
01.03	5.7, 5.8	If the laboratory is responsible for sampling, ensure there are procedures for sampling available where sampling is done and they are, whenever reasonable, based on appropriate statistical methods.	☐	☐	☑
01.04	5.7, 5.8	For sample handling, verify that there are documented procedures specified to protect the integrity of the sample from time of sampling to sample processing (including pre and post analysis storage) including, but not limited to: • use of sterile approved sample containers; • collection of chlorinated samples in sterilized containers pretreated with sodium thiosulphate (where appropriate); • instruction to ensure that holding time and sample transport / storage meets method / regulatory requirements.	☑	☐	☐
01.05	5.7, 5.8	For sample preparation/testing, verify that the laboratory can demonstrate that the test portion is a representative sample of the product as much as possible (when relevant) and suitable for analysis.	☑	☐	☐
01.06	5.7, 5.8	For sample preparation/testing, verify that the laboratory can demonstrate that steps have been taken to prevent interference by environmental conditions that can invalidate the test result and that records are maintained (e.g., storage records).	☑	☐	☐
01.07	5.7, 5.8	Ensure that there is effective separation of incompatible activities (for example, this is especially important for PCR methods).	☑	☐	☐
02		**DOCUMENT CONTROL/TEST METHOD**			
02.01	4.2.1, 4.3, 5.4.1, 5.4.2	Verify that there is an approved, documented method and deviations from the reference method are documented. Confirm versions are the same as in the QMS and within the actual lab, and that it and any supporting work instructions are readily available to the analyst.	☑	☐	☐

Item	ISO/IEC17025 Clause	Requirement	Observations Yes	No	Not applicable
02.02	4.2.1, 4.3, 5.4.1, 5.4.2	Verify that all necessary successive steps in the test procedure are based on the latest valid edition of a published reference method (where appropriate and possible) and adequately documented. Steps to look for include, but are not limited to: • Sampling; • Details on reagent preparation, storage and shelf life; • Procedure for media preparation, including labeling, storage, quality control and safety procedures for handling of media; • Colony counting and reporting criteria; appropriate reporting of non-detects, taking dilution factors and sample volumes into consideration; • Equipment, supplies, etc	☑	☐	☐
03		**TEST METHOD VALIDATION/VERIFICATION**			
03.01	4.2.1	Verify that there is a documented procedure for method validation and /or verification as appropriate.	☑	☐	☐
03.02	5.4	Verify that there are method validation and / or verification records. If there are deviations from the reference method, ensure validation is adequate. (The level and rigour of validation will depend on the nature/extent of the modification(s)).	☑	☐	☐
03.03	5.4	Verify that the: • method meets performance characteristics • method meets customer requirements and • validation / verification records include a statement that the method is "Fit for the intended use" .	☑	☐	☐
03.04	5.4	Verify that verification for Quantitative tests is conducted appropriately and includes repeatability using a minimum of 10 replicates of a known positive sample or duplicate data collected over a period of time.	☑	☐	☐
03.05	5.4	Verify that the verification for qualitative tests is based upon reliability of detection using a minimum of 10 of known positive samples, performance history, or media QC.	☐	☐	☑
03.06	5.4	Verify that in-house developed methods, published methods without validation data or commercial test kits without validation data are appropriately validated to establish relevant performance characteristics.	☐	☐	☑
03.07	CALA Policy	Verify that the laboratory has successfully participated in PT as per P02-03 - Proficiency Testing Policy for Accreditation; if PT did not meet acceptance criteria, confirm that the laboratory has records of corrective action.	☑	☐	☐
03.08	5.4.6	Confirm that the laboratory has identified factors that affect measurement of uncertainty and has estimated measurement uncertainty for quantitative tests.	☑	☐	☐
04		**METHOD QUALITY CONTROL**			
04.01	4.2.1	Verify that method quality control is documented.	☑	☐	☐
04.02	5.9.1	Verify that resulting data is recorded in such a way to detect trends, and where practicable, statistical techniques are applied to review results.	☑	☐	☐

Item	ISO/IEC17025 Clause	Requirement	Observations Yes	No	Not applicable
04.03	5.9	Confirm that method/analytical QC includes, duplicates to monitor within-run precision for quantitative methods (where appropriate). For further guidance, refer to P07.	☑	☐	☐
04.04	5.9	Confirm that method/analytical QC includes method blanks (where appropriate).	☑	☐	☐
04.05	5.9	Confirm that method/analytical QC includes monthly inter-technician comparison readings to monitor precision. Generally applicable to any method where a result depends on the judgment of an analyst (e.g., colour reaction).	☑	☐	☐
04.06	5.9	Confirm that method/analytical QC includes monthly parallel analyses on at least one positive sample to monitor inter-technician method precision for quantitative tests.	☑	☐	☐
04.07	5.9	Confirm that method/analytical QC includes confirmation of isolates as necessary (applicable only to membrane filtration methods).	☐	☐	☑
05		**MEDIA / REAGENT HANDLING AND QUALITY CONTROL**			
05.01	4.2.1	Verify that media / reagent handling requirements and quality control are documented.	☑	☐	☐
05.02	4.13.2	Verify that media and / or reagents are appropriately labeled with material, concentration or purity (as required), date prepared and /or expiry date.	☑	☐	☐
05.03	4.6.2, 5.3	Verify that media/ and or reagents are stored under proper conditions, and storage times are met.	☑	☐	☐
05.04	4.13.2	Verify that records are kept for all media/ reagents prepared or received and include: • date of receipt; • date opened / first use; • date of preparation, and expiry date (if required); • lot number, as required; • shelf-life / expiry date of product; • storage conditions; • performance specifications; • for purchased / prepared media / reagents: records of manufacturer's QC and other information, including but not limited to positive and negative control(s), sterility and final pH; • for in-house prepared media: QC results and sufficient information to enable the test to be repeated under conditions as close as possible to the original.	☑	☐	☐
05.05	4.13.2	Confirm that the laboratory has QC records for each batch of in-house prepared or purchased media. NOTE: for guidance on defining a *batch*, refer to the Interpretation in P07. The type and nature of QC testing will depend on the method, but generally involves the items listed in 05.06 to 05.10 (below).	☑	☐	☐
05.06	5.9, 4.13.2	Media QC includes a sterility check.	☑	☐	☐
05.07	5.9, 4.13.2	Media QC includes a positive control culture (traceable to ATCC or equivalent) performed using the same technique as used for routine analysis. For example, if media is used for MF, then the positive control must be applied using MF.	☑	☐	☐

Item	ISO/IEC17025 Clause	Requirement	Observations Yes	No	Not applicable
05.08	5.9, 4.13.2	Media QC includes a comparison of positive control cultures on selective and non-selective media and comparison of recovery rates of the positive control culture (see P07 for further information; not applicable for MPN methods);	☐	☐	☑
05.09	5.9, 4.13.2	Media QC includes a negative control culture (traceable to ATCC or equivalent). N.B. For MF methods, the negative culture can be streaked on the media.	☑	☐	☐
05.10	5.9, 4.13.2	For quantitative methods using non-selective media only: compare recovery rates on an old/previous batch of media to a new batch, using the same technique to do test (e.g., MF or spread plate or pour plate).	☐	☐	☑
06		**STOCK CULTURES**			
06.01	4.2.1	Verify that documented procedures are in place for the maintenance of stock cultures.	☑	☐	☐
06.02	4.13.2	Confirm that all information required to properly identify organisms appear on their containers (i.e., name or number of organism, and date subcultured) including working cultures and those stored at lower temperatures (e.g. in refrigerators / freezers, where appropriate).	☑	☐	☐
06.03	4.6.2, 4.13.2	Confirm that purchased organisms have certificates with the organism name, plus ID confirmation by the laboratory using an acceptable identification method (e.g. API, Biolog, Vitek, etc.) or key reactions are demonstrated on selective medium.	☑	☐	☐
06.04	4.6.2, 4.13.2	Confirm that organisms isolated from the environment are properly characterized, and key reactions are demonstrated on selective medium as required.	☐	☐	☑
07		**SUPPLIES/LABWARE QC**			
07.01	4.6.2, 5.5.1, 5.7, 5.9	Verify that a minimum of 1 sample container from each lot of new, certified containers is checked for sterility or for influence on parameters.	☑	☐	☐
07.02	4.6.2, 5.5.1	For MF methods, hydrophobicity of filters is tested (e.g., "charcoal" test or confluent growth or other method) and inhibitory effects of filters is tested by comparison of recoveries on a membrane filter and a spread plate.	☐	☐	☑
07.03	4.6.2, 5.4.1, 5.4.2	There are procedures in place to ensure there is no carryover between membrane filtrations (e.g., UV boxes, hot water).	☐	☐	☑
07.04	5.6	Accuracy of funnel volumetric graduations is checked (see A61).	☐	☐	☑
07.05	4.6.2, 5.5.1	If producing water in house and it is used to dilute samples, or make media or reagents, check conductivity daily or as-used and have procedures in place, including sterility testing, to verify that the water is not having a negative impact on the conduct of the test (see P07).	☑	☐	☐
07.06	4.6.2, 5.5.1	If purchasing distilled water, and it is used to dilute samples or to make media or reagents, have procedures in place, including sterility testing, to verify that the water is not having a negative impact on the conduct of the test. A certificate shall be obtained from the supplier prior to use (see P07).	☐	☐	☑

Item	ISO/IEC17025 Clause	Requirement	Observations Yes	No	Not applicable
07.07	4.6.2, 5.5.1	Verify that all labware is adequate cleaned. When washing and re-using glassware that can impact the recovery of organisms, verify that there is a procedure in place to test for residual detergent. See P07 for more direction.	☑	☐	☐
08		**SUPPLIES – AVAILABILITY**			
08.01	4.6.2, 5.5.1	Verify that all supplies (e.g., test organisms, media, reagents, reference materials, commercial kits, etc.) required for the test procedure are in sufficient quantities to carry out the volume of work.	☑	☐	☐
08.02	4.6.2, 5.5.1	Verify that all supplies (e.g., test organisms, media, reagents, reference materials, commercial kits, etc.) required for the test procedure meet requirements and/or specifications.	☑	☐	☐
08.03	4.6.2, 5.5.1	Verify that all supplies (e.g., test organisms, media, reagents, reference materials, commercial kits, etc.) required for the test procedure are stored under appropriate conditions (as specified in reference method or by regulator, etc.) and in a manner which satisfies requirements for safety, security, separation of incompatible materials / activities, and ease of retrieval.	☑	☐	☐
08.04	4.6.2, 5.5.1	Verify the following are available: • sterile rinse buffer / distilled water; • disinfectants available and routinely used for cleaning bench areas; • records of reference standards (e.g. reference weights, pH standards, etc.) and reference materials certificates (e.g. ATCC strains).	☑	☐	☐
09		**OTHER WORK INSTRUCTIONS (Procedures)**			
09.01	4.2.1, 4.3	Verify that all necessary supporting work instructions are documented and readily available including (where appropriate). Examples of supporting work instructions are listed below, but this list is not exhaustive.	☑	☐	☐
09.02	4.2.1, 4.3	Confirm that requisite reference texts / methods are available.	☑	☐	☐
09.03	4.2.1, 4.3	Confirm that supporting test methods (e.g., pH) are authorized and available.	☑	☐	☐
09.04	4.2.1, 4.3	Confirm that equipment instruction manuals are available.	☑	☐	☐
09.05	4.2.1, 4.3	Confirm that computer software related procedures (including LIMS procedures, such as data entry and approval) are authorized and available.	☑	☐	☐
09.06	4.2.1, 4.3	Confirm that glassware cleaning procedures are authorized and available.	☐	☐	☑
09.07	4.2.1, 4.3	Confirm that there are procedures in place for reporting of adverse results to authorities having jurisdiction.	☑	☐	☐
09.08	4.2.1, 4.3	Confirm that sample disposal procedures are authorized and available, including but not limited to disinfection / sterilization, disposal of biohazardous material, spill procedures and any safety considerations.	☑	☐	☐

Item	ISO/IEC17025 Clause	Requirement	Observations Yes No Not applicable
10		**EQUIPMENT**	
10.01	5.5	Verify that all equipment required for the test procedure and equipment supporting the test is available, uniquely identified, appropriately monitored, functioning properly, and safeguarded from adjustments that would invalidate results. (Note to laboratories and assessors: the list of equipment was removed from this checklist; it is incumbent to review the reference method and/or laboratory test method and confirm that equipment required for the test is available).	☑ ❑ ❑
10.02	5.5	Verify that equipment that requires regular servicing or checks to ensure conformance is included in a maintenance program.	☑ ❑ ❑
10.03	5.5	Verify that there is availability of backup equipment or a back-up plan.	☑ ❑ ❑
10.04	5.5	Verify that equipment requiring calibration (i.e. semi-automated pipettes, balances and thermometers that are critical to the test result) are labeled to indicate the status, including the date last calibrated and expiry criteria or date when due. Note: labeling is not required for equipment verified daily or as-used; see P07.	☑ ❑ ❑
11		**CONDUCT OF TESTING**	
11.01	4.2.1, 5.4.1	Verify that the test procedure and all supporting work instructions are performed as documented.	☑ ❑ ❑
12		**RECORD KEEPING**	
12.01	4.13	Verify that technical records are complete with respect to the specific tests, are recorded at the time they are made and that there is sufficient information to establish an audit trail. For guidance on the type and nature of records that may be needed, please refer to the appropriate section of P07.	☑ ❑ ❑

C3b 2nd Brodsky Report

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April 22, 2015

Kimberley A. Philip, M.Eng., P.Eng.,
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R3H 0W4

Comment on Hubbs and Diduck ALS Site Assessment Report

Further to my own audit of ALS in Winnipeg on February 17, 2015, a subsequent assessment was conducted by Steve Hubbs, Courtney Diduck on February 25, although their report cited ATL as the contract laboratory, not ALS. Is this simply a typo? A copy of their report was provided to me for review and I was asked to comment, specifically on the process identified as non-standard, the risks associated with that process, the mitigating measures in place to address that risk, and whether I see this as a possible cause of the multiple positive samples from Jan 26th.

I understand that Steve Hubbs and Courtney Diduck are not microbiologists. I have been an Environmental Microbiologist for more than 43 years. I served as the Chief of Environmental Microbiology for the Province of Ontario, Ministry of Health, Laboratory Services Branch, from 1982-1999. I serve as Chair for the AOAC Expert Review Committee for Microbiology, as a scientific reviewer in Microbiology for the AOAC OMA and the AOAC Research Institute, as a reviewer for Standard Methods for the Examination of Water and Wastewater and as a chapter editor on QA for the Compendium of Methods in Microbiology. I have been a lead auditor and technical assessor in microbiology for the Canadian Association for Laboratory Accreditation (CALA) since 2000 and serve Vice-chair of the CALA Board of Directors. I believe that I am in a much better position to evaluate laboratory practices in water microbiology.

1) Use of a syphoning apparatus to reduce sample volume.

Although I did not observe this technique being used, the use of a siphoning apparatus to remove excess volume of water from sample bottles is both unusual and unnecessary. As part of my audit I conducted a "Trace of Tests" on the records of the samples in question from receipt through processing to disposal. I reviewed all of the analytical and quality control data and interviewed the analysts identified by their initials or signatures on the records and reports. The analysts who processed the samples indicated that they did not use the syphoning. Based on all this evidence I concluded that the syphoning technique was not used in the processing of the samples in question and therefore was a non-issue with respect to the possibility of cross-contamination of those samples. In addition, if this was a high risk procedure, there would have been historical evidence of cross-contamination in blank sample controls whenever this procedure was used. There was no such evidence. This conclusion was supported by QC data recently provided on the syphoning equipment and technique that showed that it does not contribute to microbial contamination of the samples.

2) Sterilization of work area and gloves between handling each sample due to the outside of sample bottles not being sterile.

From a microbiological perspective, re-sterilization of the work area between samples is both an unnecessary and unrequired precaution. Disinfection of the work area before and after sample processing is what is expected. As I observed, the laboratory implements sufficient aseptic controls to minimize the possibility of cross-contamination and verifies the effectiveness of these precautions through appropriate QC procedures, including environmental monitoring and method blanks.

3) Analyst fingers close to the Quanti-tray opening.

The Quanti-Tray method is a single-use analytical system that is less prone to cross-contamination than other traditional procedures used in water microbiology. I saw no evidence of any mishandling of the trays by the analysts. This conclusion is corroborated by the continual absence of contamination of method blanks that are handled identically as if they were samples.

4) The pipette used to subsample for the HPC test risks contaminating the inside rim of sample bottles.

Aseptic protocols dictate no contact between the pipette and the bottle rim. During my audit, I observed these same precautions being taken. In addition, as evidenced in my Trace of Tests report, there was no QC evidence to indicate that pipetting could have contributed to a cross-contamination issue. Again, this conclusion is corroborated by the continual absence of contamination of method blanks that are handled identically as if they were samples.

It is my professional opinion that there is no evidence to indicate that the ALS results were inaccurate or false. This laboratory is accredited by the Canadian Association for Laboratory Accreditation, indicating that its Quality System meets all the requirements stipulated by ISO/IEC 17025:2005, both from a management perspective and technically. I believe that the samples in question were indeed contaminated with coliforms and *Escherichia coli* before being received by the laboratory. Based on the substantial supporting QC evidence and my own on-site observations during my audit, that there was no possibility of inadvertent contamination during sample processing in the laboratory.

Sincerely

Michael Brodsky

M. H. Brodsky

Appendix D

- City of Winnipeg Technical Memorandums

D1 Backflow and Cross Connections

D1a Review of Backflow Records

City of Winnipeg - Water and Waste Department

NE01 -

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes/Comments
		Parkade - Water Meter Stall 28	Active	ZE099	9/30/2013	9/30/2014	Notice of violation - fail to test annually letter sent February 2, 2015.
		Parkade Stall 22	Active	ZD868	9/30/2013	9/30/2014	
		Parkade above Stall 5	Active	ZI383	7/4/2014	7/4/2015	1/2 Okay - Moderate hazard building
		Parkade above Water Meter Stall 28	Active	ZE097	7/4/2014	7/4/2015	
		Parkade above Stall 28	Active	ZD932	7/4/2014	7/4/2015	
		Water Meter Room - Parkade	Active	ZD988	9/30/2013	9/30/2014	Notice of violation - fail to test annually letter sent February 2, 2015. Lorraine has hired Pyrene
		Water Meter Room - Parkade	Active	ZE123	9/30/2013	9/30/2014	to come in and test ASAP. (Premise) - Moderate hazard building
		Boiler Room	Active	350696	6/6/2011	6/6/2012	Notice of violation - fail to test annually letter sent June 9, 2014. Mike tried the phone number in our water billing program and it was out of service.204-334-0619 Mike also talked with
		Mechanical Room #7	Active	97297	8/18/2009	8/18/2010	Lorraine from Linden realestate and she said they do not have a property management company looking after the building. Moderate hazard building
		Water Meter Room	Active	B03560	11/29/2014	11/29/2015	Okay - Severe hazard building
		Water Meter Room (Lawn Irrigation)	Active	B13874	11/29/2014	11/29/2015	
		Mechanical Room	Active	59	10/11/2013	10/11/2014	Notice of violation - 60 days without inspection sent February 3, 2015. Dave has a work order out for the building. - Severe hazard building
		Water Meter Room	Active	142766	8/25/2014	8/25/2015	Okay - Moderate hazard building
		Water Meter Room	Active	2332250	8/25/2014	8/25/2015	
		Water Meter Room	Active	Y01693	8/25/2014	8/25/2015	
		Meter Room	Active	DD849	9/22/2014	9/22/2015	Okay - Moderate Hazard building
		NE Parkade Storage Room	Active	175021	9/22/2014	9/22/2015	
		Parkade Stall 918	Active	FC978	9/22/2014	9/22/2015	
		Storage Room	Active	DY317	9/22/2014	9/22/2015	
		Front Entrance	Active	6027	12/11/2013	12/11/2014	Notice of violation - fail to test annually letter sent February 2, 2015. Mike spoke with Yozef about having the test sheets emailed to us immediately. Other test sheets sent in but this one. Mozard hazard building
		Mechanical Room	Active	401323	2/7/2015	2/7/2016	Okay - Moderate hazard building
		Mechanical Room B-04	Active	356700	2/7/2015	2/7/2016	
		Mechanical Room B-05	Active	310300	2/7/2015	2/7/2016	
		Mechanical Room B-05	Active	A174249	2/7/2015	2/7/2016	

Mechanical Room B-05	Active	A50373	2/7/2015	2/7/2016	
Water Mechanical Room	Active	162584	5/20/2014	5/20/2015	Okay - Severe hazard building
Water Mechanical Room	Active	162585	5/20/2014	5/20/2015	
Boiler Room	Active	EK684	8/12/2014	8/12/2015	Okay - Moderate hazard building

City of Winnipeg - Water and Waste Department

NE06 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes/Comments
[redacted]	[redacted]	[redacted] Mechanical Room	Active	KF457	9/1/2011	9/1/2012	Notice of violation - fail to test annually letter sent February 5, 2015. Dave to inspect March 2, 2015. Inspector mnet with property manager. Backflow preventer being addressed immediately. Moderate hazard building.
		Electrical Room	Active	A01784	7/5/2013	7/5/2014	
		Electrical Room	Active	A01765	8/5/2013	8/5/2014	
		[redacted] Shipping/Receiving	Active	A02326	7/5/2013	7/5/2014	
		Meter Room	Active	ED645	6/28/2010	6/28/2011	Notice of violation - fail to test annually letter sent February 5, 2015. Moderate hazard building.
		Meter Room	Active	EH735	6/28/2010	6/28/2011	

City of Winnipeg - Water and Waste Department

NE07 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes/Comments
[redacted]	[redacted]	Main Floor Water Meter Room	Active	114464	9/3/2014	9/3/2015	Okay - Moderate hazard building
		4th Floor Garbage Room	Active	362918	9/15/2014	9/15/2015	Okay - Moderate hazard building
		Mechanical/Water Meter Room	Active	KK1831	7/4/2014	7/4/2015	
		[redacted]	Active	447155	7/9/2014	7/9/2015	Okay - Moderate hazard building
			Active	415100	7/9/2014	7/9/2015	
			Active	434320	6/5/2014	6/5/2015	
			Active	434327	6/5/2014	6/5/2015	
		Sprinkler/Meter Room	Active	329881	6/5/2014	6/5/2015	
		Water Meter Room in Receiving	Active	1952A	8/19/2014	8/19/2015	
		Kitchen	Active	441808	9/15/2014	9/15/2015	Okay - Moderate hazard building
		Water Meter Room	Active	LC1501	5/15/2014	5/15/2015	
		Kitchen	Active	B02555	9/15/2014	9/15/2015	Okay - Moderate hazard building
		Water Meter Room	Active	JF0152	5/15/2014	5/15/2015	
		Water Meter Room	Active	A37313	9/16/2014	9/16/2015	
		East Building - [redacted] Water Meter	Active	LW944	4/8/2005	4/8/2006	30 day work order sent out. Severe hazard building. Work order has now been completed as of Feb.27, 2015.
		West Building Water Meter Room	Active	139721	4/8/2005	4/8/2006	
		[redacted]	Active	90783	11/20/2014	11/20/2015	Okay - Moderate hazard building
		Sprinkler/Electrical Room	Active	NK0544	4/21/2014	4/21/2015	
		Water Meter Room	Active	339688	11/20/2014	11/20/2015	

City of Winnipeg - Water and Waste Department

SE02 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes/Comments
[redacted]	[redacted]	Boiler Room	Active	A30701	7/15/2014	7/15/2015	Okay - Moderate hazard building
		Boiler Room	Active	44209	7/7/2014	7/7/2015	Okay - Moderate hazard building
		Boiler Feed Line	Active	A76716	2/25/2013	2/25/2014	Fail to test annually letter sent out February 22, 2015
		Boiler Room	Active	123032	2/25/2013	2/25/2014	
		Boiler Room	Active	123027	2/25/2013	2/25/2014	
		Boiler Room	Active	A99048	11/19/2013	11/19/2014	Fail to test annually letter sent out March 11, 2015
		Crawl Space South Centre	Active	B4396	7/22/2014	7/22/2015	Okay - Moderate hazard building

City of Winnipeg - Water and Waste Department

SE03 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes/Comments
[redacted]	[redacted]	Boiler Room	Active	392157	1/28/2015	1/28/2016	Okay - Severe hazard building
		[redacted]	Active	126246	1/23/2015	1/23/2016	
			Active	408558	2/10/2015	2/10/2016	
			Active	245581	1/23/2015	1/23/2016	
			Active	388375	1/23/2015	1/23/2016	
			Active	221208	1/23/2015	1/23/2016	
			Active	247161	1/23/2015	1/23/2016	
			Active	221226	1/28/2015	1/28/2016	
			Active	243708	1/23/2015	1/23/2016	
			Active	40965	1/23/2015	1/23/2016	
			Active	115501	1/23/2015	1/23/2016	
			Active	123311	1/23/2015	1/23/2016	
			Active	243701	1/23/2015	1/23/2016	
	[redacted]	South/Center of Building	Active	U11870	9/25/2014	9/25/2015	Okay - Moderate hazard building
		Unit D-Sprinkler Room South End	Active	JF0151	9/25/2014	9/25/2015	
		[redacted]	Active	617213	12/22/2014	12/22/2015	Okay - Severe hazard building (well water on site)
			Active	640985	12/22/2014	12/22/2015	
		Water Meter Room	Active	202725	12/22/2014	12/22/2015	
		Sprinkler Shed	Active	205175	5/24/2013	5/24/2014	Annual testing notice sent April 4, 2014. Will be tested in the spring. Unaccessible in the winter. Moderate hazard building.

City of Winnipeg - Water and Waste Department

SE04 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest	TestDue	Notes\Comments
[redacted]	[redacted]	Boiler Room	Active	499328	10/8/2014	10/8/2015	Okay - Moderate hazard building
		Boiler Room	Active	501521	10/8/2014	10/8/2015	

City of Winnipeg - Water and Waste Department

SE07 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes/Comments
[redacted]	[redacted]	Crawl Space ([redacted]	Active	80993	39990	40355	Annual testing notice sent March 19, 2014. Spring testing. Unaccessible in winter. Moderate hazard device
		Garbage Room	Active	177354	4/15/2014	4/15/2015	1/2 Okay - Moderate hazard building
		Electrical room - lawn irrigation	Active	1353	5/31/2012	5/31/2013	Notice of violation - fail to test annually letter sent June 2, 2014. Spring testing. Unaccessible in winter. Moderate hazard device
		[redacted]	Active	361622	6/2/2014	6/2/2015	Okay - Moderate hazard building
			Active	361623	6/2/2014	6/2/2015	
		Water Meter Room	Active	176490	3/14/2014	3/14/2015	
		Lawn Sprinkler Pit	Active	B669	6/4/2014	6/4/2015	Okay - (Frozen) Unaccessible in winter. Moderate hazard device
		Mezzanine Mechanical Room	Active	AK4580	3/12/2014	3/12/2015	Okay - Moderate hazard building
		Boiler Room	Active	R066	10/6/2014	10/6/2015	Okay - Moderate hazard building

City of Winnipeg - Water and Waste Department

SE08 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest	TestDue	Notes\Comments
[redacted]	[redacted]	Boiler Room	Active	100704	12/22/2014	12/22/2015	Okay - Moderate hazard building
		Boiler Room	Active	134397	12/22/2014	12/22/2015	
		Boiler Room	Active	158513	12/22/2014	12/22/2015	
		Crawl Space [redacted]	Active	809291	12/22/2014	12/22/2015	
		Crawlspace	Active	232947	12/22/2014	12/22/2015	
		[redacted]	Active	WI680	12/22/2014	12/22/2015	
		Tunnel	Active	FP531	12/22/2014	12/22/2015	
		Main Floor Water Meter Room	Active	147763	7/11/2013	7/11/2014	Annual testing notice sent June 13, 2014. Fail to test annually letter sent March 3, 2015. Moderate hazard building
		Main Floor Water Meter Room	Active	145988	7/16/2013	7/16/2014	
		[redacted]	Active	ZR761	7/11/2013	7/11/2014	

City of Winnipeg - Water and Waste Department

SW04 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes\Comments
[redacted]	[redacted]	[redacted]	Active	101102	1/8/2015	1/8/2016	Okay - Moderate hazard application
		Boiler Room	Active	190529	6/6/2007	6/6/2008	Fail to test annually letter sent March 11, 2015
		Boiler Room	Active	463955	12/22/2014	12/22/2015	Okay - Moderate hazard building
		Lower level - Mechanical room Sprinkler	Active	IL0118	12/22/2014	12/22/2015	
		Basement Building E Boiler Room	Active	287981	1/3/2015	1/3/2016	Okay - Moderate hazard building
		Bsmt Bldg G Boiler Room	Active	290762	1/3/2015	1/3/2016	
		Pump Room	Active	164630	6/13/2014	6/13/2015	Okay - Severe hazard building
		Mechanical Boiler - Condensate Tank	Active	A72422	10/1/2014	10/1/2015	Okay - Moderate hazard building

City of Winnipeg - Water and Waste Department

SW07 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes\Comments
[redacted]	[redacted]	Boiler Room	Active	449300	5/30/2013	5/30/2014	Notice of violation - fail to test annually letter sent February 2, 2015. Severe hazard building
		Mechanical Room	Active	FT471	4/18/2011	4/18/2012	
		[redacted] Mechanical Room	Active	247076	10/28/2014	10/28/2015	Okay - Severe hazard building
		[redacted] Mechanical Room	Active	51749	10/28/2014	10/28/2015	
		Boiler Room	Active	CY033	2/6/2015	2/6/2016	Okay - Moderate hazard building
		Basement Boiler Room	Active	230708	8/26/2014	8/26/2015	Okay - Moderate hazard building
		Portable	Active	441943	4/11/2014	4/11/2015	Okay - Severe hazard application
		Car Wash Water Meter	Active	KB640	3/17/2014	3/17/2015	Okay - Severe hazard building
		Car Wash Water Meter	Active	KR265	3/17/2014	3/17/2015	
		Mechanical Room	Active	51237	4/29/2014	4/29/2015	Okay - Moderate hazard building
		Mechanical Room	Active	16130	12/1/2014	12/1/2015	
		North Side Mop Sink Room	Active	360093	4/29/2014	4/29/2015	
		North Side Mop Sink Room	Active	75433	4/29/2014	4/29/2015	
		Mechanical Room Front of Store	Active	457341	10/7/2014	10/7/2015	Okay - Moderate hazard building
		Water Meter Room	Active	NH0105	12/16/2014	12/16/2015	
		[redacted]	Active	209432	10/7/2014	10/7/2015	Okay - Moderate hazard building
		Water Meter Room	Active	NH0643	12/16/2014	12/16/2015	Okay - Severe hazard building
		Mechanical Room	Active	22172	10/7/2014	10/7/2015	Okay - Moderate hazard building
		Water Meter Room	Active	NG1594	12/17/2014	12/17/2015	
		SW Sprinkler Room	Active	U17652	4/1/2014	4/1/2015	Okay - Moderate hazard building
		[redacted] Mechanical Room	Active	356582	10/9/2013	10/9/2014	Notice of violation - fail to test annually letter sent February 2, 2015. (Premise) - Severe hazard building
		[redacted] Mechanical Room	Active	468666	10/9/2013	10/9/2014	

City of Winnipeg - Water and Waste Department

SW12 - [redacted]

Company	Address	Location	Device Status	Serial #	LastTest #	TestDue #	Notes\Comments
[redacted]	[redacted]	Boiler Room	Active	395184	7/14/2014	7/14/2015	Okay - Moderate hazard building
		Boiler Room	Active	NA355	5/15/2014	5/15/2015	Okay - Moderate hazard building
		Boiler room	Active	378547	3/10/2014	3/10/2015	Okay - Moderate hazard building
		[redacted]	Active	A203136	11/1/2012	11/1/2013	Notice of violation - fail to test annually letter sent October 30, 2014. Moderate hazard building
		Water Meter Room	Active	22650	11/21/2013	11/21/2014	Annual testing notice sent October 21, 2014. (Premise) Moderate hazard building
		Boiler Room	Active	463714	6/19/2014	6/19/2015	Okay - Moderate hazard building
		Water Meter Room	Active	25642	6/18/2014	6/18/2015	
		Water Meter Room	Active	25669	6/18/2014	6/18/2015	
		Boiler Rm/west wall (glycol)	Active	174811	11/17/2011	11/17/2012	Okay - Maintenance supervisor contacted and requested test sheet February 26, 2015. Moderate hazard building
		Boiler Room/west wall	Active	174763	11/17/2011	11/17/2012	
		Water Meter (Mechanical)	Active	HM216	11/18/2008	11/18/2009	Okay - Moderate hazard building
		Boiler Room	Active	381859	5/16/2013	5/16/2014	Notice of violation - fail to test annually letter sent February 25, 2015. (Premise) - Moderate hazard building
		SE Corner of Building	Active	J06100	1/22/2013	1/22/2014	
		Water meter	Active	14802	1/22/2013	1/22/2014	
		Boiler Room	Active	396260	9/17/2013	9/17/2014	Notice of violation - fail to test annually letter sent February 25, 2015. Moderate hazard building

D1b Severe Hazard Inspections

City of Winnipeg - Water and Waste Department
Severe Hazard Locations Close to Feedermain

Company	Address	Device Status	Serial #	LastTest #	TestDue #	Notes\Comments
[redacted]	[redacted]	Active	09520	1/12/2015	1/12/2016	An inspection was completed for premise isolation March 3, 2015; All devices were in place and in compliance.
		Active	254172	5/4/2014	5/4/2015	An inspection was completed for premise isolation March 3, 2015; Backflow preventers have been tested and are in compliance; Room #74 had 2 connections upstream of the premises devices used by the City of Winnipeg to flow test the water meter; Room #74 Backflow prevention devices have a by-pass installed; By-pass valves are in the closed position; A Work order is being sent to remove the by-pass as it not allowed.
		Active	254295	6/12/2014	6/12/2015	An Inspection was completed for premise isolation March 5, 2015; 3 services were observed on the premises; 1- 6 inch fire/domestic service with a single check valve on the fire supply and a reduced pressure backflow preventer on the domestic supply. Domestic reduced pressure backflow preventer had been tested and is in comliance; 1- 2 inch service has been abandoned; 1- 1 inch service requires a premises isolation backflow preventer; A Work order was sent on March 9, 2015; All other backflow prevention devices on site are in compliance
		Active	120411	3/5/2015	3/5/2016	An Inspection was completed for premises isolation March 3, 2015; This building has 3 locations with incoming services; 1st location on the west side of building has 2 premises devices in compliance tested Feb.26,2015; 2nd location on the east side [redacted] has 2 premises devices on the domestic water in compliance tested Feb.10, 2015. There were 4 premises devices on the fire protection system all in compliance tested Feb. 19 and 20, 2015; 3rd location Central Boiler Room has 2 premises devices and 1 fire protection device due for testings near the end of January of 2015; Tester who works for the [redacted] full time is scheduled to test 3 premises devices the week of March 3, 2015; The 2 domestic water premise backflow preventers have been submitted and are in compliance. The fire system device requires repair. Parts are scheduled to be available the week of March 16,2015

D2 Underground Valve Chambers

D2a Valve Pit Inspection Reports from the 2013 "Feedermain Valve Chamber Condition Assessment" Report.

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

3.5 Rating System for Inspection Results

A condition rating system was created prior to the inspection survey. The rating system was used to rank the condition of elements and provide input into decision processes for future work. Each chamber was divided into seven major groups (Figure 16) with a number of more discrete elements contained within each group to more fully describe condition.

The individual elements are given a condition rating value from 1 to 5 with 1 being good condition and 5 being in extremely poor or failed condition. Ratings of 2 to through 4 are a gradation between these two extreme ends of the scale. For elements that are more functional rather than discrete (Cleanliness compared to a Roof Slab, for example), the rating system is boolean in nature with a Yes / No basis. Since numeric values are required to relate between element ratings only the values of 1 and 5 are used in the rating with 1 representing a positive and 5 representing a negative sense. The pairing of 1. to Yes / 5. to No or 1. to No / 5. to Yes will depend on the context of the element in question. For example, Infiltration uses 1. No / 5. Yes since it is a positive sense to not have infiltration and a value of 1 should be assigned to be compatible with the sense of the other ratings and resultant calculations for the group. Conversely, Cleanliness uses 1. Yes / 5. No since a clean chamber is a positive as opposed to a negative implication.

In turn, the condition rating for the group is calculated based on the aggregated condition ratings from all elements within the group (Figure 16). The six groups are as follows.

1. Structural
2. Electrical
3. In-Chamber Piping
4. Overall Valve Rating
5. Overall Air Valve Rating
6. Overall Fitting Rating

A separate group entitled Chamber Operational Rating reflects the use of valve chambers as access points for both pipeline assessment tools and advanced rehabilitation technology. It was considered cost effective to review these types of related issues and retrofit requirements as part of the chamber inspection process. With this in mind, the rating system has included an assessment for accessibility issues, as they relate to the future deployment of current pipeline assessment, monitoring, and rehabilitation technologies.

Table 2 to Table 8 present the details of the rating system including the descriptions for each rating value as it relates to the specific element and some example pictures. For the groups related to valves and fittings (Groups 4, 5, and 6) a rating has been created for the overall condition of the group containing all the respective elements (as is the case for Groups 1, 2, 3, and 7) plus an additional rating for the individual valve. These additional valve-specific ratings are shown in green in Figure 16.

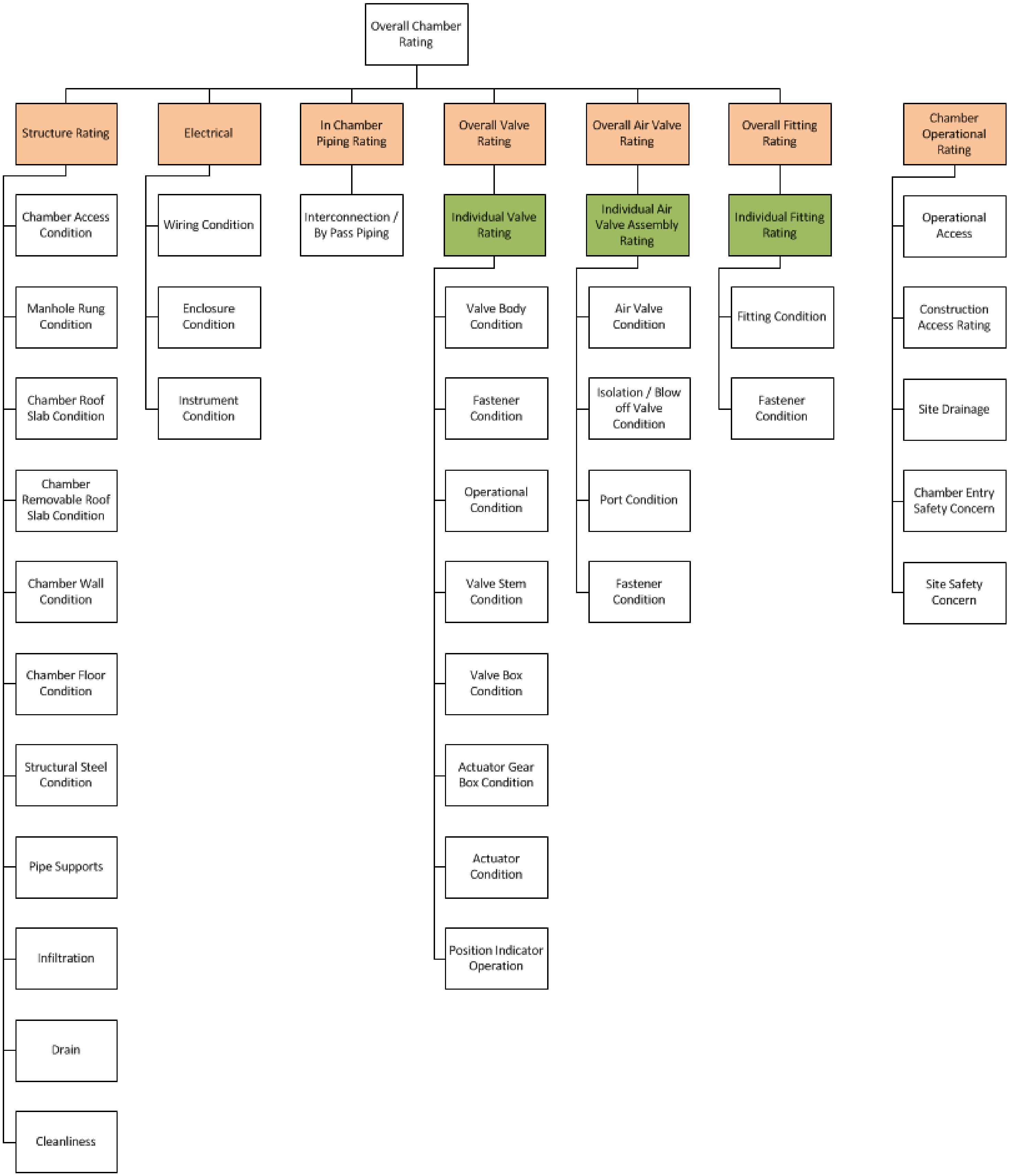


Figure 16: Elements of Inspection Survey

3.5.1 Structure Rating

The structural rating (Table 2) pertains to the condition of the chamber which is the buried structure that houses the pipeworks. This is the most external boundary where soil meets the structure. The elements are either the actual parts of the chamber such as walls and floor or those items that are attached to the chamber (manhole rungs) or facilitate the use of the chamber (drain). Most of the elements have a rating from 1 to 5 with the exception of the elements Infiltration, Drain, and Cleanliness where a boolean scale is used (i.e. a 1 or a 5).

Table 2: Chamber Structure Rating System

Chamber Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Access Manhole	Extends from chamber roof to ground surface and includes risers, lid, cover and frame. Indicate whether or not manhole reducers exist and their condition.	1. L ke New 2. Evidence of Water Infiltration 3. Spalling Concrete 4. Missing Concrete / Bricks or Voiding 5. Severe Structural Distress
Manhole Rung	Grouped by type, material, and condition.	1. L ke New 2. Normal Wear 3. Moderate Corrosion / Wear 4. Heavy Corrosion / Wear 5. Missing / Unusable
Roof Slab	Based on the most prevalent material used.	1. No Structural Issues 2. Cracks Greater than 3mm and/or Rust Stains 3. Concrete Delamination and/or Spalls 4. Efflorescence and/or Water Infiltration 5. Evidence of Structural Distress
Removable Roof Slab	Based on the most prevalent material used.	1. No Structural Issues 2. Cracks Greater than 3mm and/or Rust Stains 3. Concrete Delamination and/or Spalls 4. Efflorescence and/or Water Infiltration 5. Evidence of Structural Distress
Wall	Based on the most prevalent material used.	1. No Structural Issues 2. Cracks Greater than 3mm and/or Rust Stains 3. Concrete Delamination and/or Spalls 4. Efflorescence and/or Water Infiltration 5. Evidence of Structural Distress
Floor	Based on the most prevalent material used.	1. No Structural Issues 2. Cracks Greater than 3mm and/or Rust Stains 3. Concrete Delamination and/or Spalls 4. Efflorescence and/or Water Infiltration 5. Evidence of Structural Distress
Structural Steel	I-beams and other structural steel sections that form part of the chamber structure. Pitting is measured where possible.	1. L ke New 2. Slight Coating Disbondment 3. Significant Coating Disbondment, Corrosion 4. Significant Corrosion 5. Structural Distress

Chamber Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Pipe Supports	Based on material type including: • CIPC – cast-in-place concrete • PCC – precast concrete • Brick • Steel • Other	1. L ke New 2. Slight Deterioration 3. Moderate Deterioration 4. Severe Deterioration 5. Imminent Failure
Infiltration	Infiltration is present. Add comment related to location and cause specific to chamber access, roof, walls, and floor.	1. No 5. Yes
Drain	Drain is present. Add comment that drain works or not.	1. Yes 5. No
Cleanliness	Cleaning is required.	1. No 5. Yes

Figure 17: Example of Removable Roof Slab with Condition Rating of 4. Efflorescence and/or Water Infiltration

Figure 18: Example of Conditions for the Roof (4. Efflorescence and/or Water Infiltration) and Rungs (2. Normal Wear)

3.5.2 Electrical Rating

The elements and ratings for electrical are presented in Table 3. General information was gathered from labels on the electrical equipment to record the phase, voltage, and amperage of the equipment. Circuit and wiring details were also inspected. Recommendations for replacement are based on these rated conditions.

Table 3: Electrical Rating System

Electrical Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Wiring	Based on type including: • Teck • EMT - electrical metallic tubing • Steel • Aluminium	1. Good 2. Minor Corrosion 3. Corrosion and Damage 4. Severe Corrosion and Damage 5. Severe Damaged
Enclosure	Include tag numbers, descriptions, and NEMA rating (National Electrical Manufacturers Association).	1. Good 2. Minor Corrosion 3. Corrosion and Damage 4. Severe Corrosion and Damage 5. Severe Damaged
Instrument	Include tag numbers and descriptions.	1. Good 2. Minor Corrosion 3. Corrosion and Damage 4. Severe Corrosion and Damage 5. Severe Damaged

Figure 19: Example of Pressure Transmitter (QIB-599-PT) with Condition Rating 1. Good.

3.5.3 In-Chamber Pipe Rating

Pipes in the chamber consist of the feedermains and other branch pipes. Condition ratings are related to the material types as shown in (Table 4).

Table 4: In-Chamber Pipe Rating System

In-Chamber Pipe Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Interconnection And By-Pass Pipes	Based on material type as follows with comments. • Welded steel • Cast iron • Ductile iron • PVC – polyvinyl chloride • Fabricated PVC • Other	1. Like New 2. Slight missing coating and corrosion of metal 3. Moderate missing coating and corrosion of metal 4. Severe missing coating and corrosion of metal 5. Imminent failure

3.5.4 Overall Valve Rating

The overall valve rating is calculated as an average of the individual valve ratings for each element. The element ratings are presented in (Table 5). An important aspect of the overall valve rating is the operability of each valve. Based on the WSD's preference this was not determined based on actual operation of the valve in all cases. Only 219 of the 544 main line valves were operated in this program. All other valves operational status was determined based on the operator's understanding of the valve's operational state.

Table 5: Overall Valve Rating System

Valve Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Valve Body	Based on material type: • Cast iron • Brass • Ductile Iron • PVC • Steel • Other And coating type: • None • Paint • Enamel • Primer • Coal Tar • Epoxy • Asphalt • Other Fasteners located on the valve body holding components of the valve are included within the condition assessment.	1. Like New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure
Fastener	Relates to fasteners connecting the valve to the pipe and not fasteners on the valve itself.	1. Like New 2. Slight Corrosion 3. Moderate Corrosion 4. Severe Corrosion 5. Imminent Failure
Operational[3]	Indicate handwheel presence, rotation direction, and number of turns to open valve.	1. Operates 5. Does not Operate
Valve Stem	Include joint and nut details, and also dimensions.	1. Like New 2. Slight Coating Disbondment 3. Significant Coating Disbondment, Corrosion 4. Significant Corrosion 5. Structural Distress
Valve Box	Include grade and alignment.	1. Good 3. Damaged 5. Destroyed / Missing
Actuator Gear Box	Include identification, ratio, and coating.	1. Like New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure
Actuator	Actuator specification, electrical requirements and coating type are determined and condition assessed.	1. Like New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure
Valve Opening Position Indicator	Indicator is present and working.	1. Yes 5. No

[3] *NOTE: Operational state of valve was based on valve operator's opinion/knowledge if not determined based on actual operation of valve. Basis for assessment is noted in database comments.*

Figure 20: Example of Gearbox Condition with Rating of 2. Slight Missing Coating and Corrosion of Metal

3.5.5 Overall Air Valve Rating

The overall valve rating is calculated as an average of the individual valve ratings for each element. The element ratings are presented in (Table 6).

Table 6: Overall Air Valve Rating System

Air Valve Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Air Valve Body	Based on material type: • Cast iron • Brass • Ductile Iron • PVC • Steel • Other And coating type: • None • Paint • Enamel • Primer • Coal Tar • Epoxy • Asphalt • Other Fasteners located on the valve body holding components of the valve are included within the condition assessment.	1. Like New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure

Air Valve Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Isolation / Blow Off Valve	Identify manual valves present and assess based on material type: • Cast iron • Ductile Iron • Steel • Brass • PVC • Other And coating type: • None • Enamel • Coal Tar • Asphalt • Paint • Primer • Epoxy • Other Fasteners located on the valve body holding components of the valve are included within the condition assessment.	1. Like New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure
Port	Identify type. Assess all elements between the valve and the pipeline.	1. Like New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure
Fastener	Relates to fasteners connecting the air valve to the pipe and not fasteners on the air valve itself.	1. Like New 2. Slight Corrosion 3. Moderate Corrosion 4. Severe Corrosion 5. Imminent Failure

Figure 21: Example of Air Release Valve Body (2. Slight Missing Coating and Corrosion of Metal), Fastener (2. Slight Corrosion), and Port (3. Moderate Missing Coating and Corrosion of Metal)

3.5.6 Overall Fitting Rating

The overall fitting rating is calculated as an average of the individual fitting ratings for each element. The element ratings are presented in Table 7. Fitting types include, but are not limited to:

- Tee
- Double Tee
- Cross
- Reducer
- Increaser
- Spool Piece
- Blind Flange
- Reducing Tee
- Reducing Double Tee

Table 7: Overall Fitting Rating System

Overall Fitting Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Fitting	Identify pitting of steel fittings and pit depths.	1. L ke New 2. Slight Missing Coating and Corrosion of Metal 3. Moderate Missing Coating and Corrosion of Metal 4. Severe Missing Coating and Corrosion of Metal 5. Imminent Failure
Fastener	Relates to fasteners connecting the fitting to the pipe and not fasteners on the valve itself.	1. L ke New 2. Slight Corrosion 3. Moderate Corrosion 4. Severe Corrosion 5. Imminent Failure

Figure 22: Fasteners, Condition Grade 2. Interconnecting Pipework Body Condition Grade 3

3.5.7 Chamber Operational Rating

The chamber operational rating (Table 8) builds upon site observations that can be used by the City to assist in planning for future operations, site construction, and inspection (robotic). Where a maximum rating value (5) exists entitled “Other”, this rating describes a current environment that poses a greater risk or condition that will involve significant operational issues. Further comment is also provided. Elements with this rating are not included in the cost model.

Table 8: Chamber Operational Rating System

Chamber Operational Element	Additional Element Description	Rating Value and Description (From 1 to 5)
Operational and Inspection Access	Imposed by site condition or location. Examples: • manhole located on busy street or at intersection • overgrown with trees and shrubs • buried beneath pavement	1. Full 2. Partially Blocked 3. Limited 4. Completely Blocked 5. Other
Construction Access	Imposed by site condition or location. Examples: • manhole located on busy street or at intersection • overgrown with trees and shrubs • buried beneath pavement	1. Full 2. Partially Blocked 3. Limited 4. Completely Blocked 5. Other
Site Drainage	Chamber access location relative to surrounding ground. Identify chamber flood risk.	1. Slopes away from Chamber 2. Flat 3. Slopes toward Chamber 4. Other
Chamber Entry Safety Concern	Indicate chamber type with check box. Provide dimensions. Descr be safety concerns.	1. Unchecked 5. Checked (with description)
Site Safety Concern	Extraordinary safety concerns. Examples: • chamber access in road intersection • manhole located 1.5m above ground level	1. Unchecked 5. Checked (with description)

W-AV70000003

City of Winnipeg Asset Name	
Feedermain Name	Plessis Road
Address of Nearest Building	[redacted]
Feedermain ID	FM013
Easting Northing	[redacted]
Type of chamber Access	
Depth of Chamber	
Primary FM Pipe Diameter	600
Smaller Diameter	
Branch Pipes	

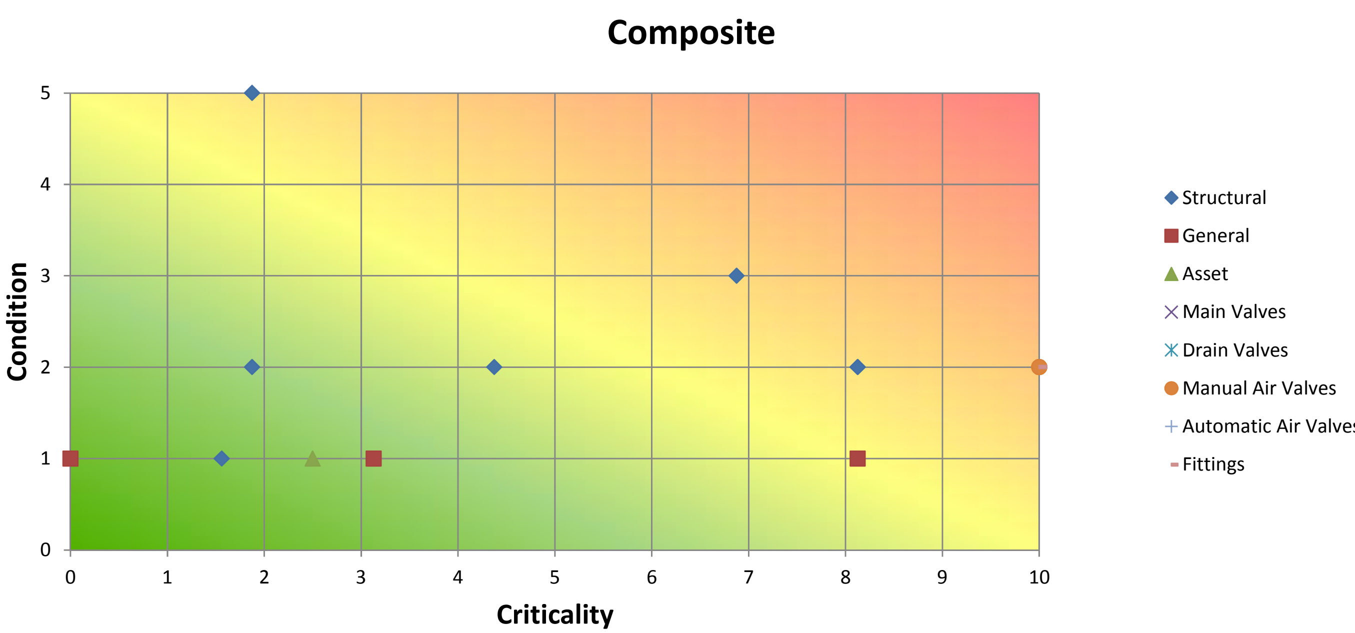
Observations:

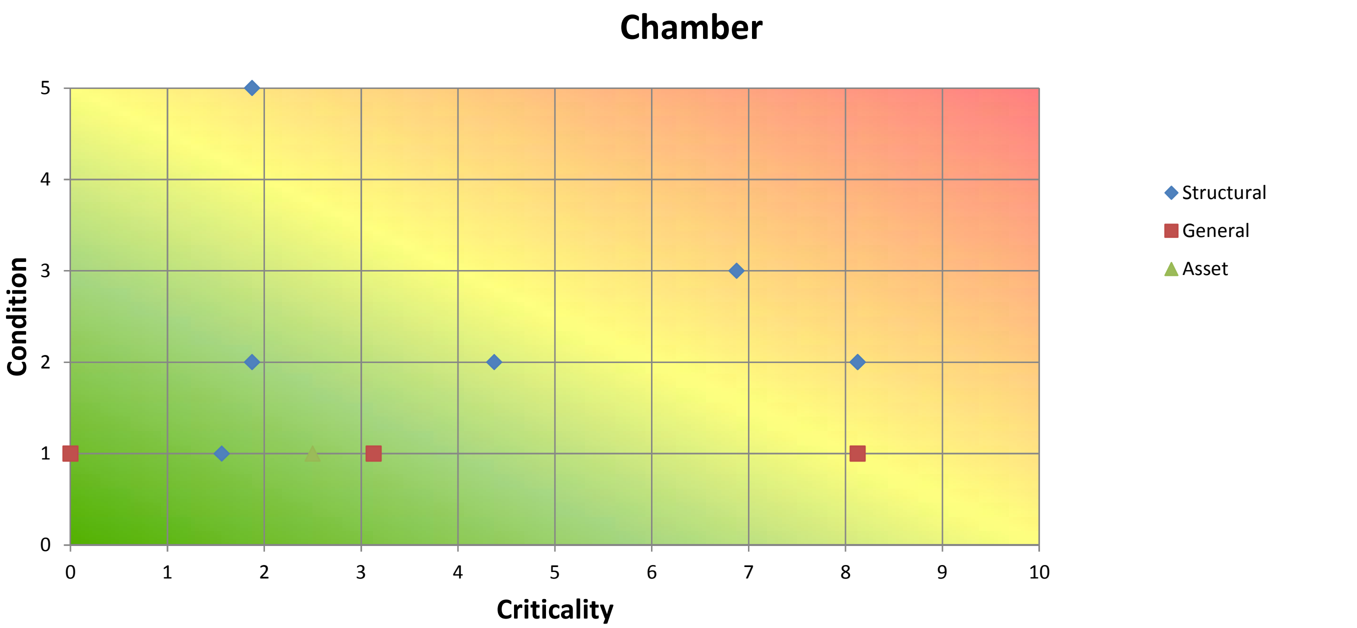
[redacted]

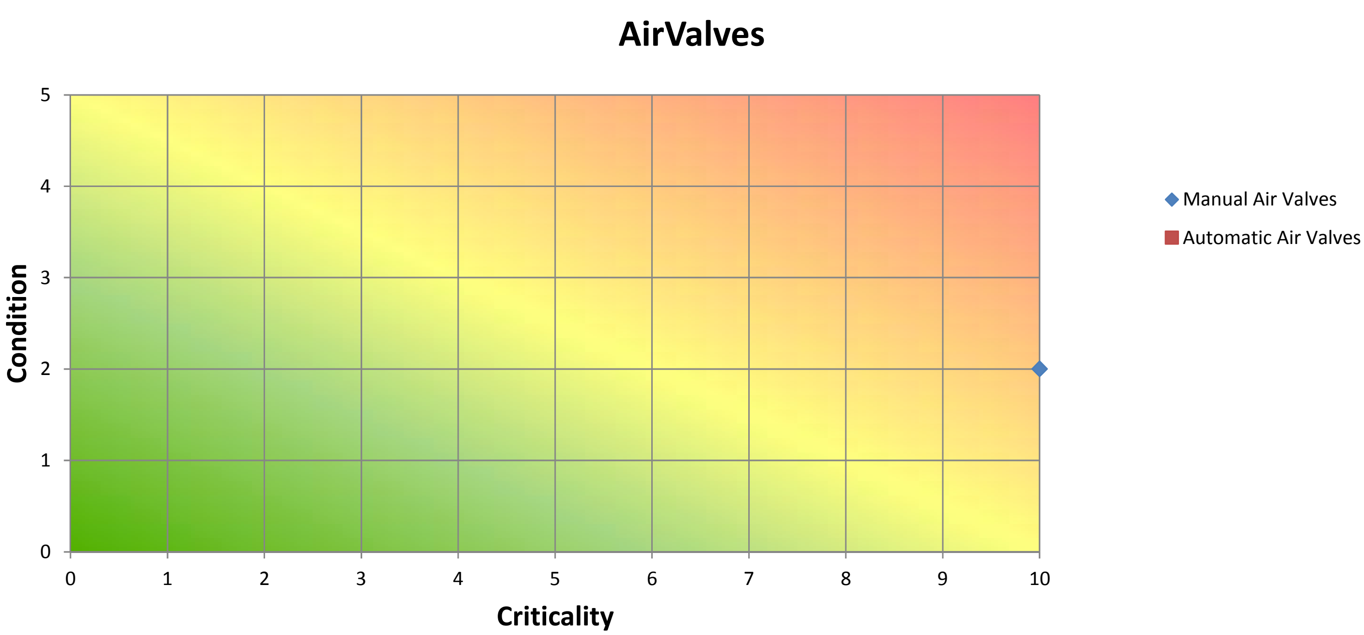
Actions:

mitigate infiltration, repair access, repair concrete structure

General Comments:




Chamber
Condition
Criticality
0
1
2
3
4
5
6
7
8
9
10
Structural
General
Asset


AirValves
Condition
Criticality
0
1
2
3
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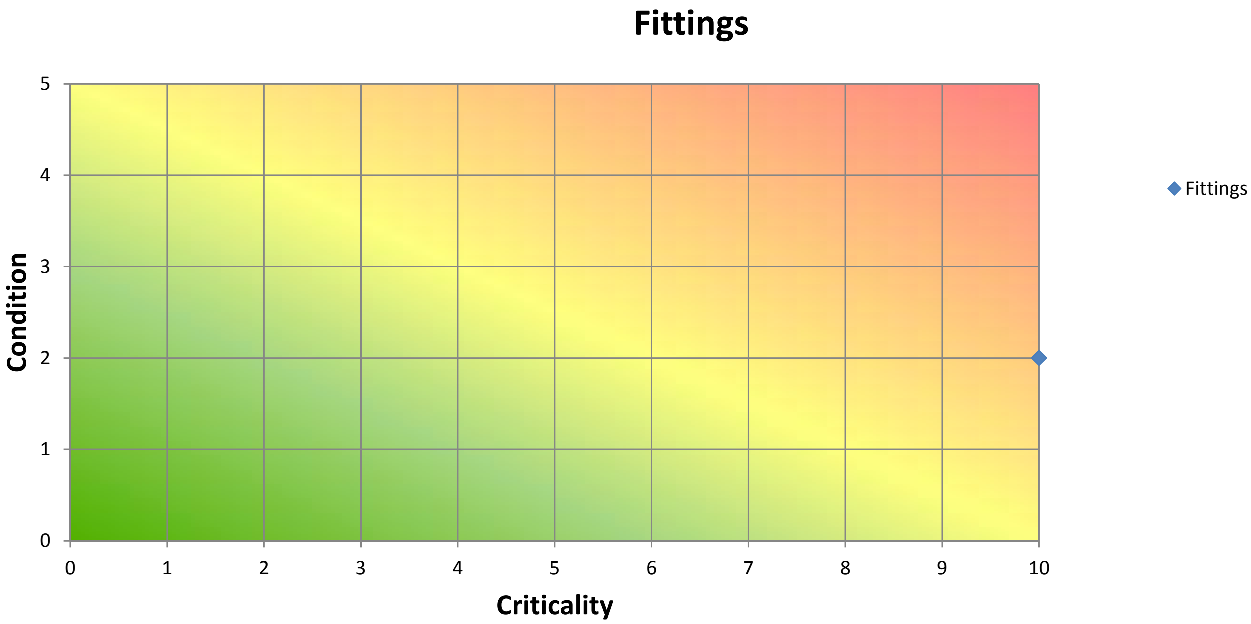
6
7
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
Criticality
0
1
2
3
4
5
0
1
2
3
4
5
6
7
8
9
10
Fittings

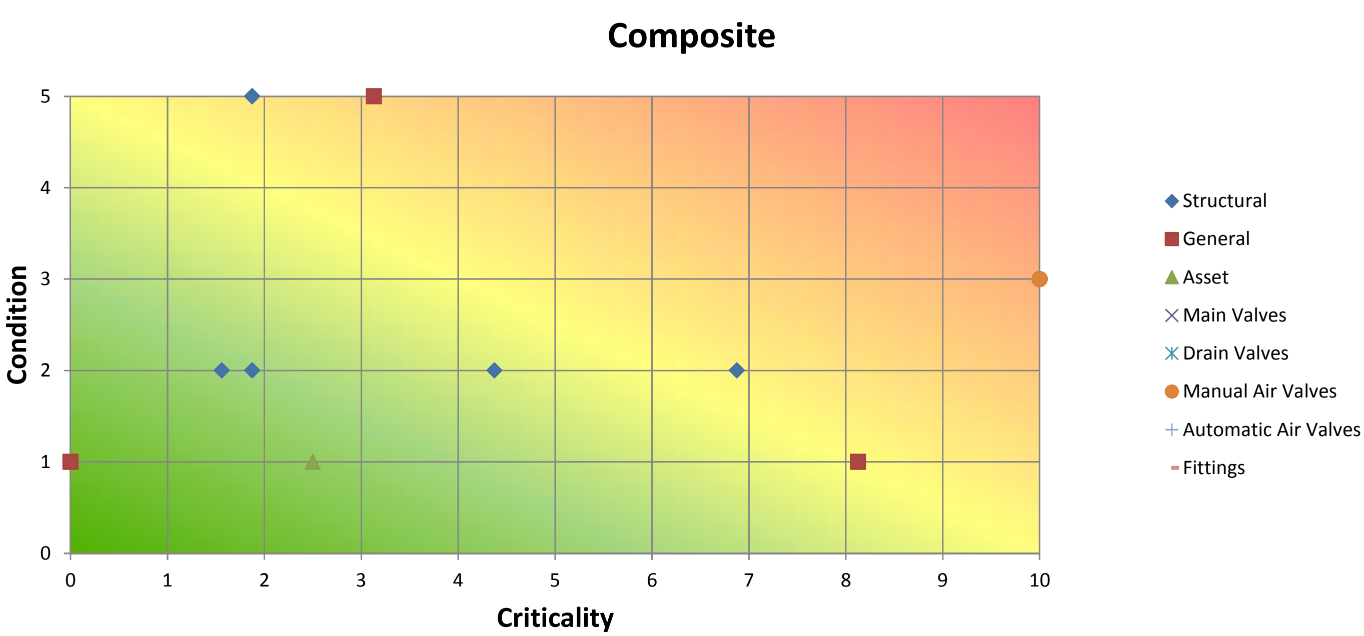
W-AV70000043

City of Winnipeg Asset Name	
Feedermain Name	Dakota Extension
Address of Nearest Building	
Feedermain ID	FM021
Easting Northing	
Type of chamber Access	
Depth of Chamber	
Primary FM Pipe Diameter	
Smaller Diameter	
Branch Pipes	

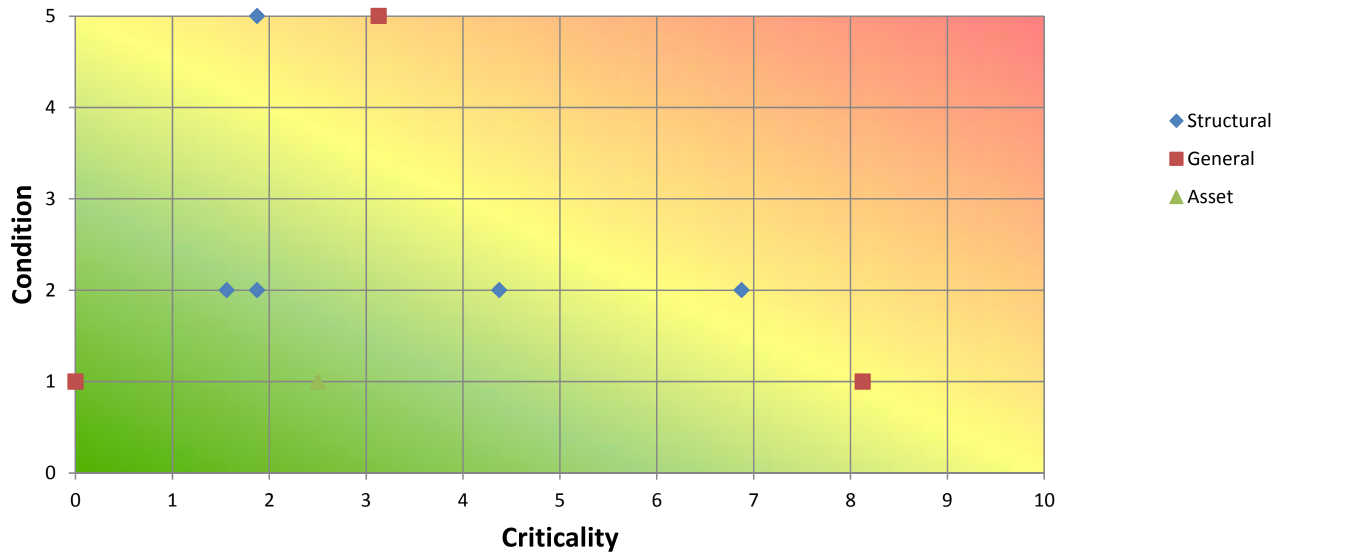
Observations:

Actions:
replace or refinish valve components, mitigate infiltration

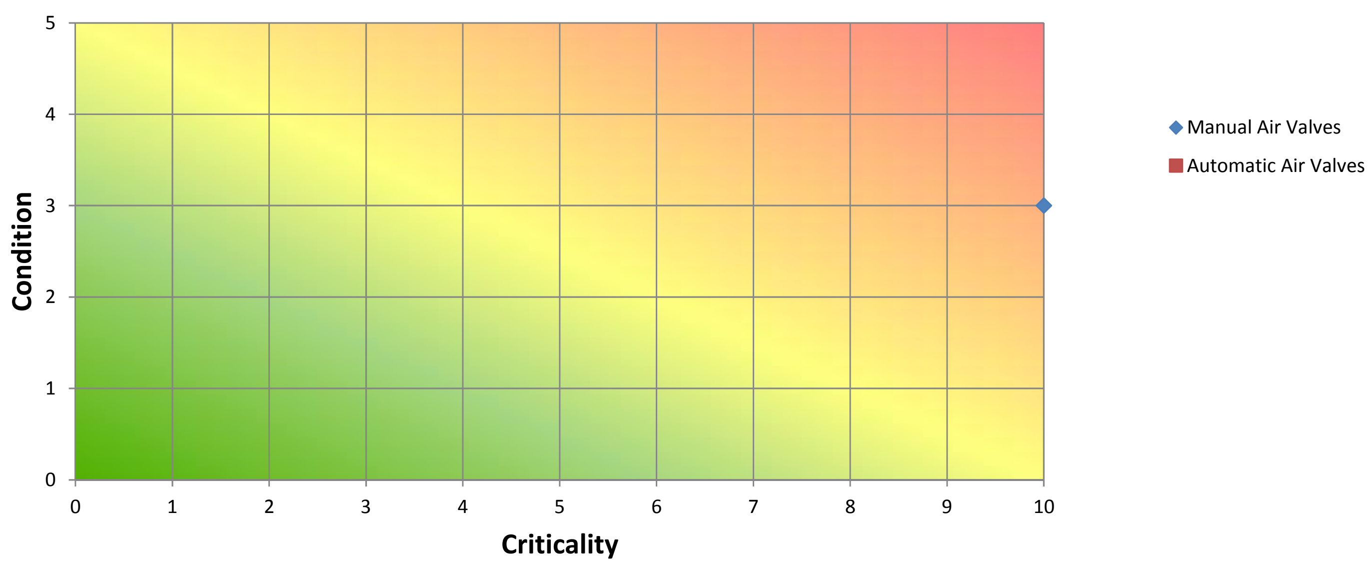
General Comments:



Chamber



AirValves



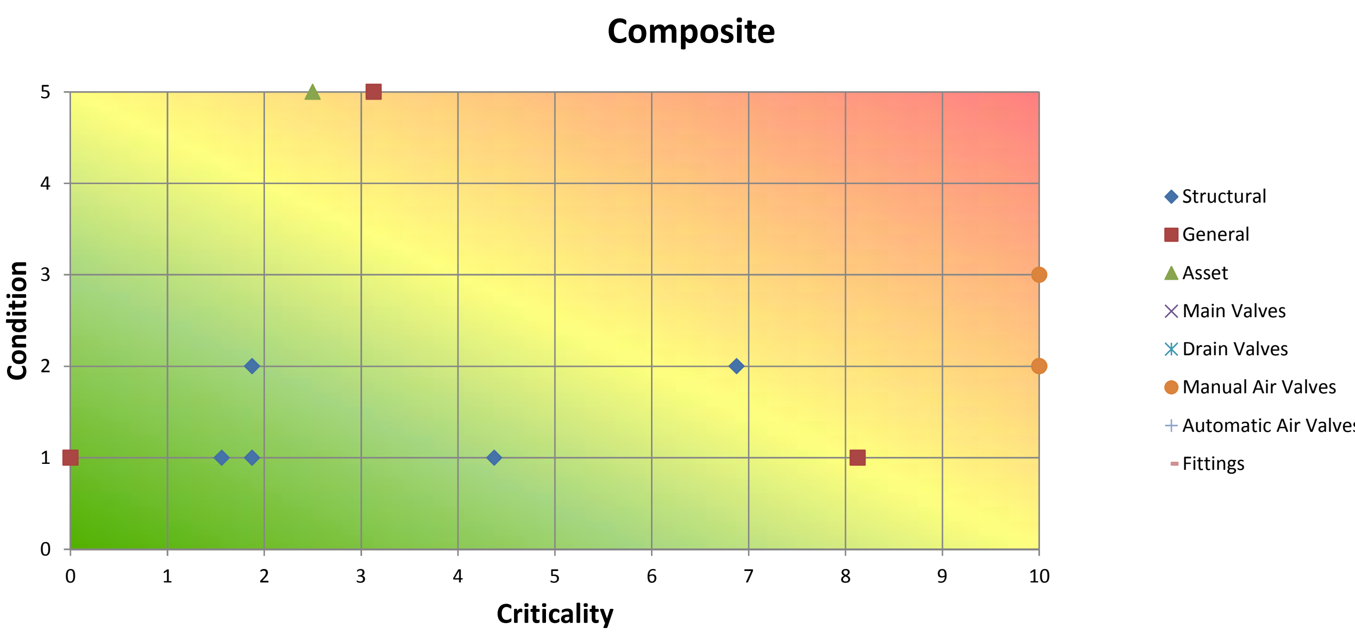
W-AV70000044

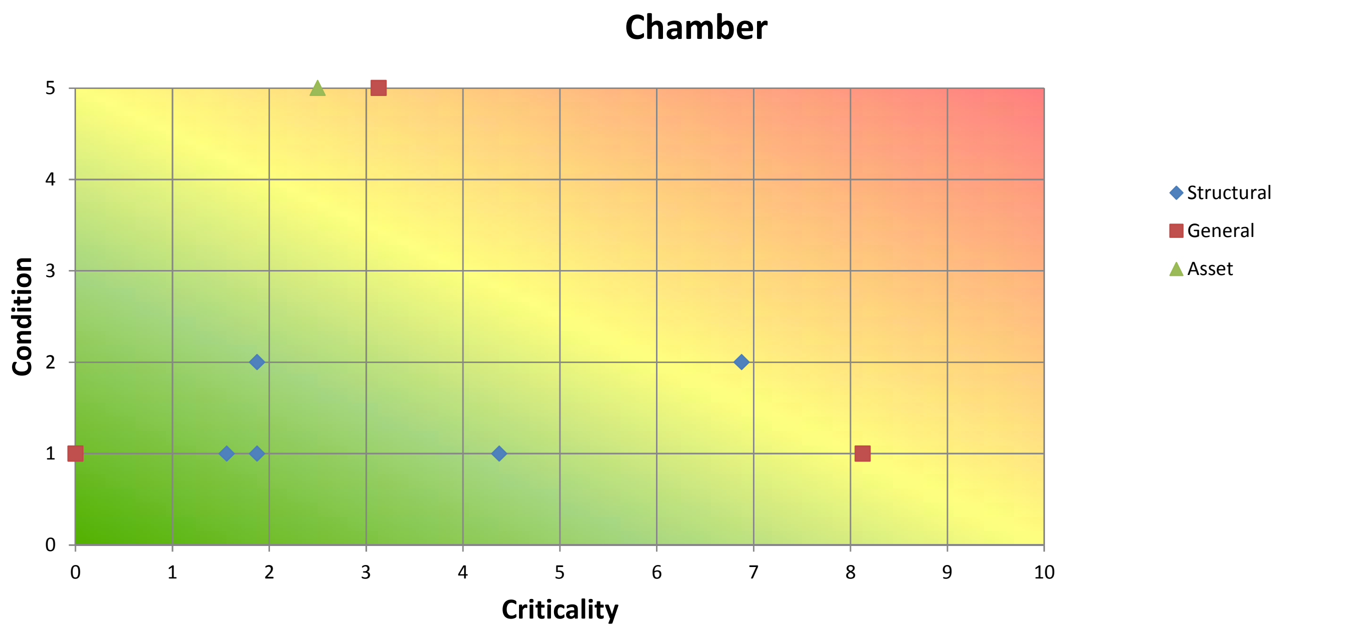
City of Winnipeg Asset Name	
Feedermain Name	Dakota Extension
Address of Nearest Building	
Feedermain ID	FM021
Easting Northing	
Type of chamber Access	
Depth of Chamber	525
Primary FM Pipe Diameter	600
Smaller Diameter	
Branch Pipes	

Observations:

Actions:
replace or refinish valve components, mitigate infiltration

General Comments:




Chamber
Condition
Criticality
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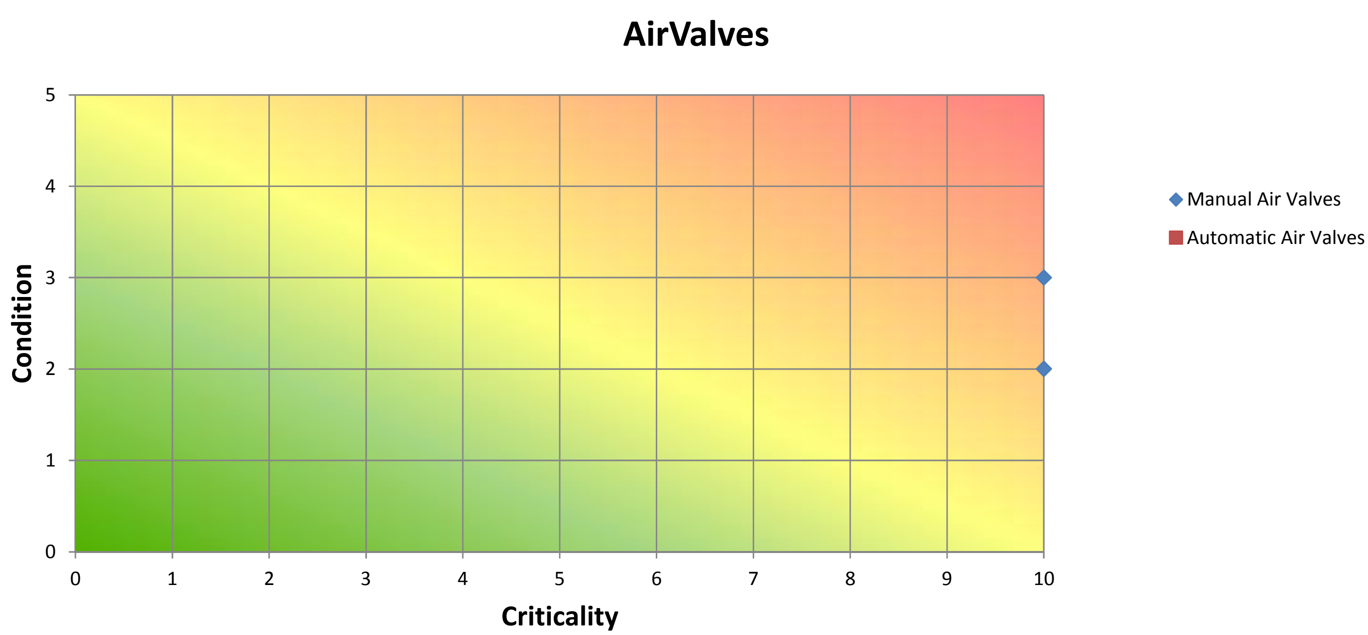
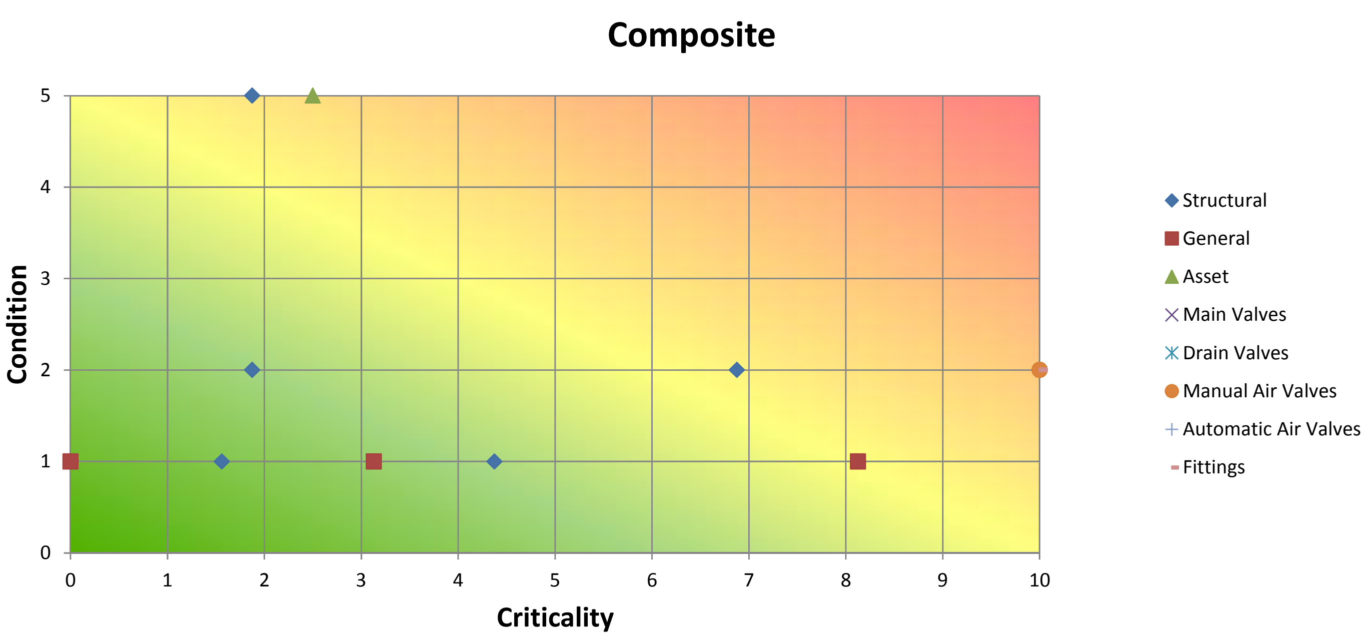
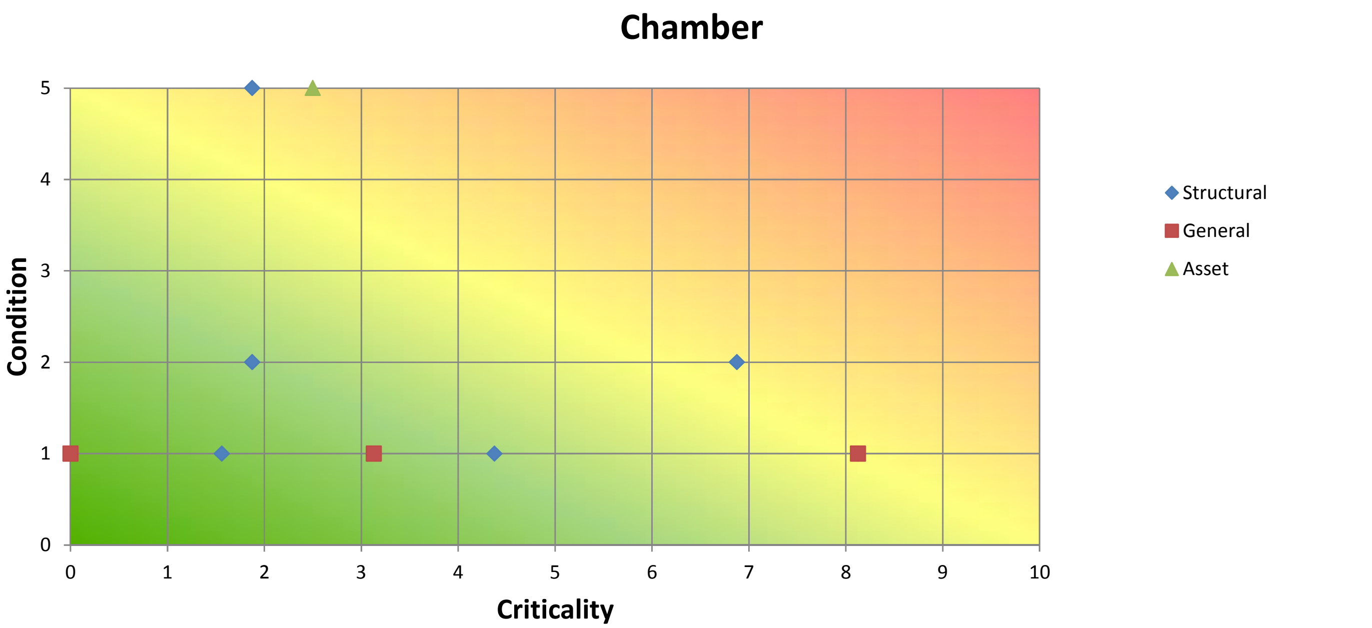
Structural
General
Asset


AirValves
Condition
Criticality
0
1
2
3
4
5
0
1
2
3
4
5
6
7
8
9
10
Manual Air Valves
Automatic Air Valves

W-AV70000110

City of Winnipeg Asset Name		**Observations:** [redacted]
Feedermain Name	Charleswood	
Address of Nearest Building		
Feedermain ID	FM005	
Easting Northing	[redacted]	
Type of chamber Access	frame offset from riser	**Actions:** none
Depth of Chamber	2390	
Primary FM Pipe Diameter	600	**General Comments:**
Smaller Diameter		
Branch Pipes		




Chamber
Condition
Criticality
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2
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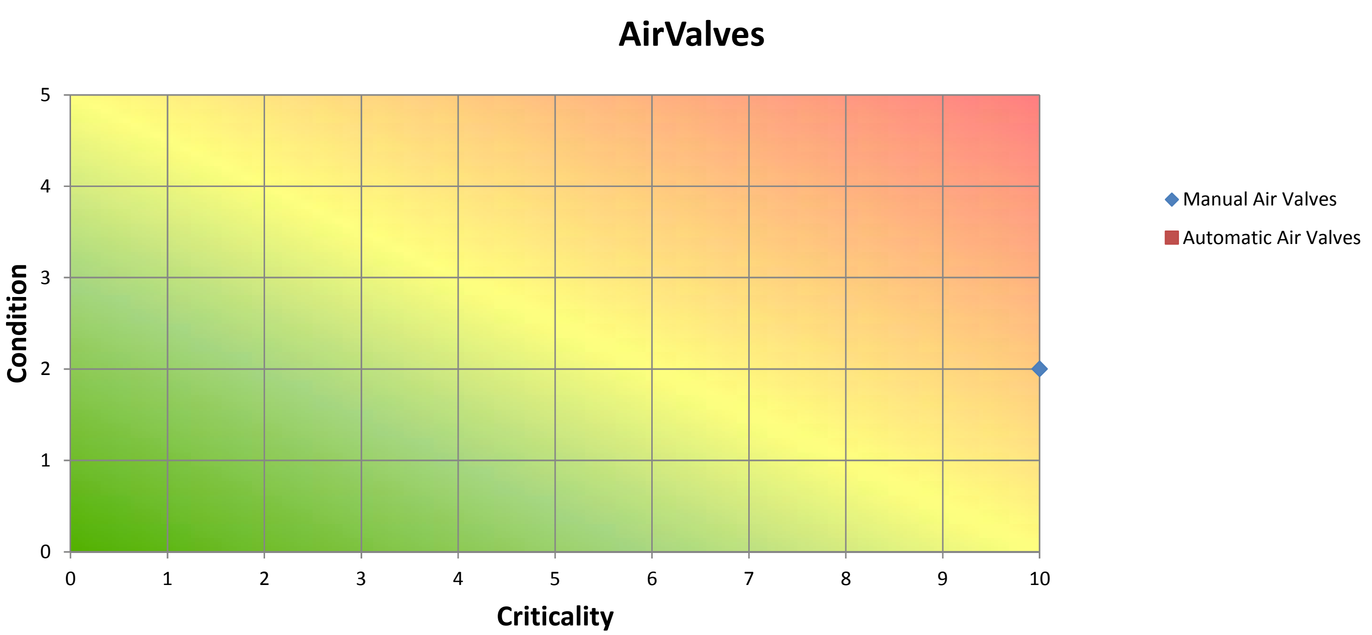
10
Structural
General
Asset


AirValves
Condition
Criticality
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8
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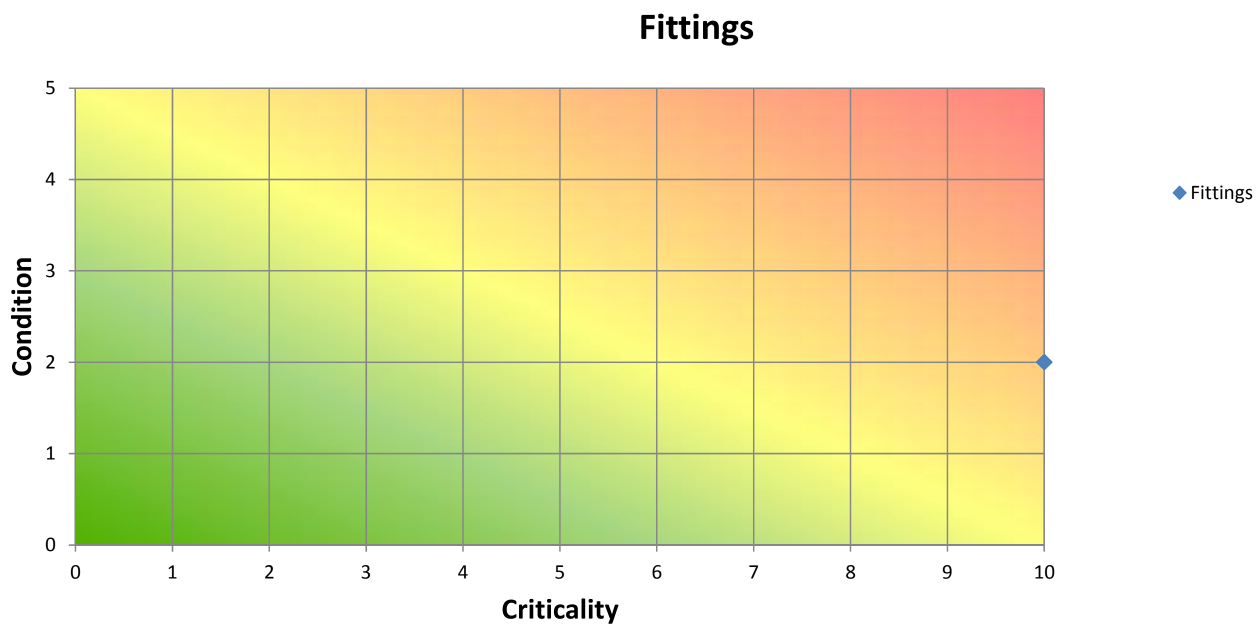
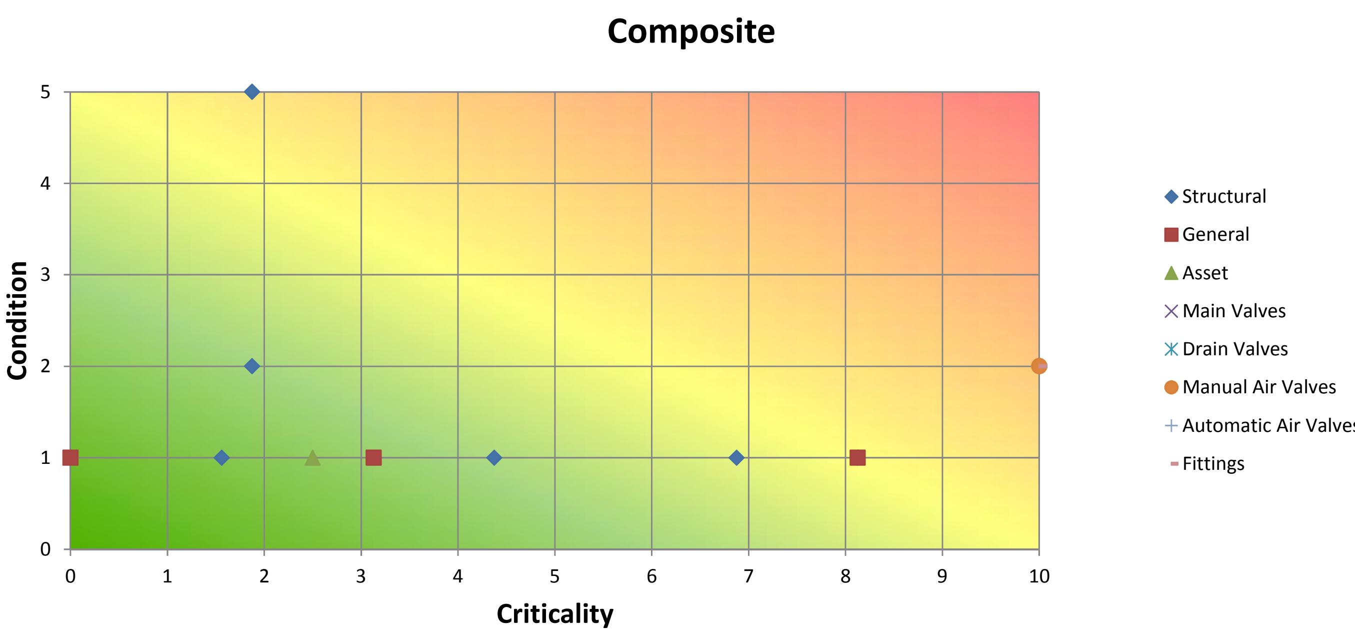
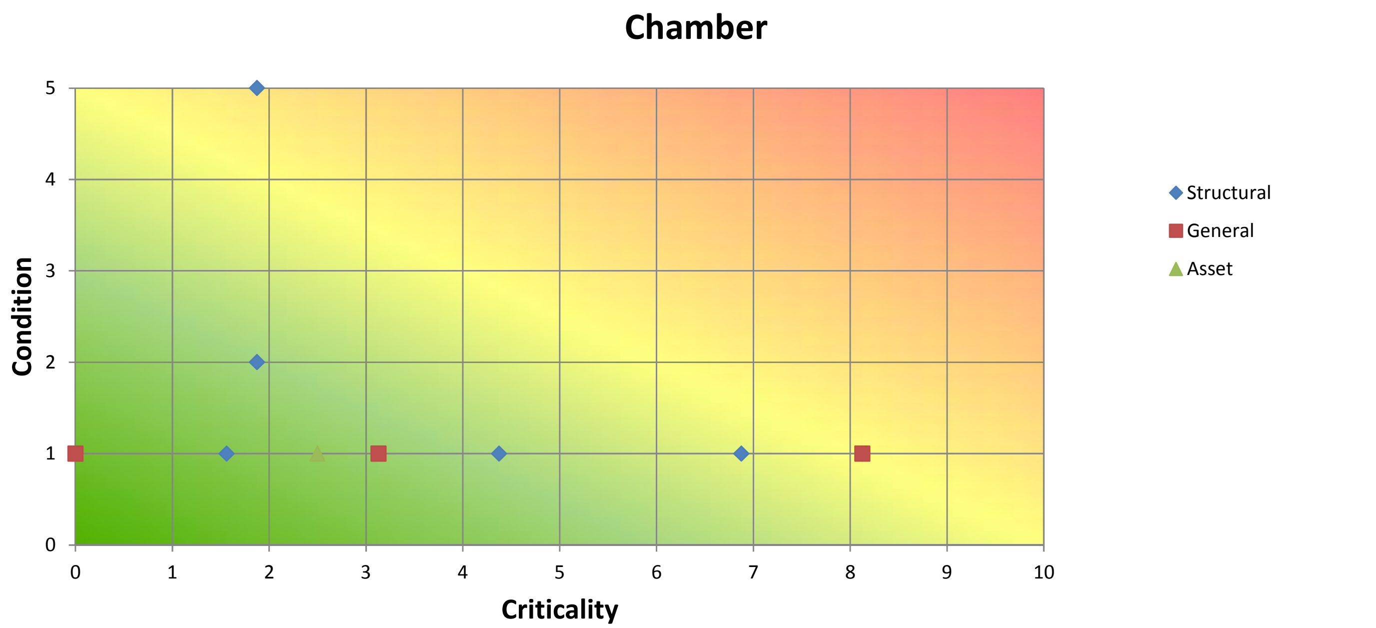
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
Criticality
Fittings

W-AV70000116

City of Winnipeg Asset Name		**Observations:**
Feedermain Name	South Transcona	
Address of Nearest Building		
Feedermain ID	FM019	
Easting Northing		
Type of chamber Access		**Actions:**
Depth of Chamber		none
Primary FM Pipe Diameter	750	**General Comments:**
Smaller Diameter		
Branch Pipes		





Chamber
Condition
Criticality
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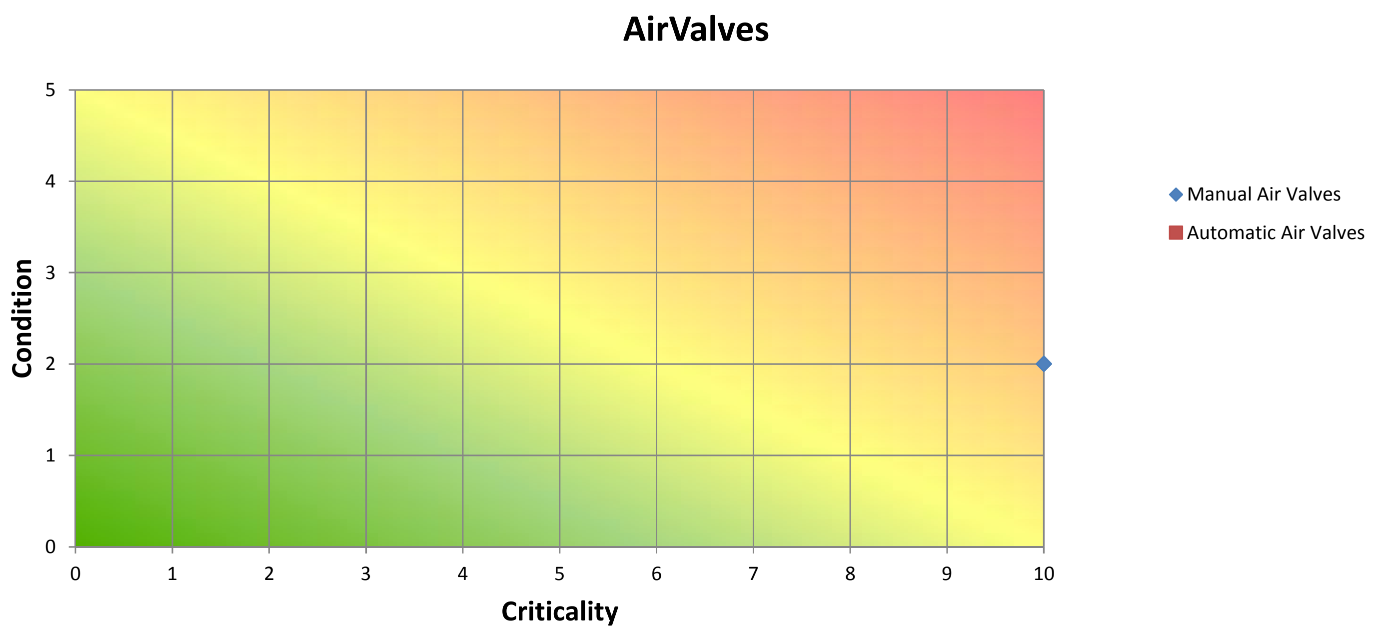
2
3
4
5
6
7
8
9
10
Structural
General
Asset



AirValves
Condition
Criticality
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3
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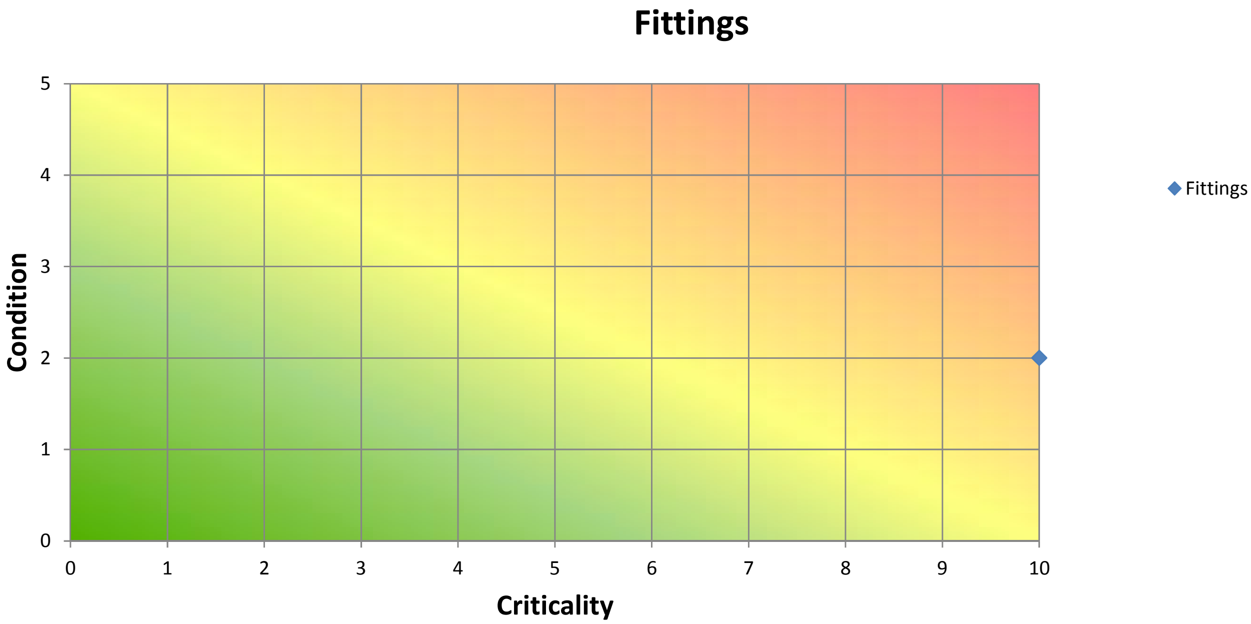
7
8
9
10
Manual Air Valves
Automatic Air Valves



Fittings
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
Condition
Criticality
Fittings

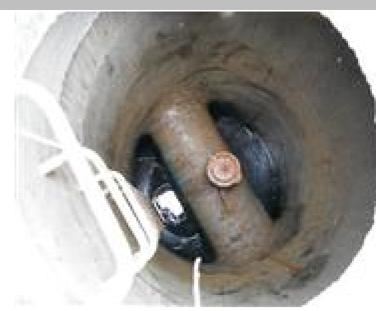
W-AV70000293

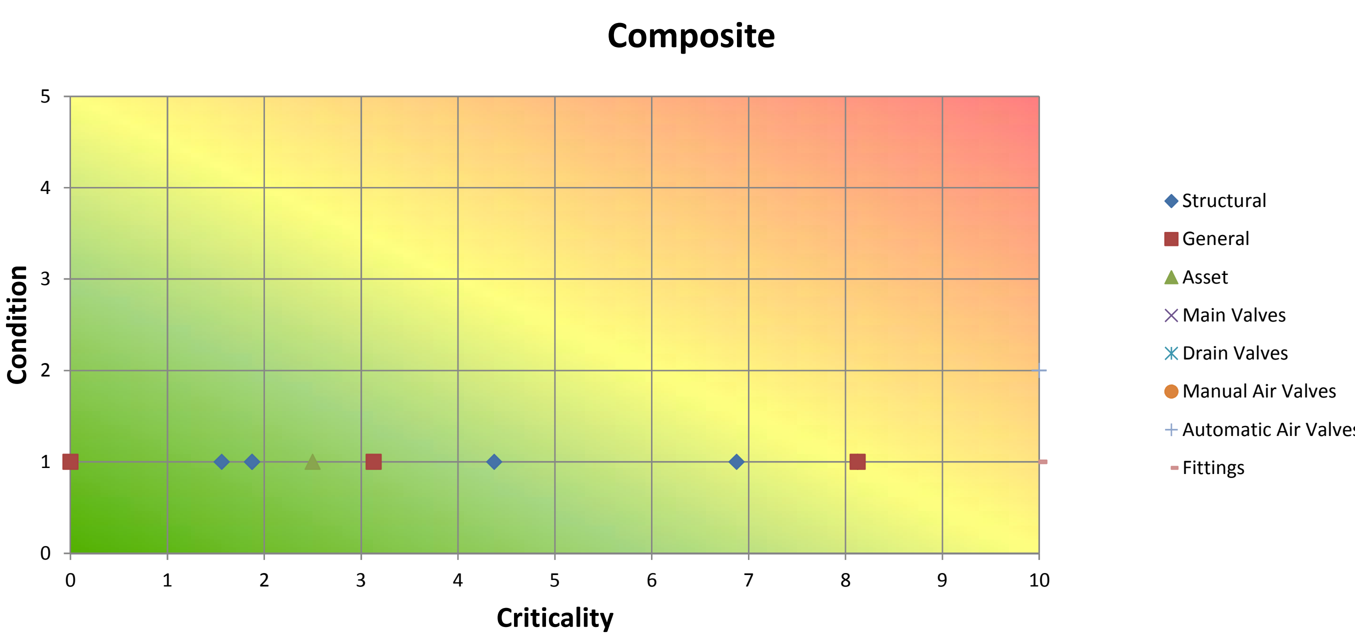
City of Winnipeg Asset Name	
Feedermain Name	Charleswood
Address of Nearest Building	
Feedermain ID	FM005
Easting Northing	
Type of chamber Access	
Depth of Chamber	3590
Primary FM Pipe Diameter	600
Smaller Diameter	
Branch Pipes	

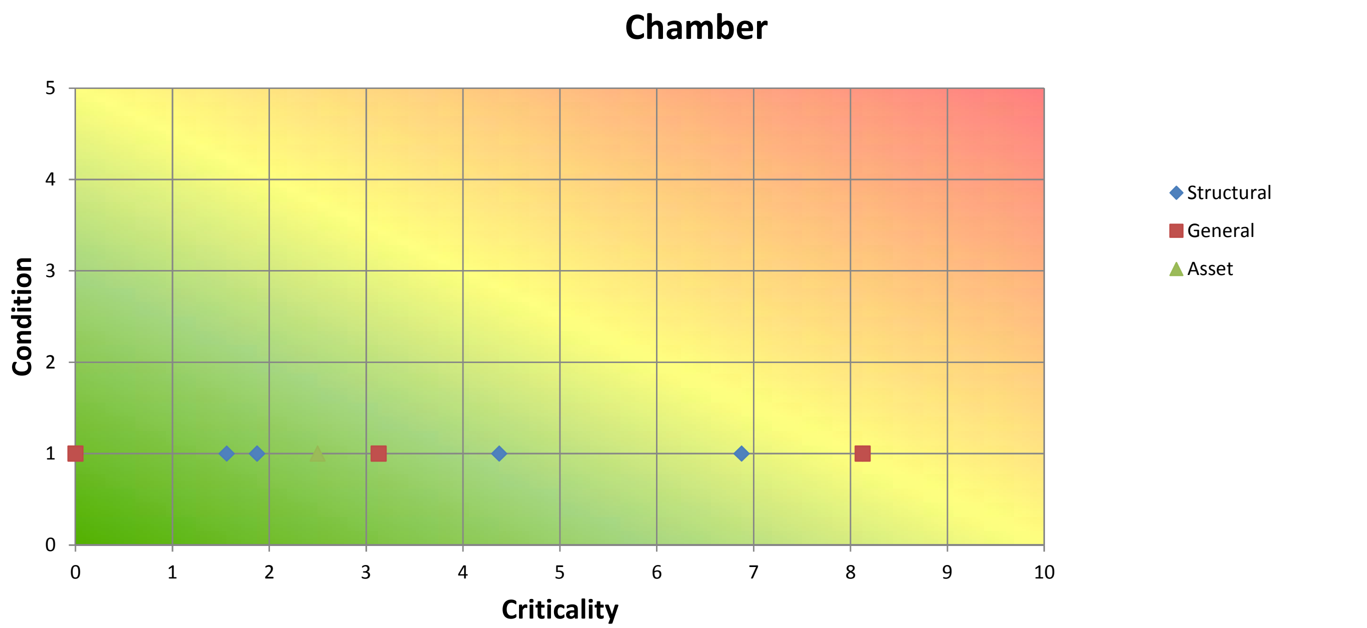
Observations:

Actions:
none

General Comments:






Chamber
Condition
Criticality
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5
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1
2
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6
7
8
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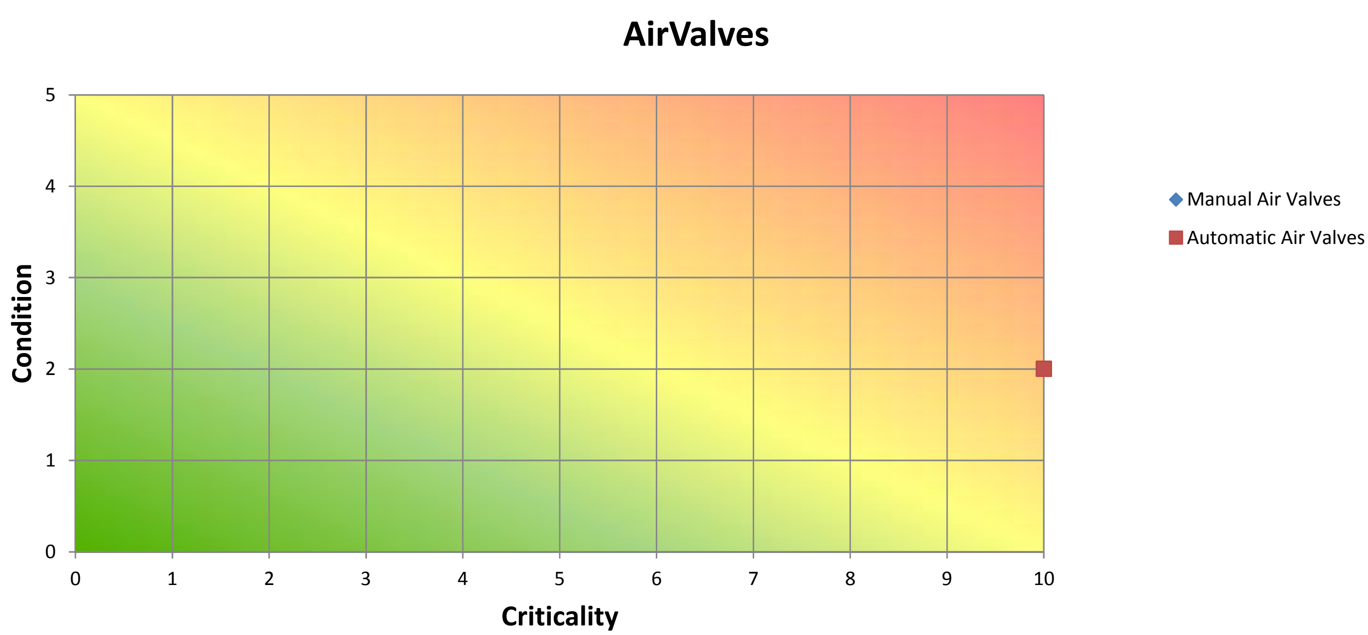
Structural
General
Asset


AirValves
Condition
Criticality
0
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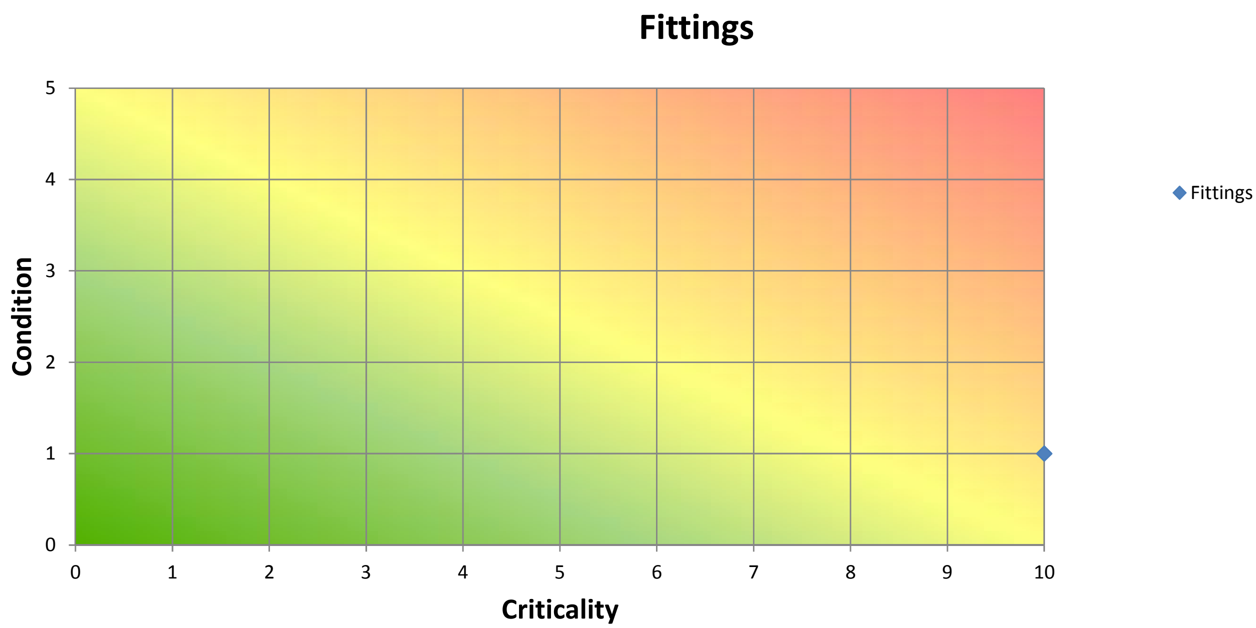
5
0
1
2
3
4
5
6
7
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
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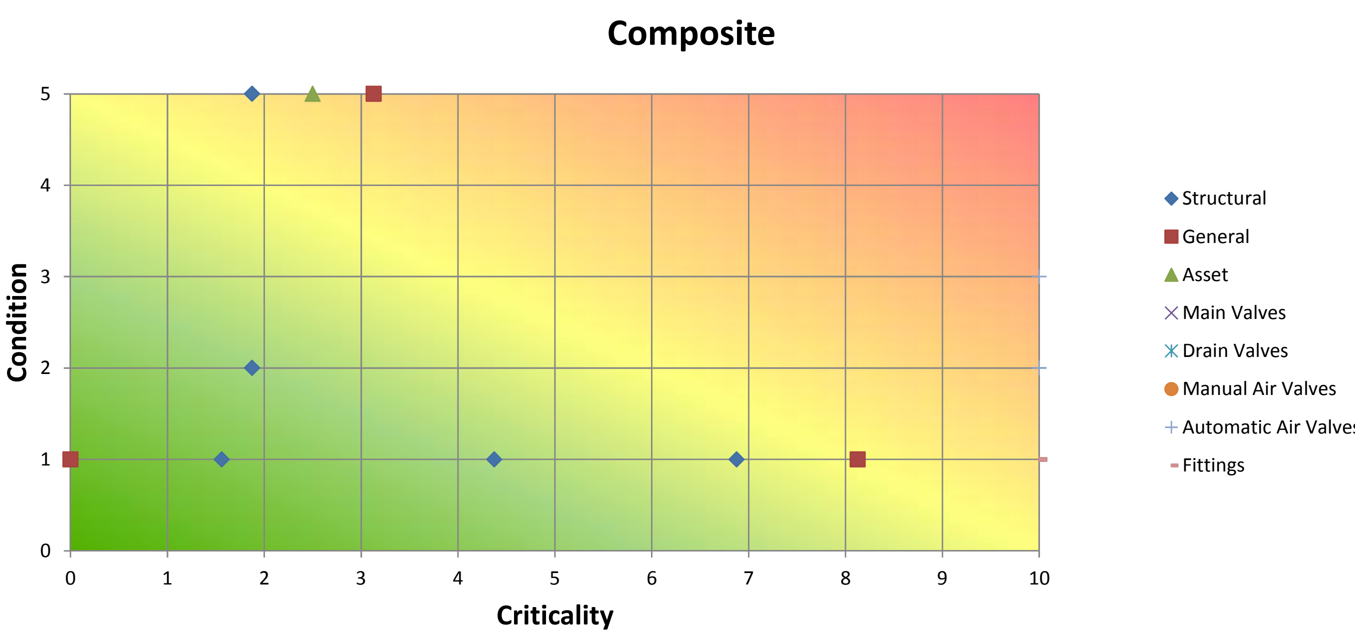
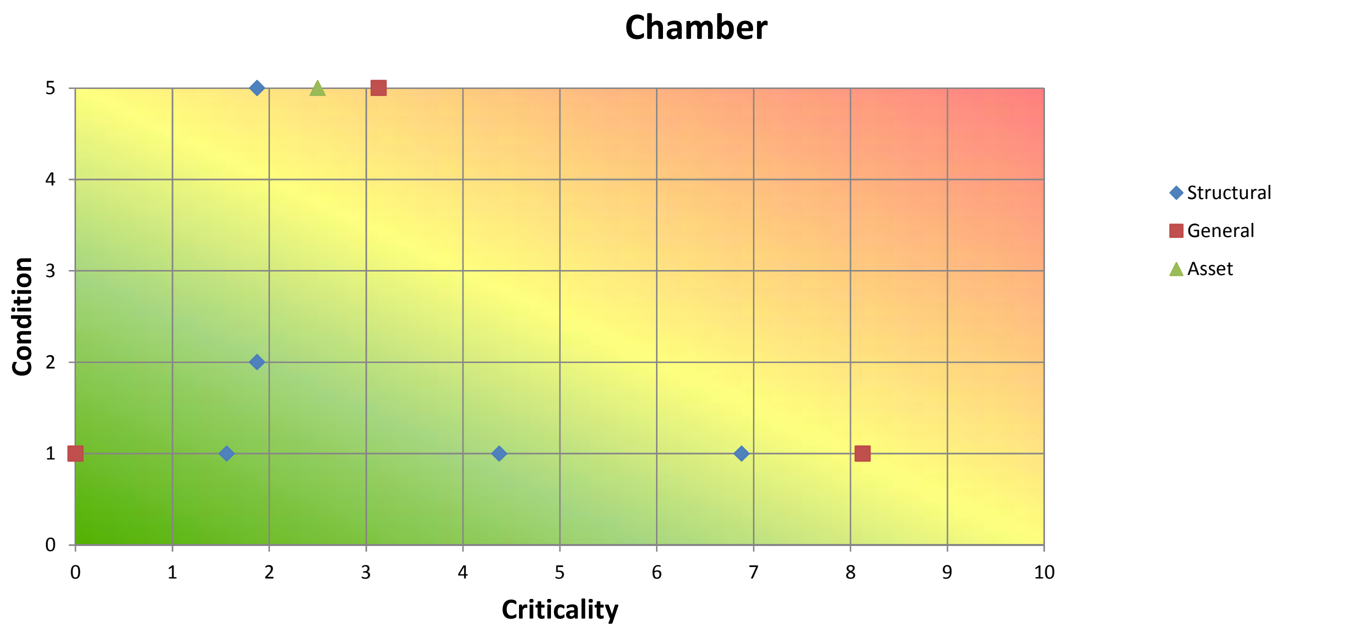
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
Criticality
Fittings

W-AV70000312

City of Winnipeg Asset Name		**Observations:** [redacted]
Feedermain Name	Wilkes	
Address of Nearest Building	[redacted]	
Feedermain ID	FM002	
Easting Northing	[redacted]	
Type of chamber Access		**Actions:**
Depth of Chamber	4350	mitigate infiltration
Primary FM Pipe Diameter	900	**General Comments:**
Smaller Diameter		
Branch Pipes		




Chamber
Condition
Criticality
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2
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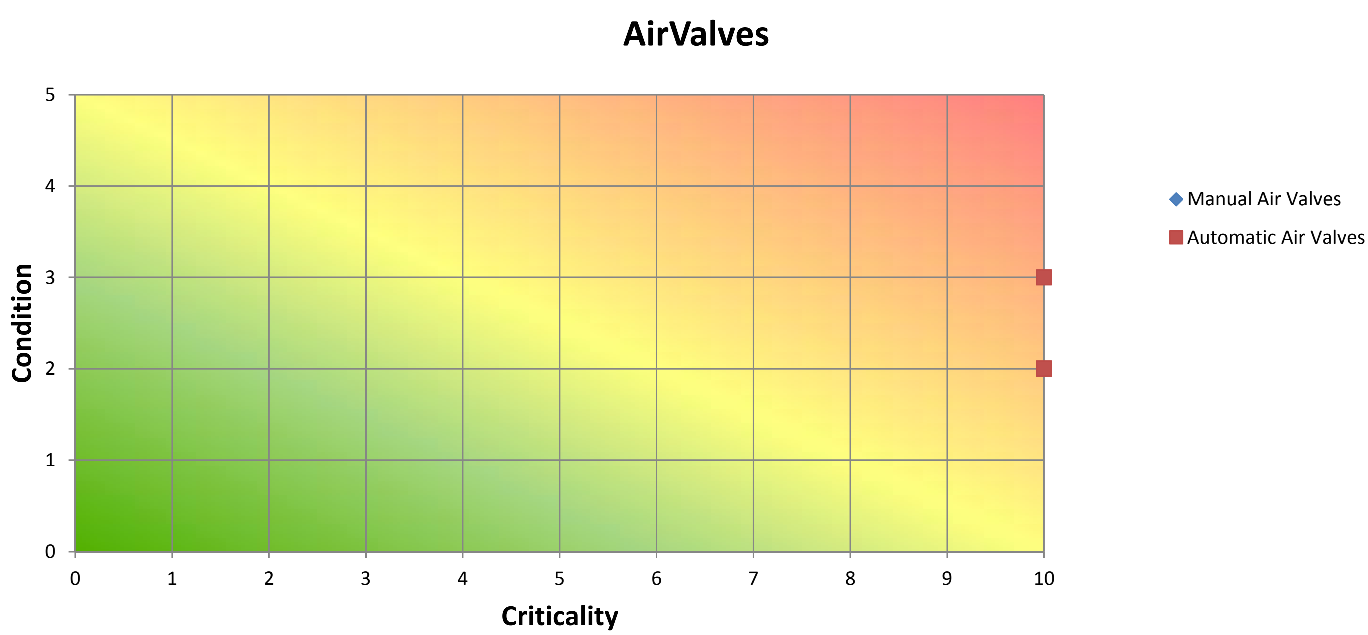
6
7
8
9
10
Structural
General
Asset


AirValves
Condition
Criticality
0
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2
3
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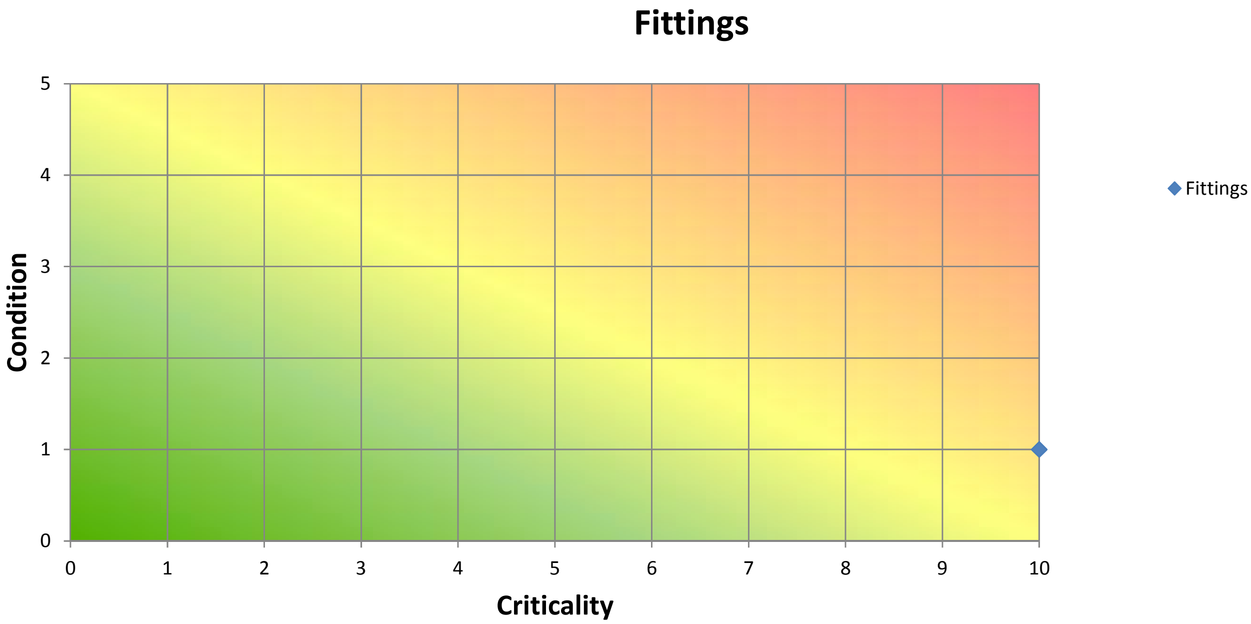
5
0
1
2
3
4
5
6
7
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
Criticality
0
1
2
3
4
5
0
1
2
3
4
5
6
7
8
9
10
Fittings

W-VP00000103

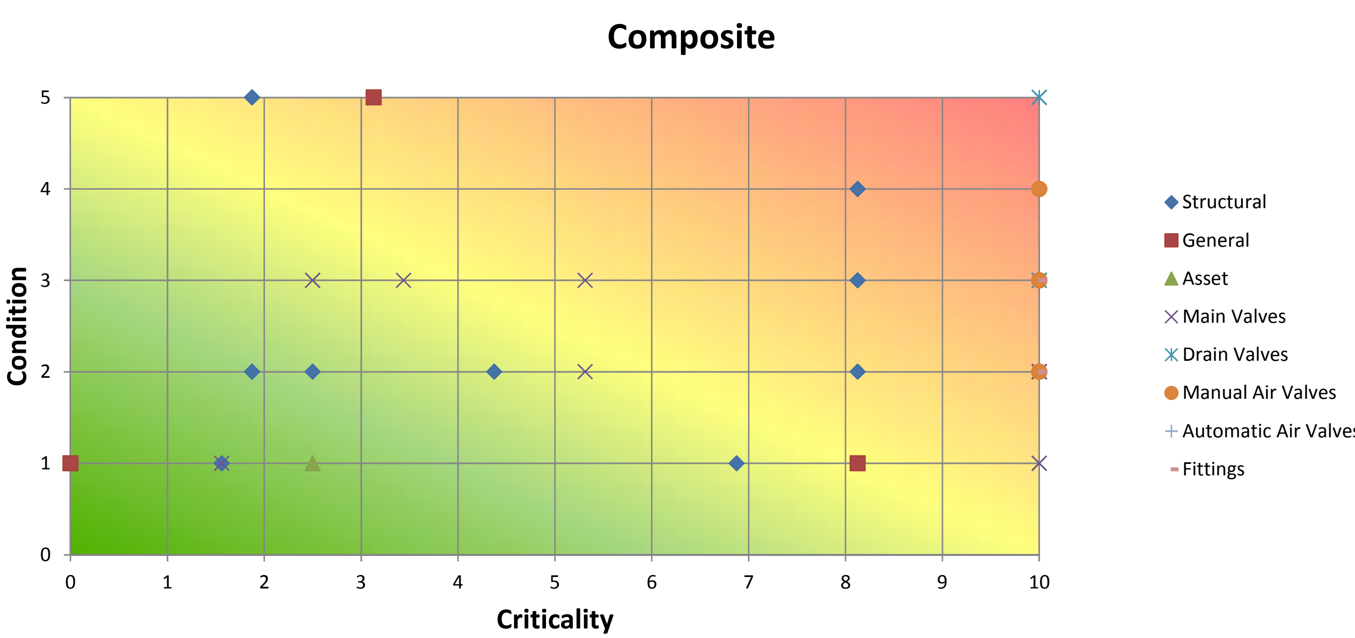
City of Winnipeg Asset Name	[redacted]
Feedermain Name	Spears Road
Address of Nearest Building	[redacted]
Feedermain ID	FM018
Easting Northing	[redacted]
Type of chamber Access	
Depth of Chamber	
Primary FM Pipe Diameter	750
Smaller Diameter	400
Branch Pipes	750 North

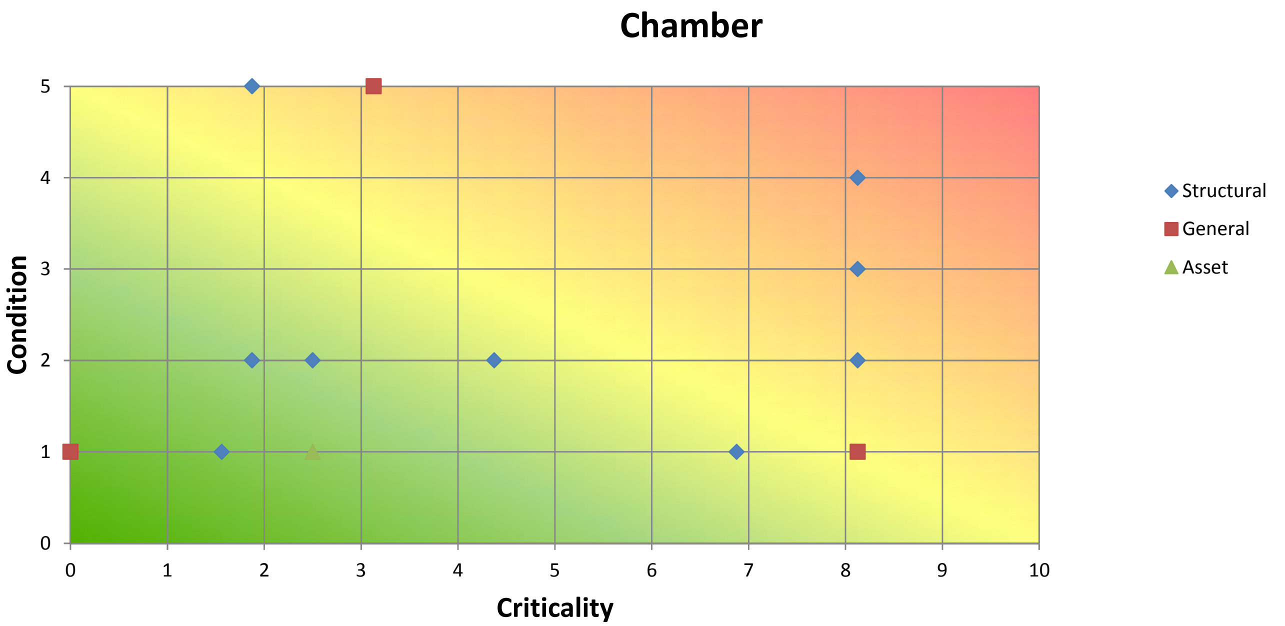
Observations:
[redacted]

Actions:
replace or refinish valve components, refinish or replace fittings and fasteners, repair concrete structure, mitigate infiltration

General Comments:

[redacted]




Chamber
Condition
Criticality
0
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2
3
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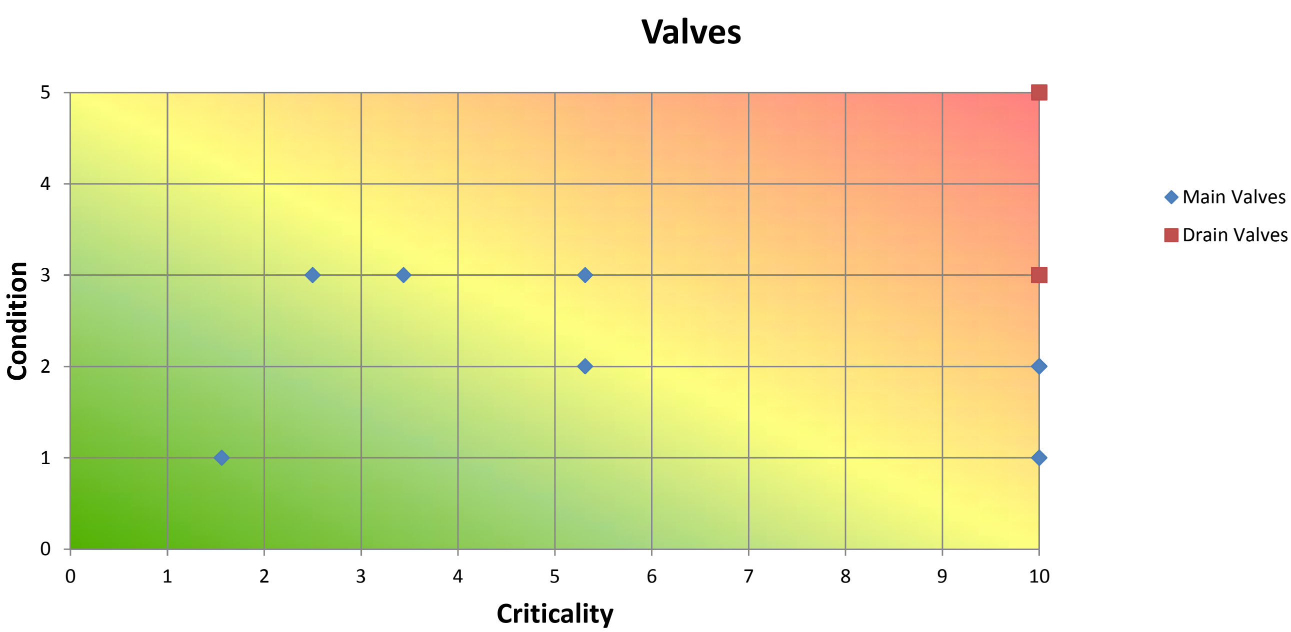
6
7
8
9
10
Structural
General
Asset


Valves
Condition
Criticality
0
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2
3
4
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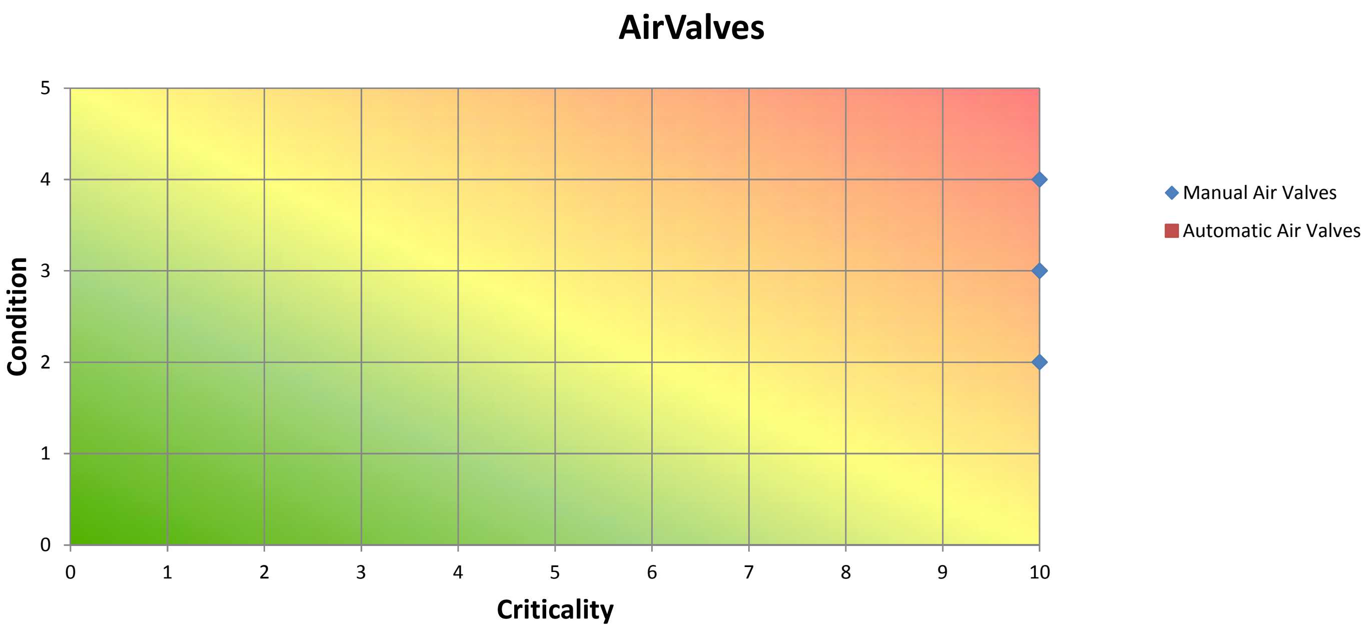
6
7
8
9
10
Main Valves
Drain Valves


AirValves
Condition
Criticality
0
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3
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1
2
3
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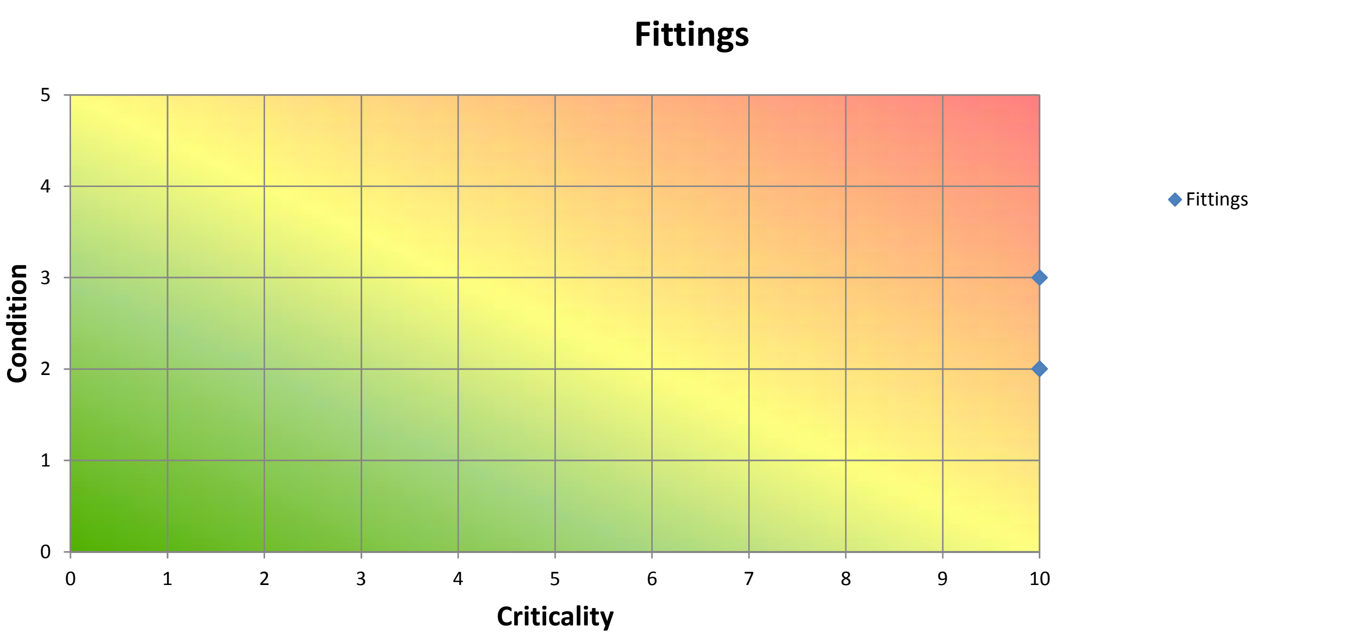
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
Criticality
0
1
2
3
4
5
0
1
2
3
4
5
6
7
8
9
10
Fittings

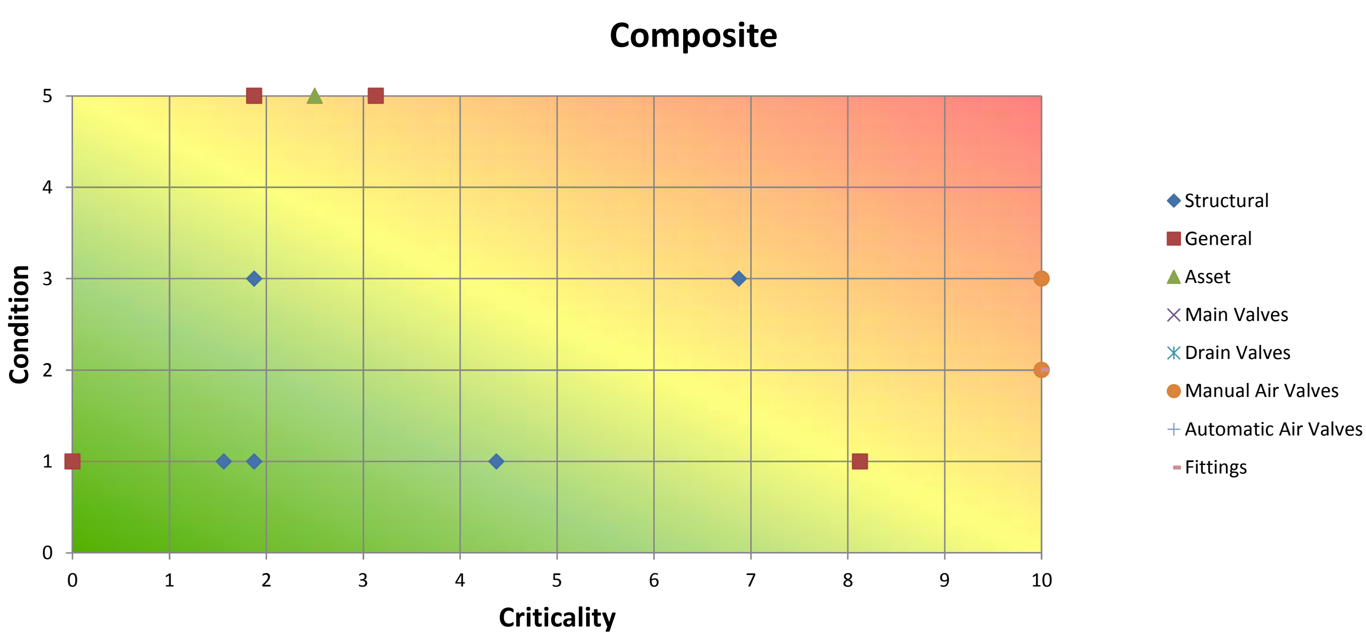
W-VP00000115

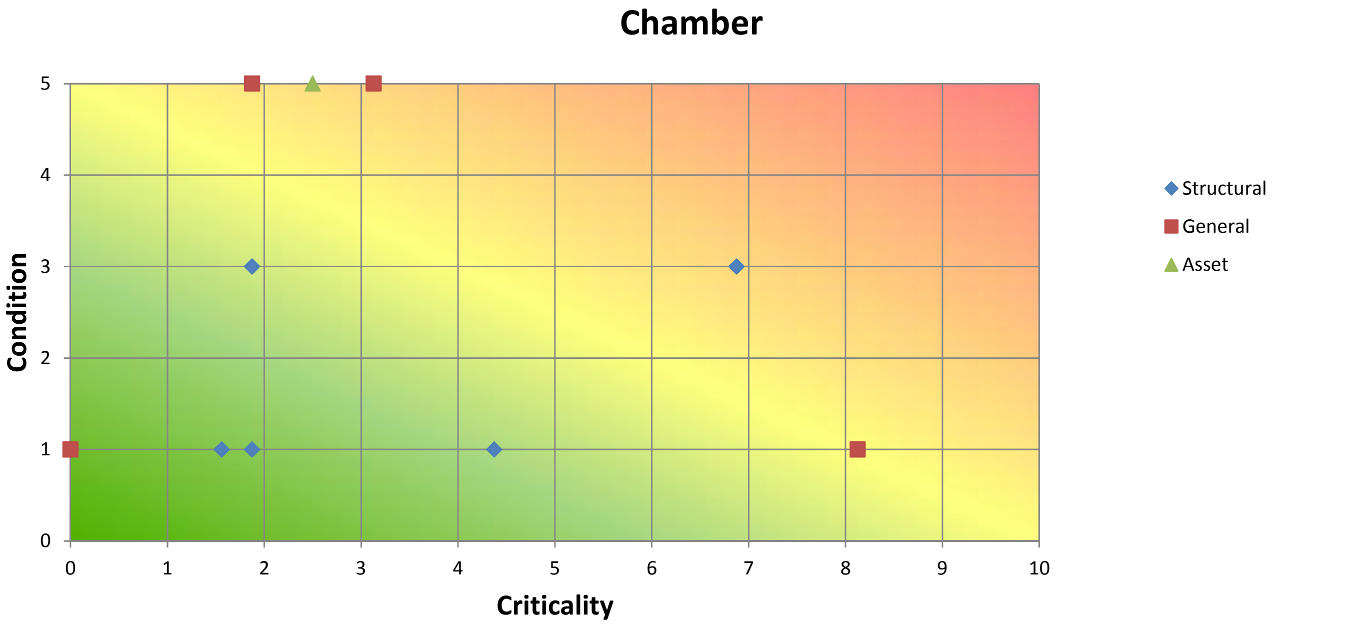
City of Winnipeg Asset Name	[redacted]
Feedermain Name	Birds Hill
Address of Nearest Building	[redacted]
Feedermain ID	FM017
Easting Northing	[redacted]
Type of chamber Access	Rim Is Cracked and Needs To Be Replaced
Depth of Chamber	
Primary FM Pipe Diameter	900
Smaller Diameter	
Branch Pipes	

Observations:
[redacted]

Actions:
replace manhole rim, repair access, mitigate infiltration, refinish or replace valve components

General Comments:




Chamber
Condition
Criticality
0
1
2
3
4
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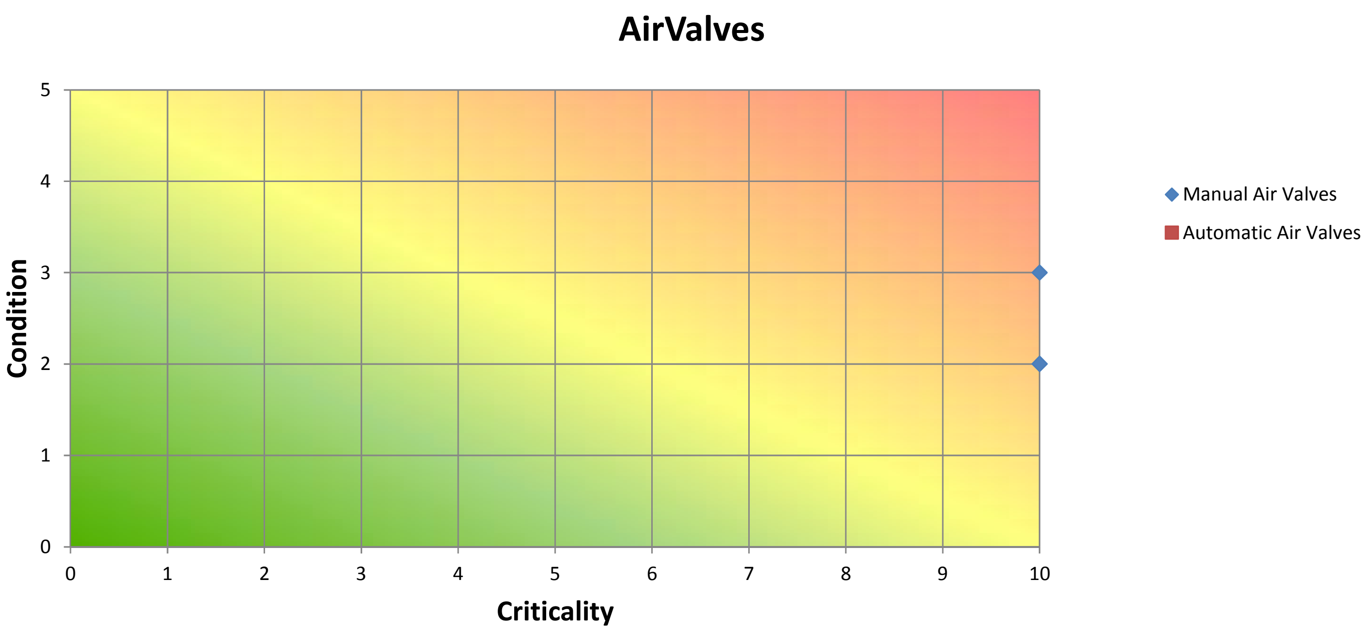
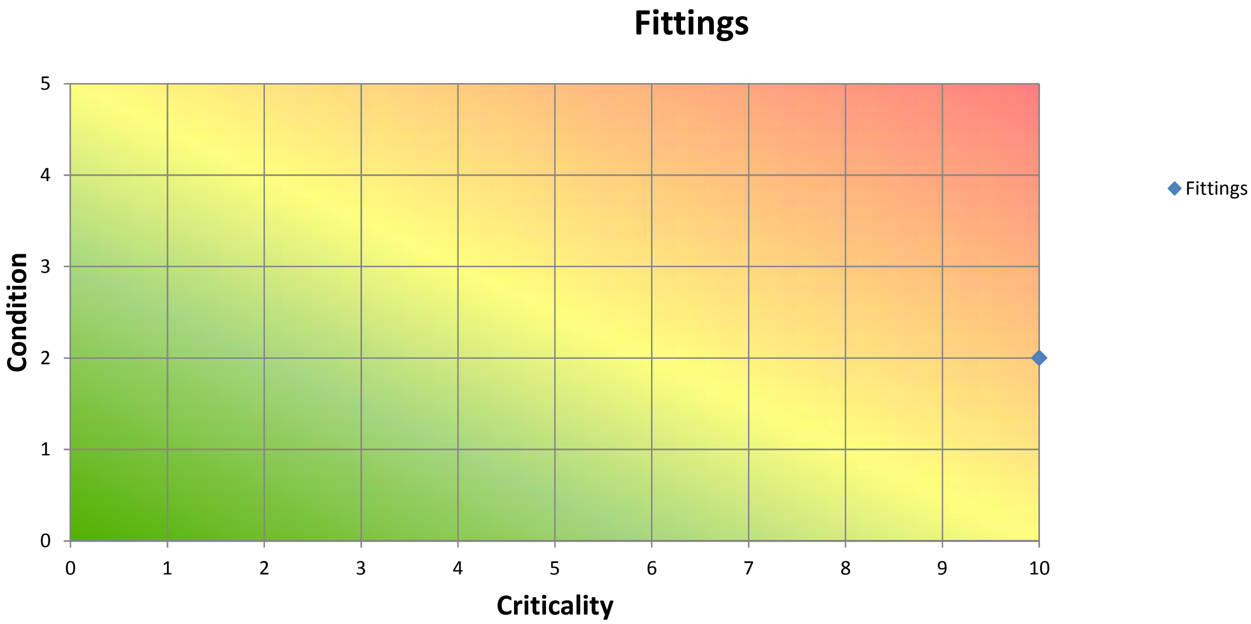
6
7
8
9
10
Structural
General
Asset


AirValves
Condition
Criticality
0
1
2
3
4
5
6
7
8
9
10
Manual Air Valves
Automatic Air Valves



Fittings
Condition
Criticality
0
1
2
3
4
5
0
1
2
3
4
5
6
7
8
9
10
Fittings

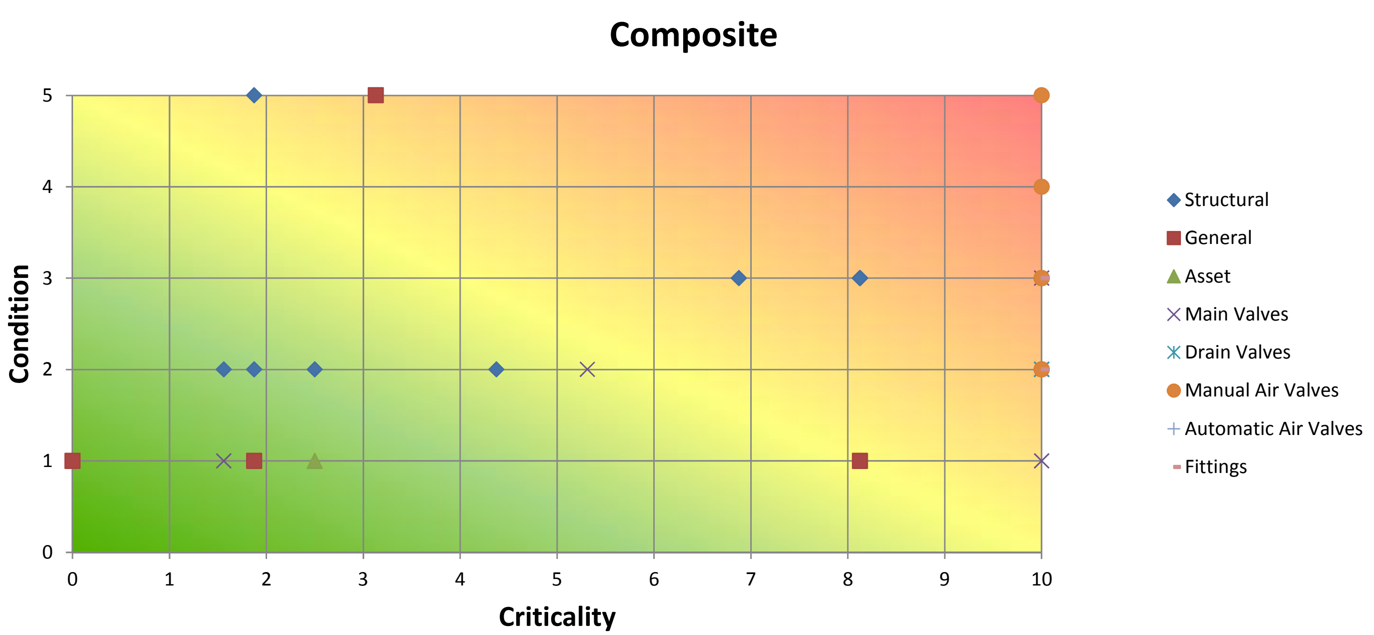
W-VP00000125

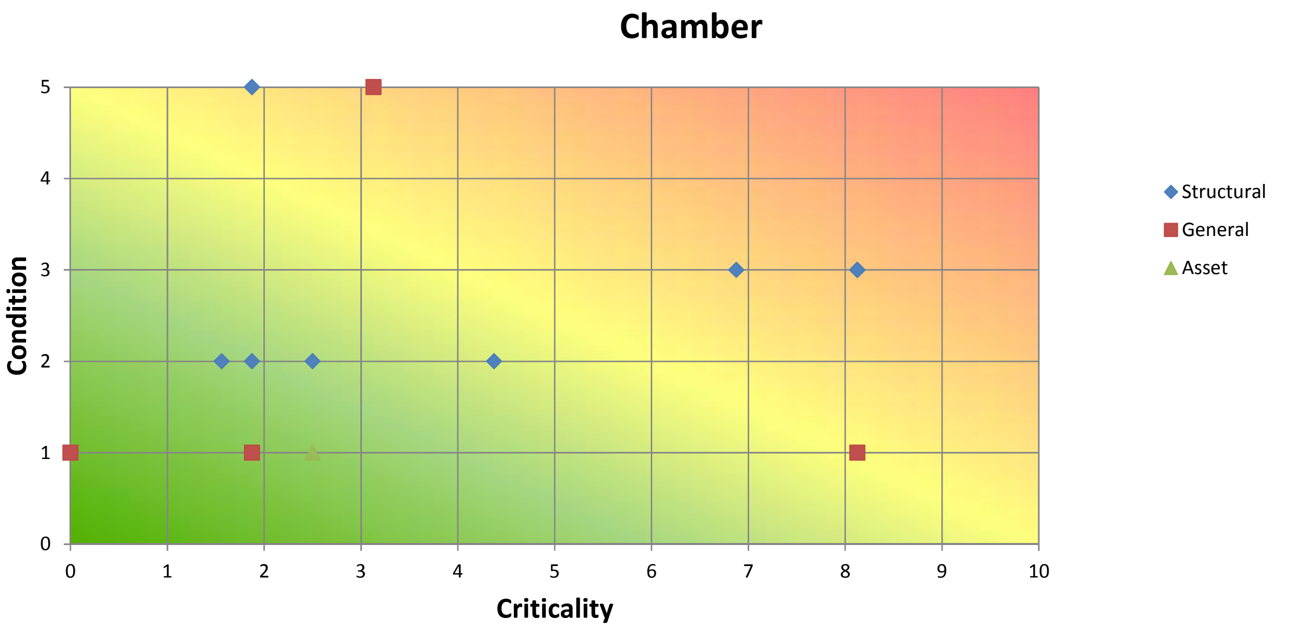
City of Winnipeg Asset Name	[redacted]
Feedermain Name	Spears Road
Address of Nearest Building	[redacted]
Feedermain ID	FM018
Easting Northing	[redacted]
Type of chamber Access	
Depth of Chamber	
Primary FM Pipe Diameter	750
Smaller Diameter	
Branch Pipes	600 - West

Observations:
[redacted]

Actions:
replace or refinish valve components, refinish or replace fittings and fasteners, refinish steel, repair access, mitigate infiltration

General Comments:




Chamber
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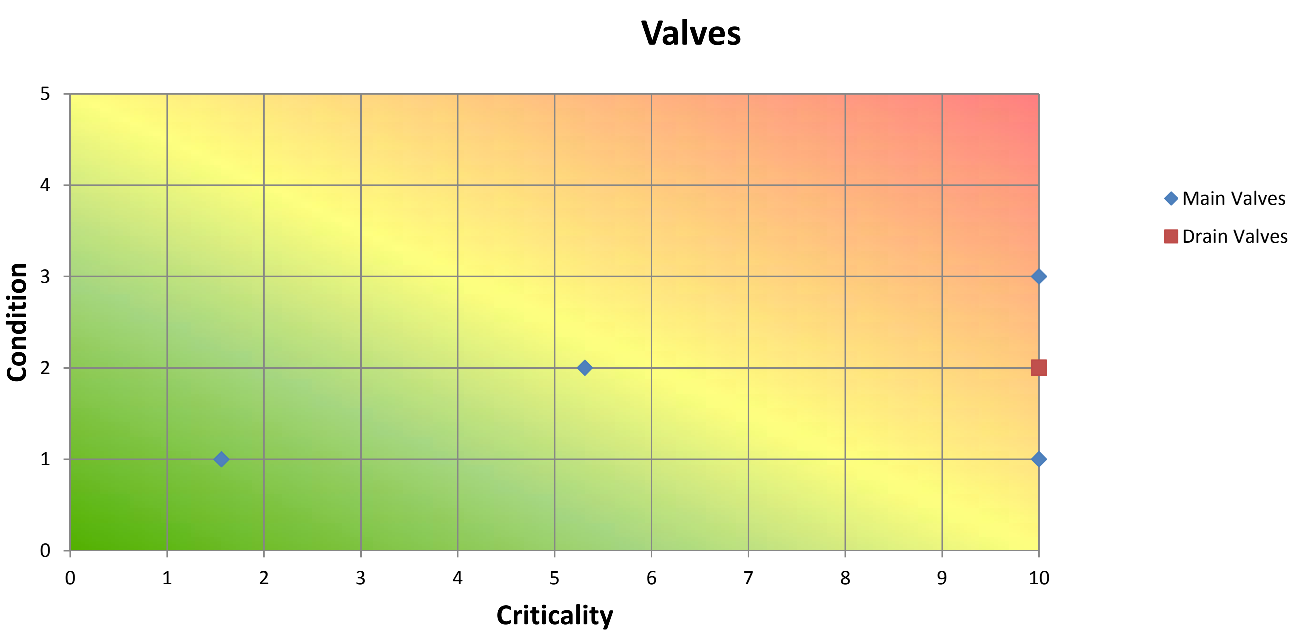
Condition
Criticality
Structural
General
Asset


Valves
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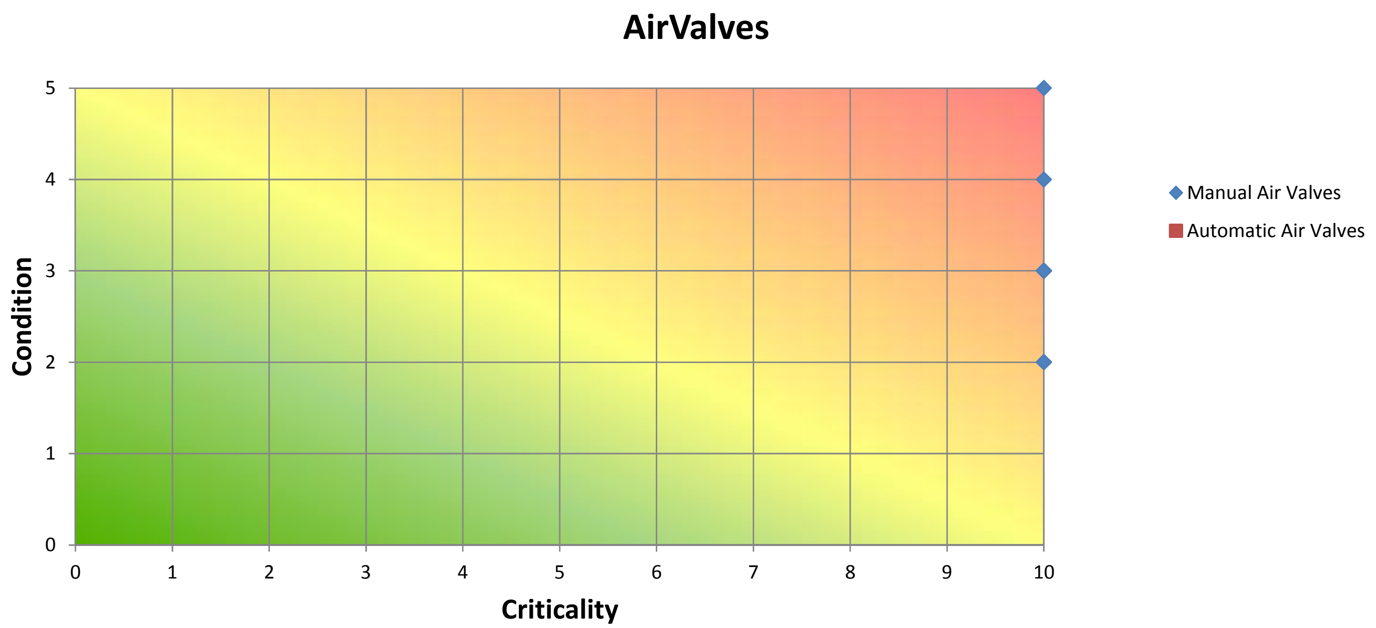
Condition
Criticality
Main Valves
Drain Valves


AirValves
Condition
Criticality
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2
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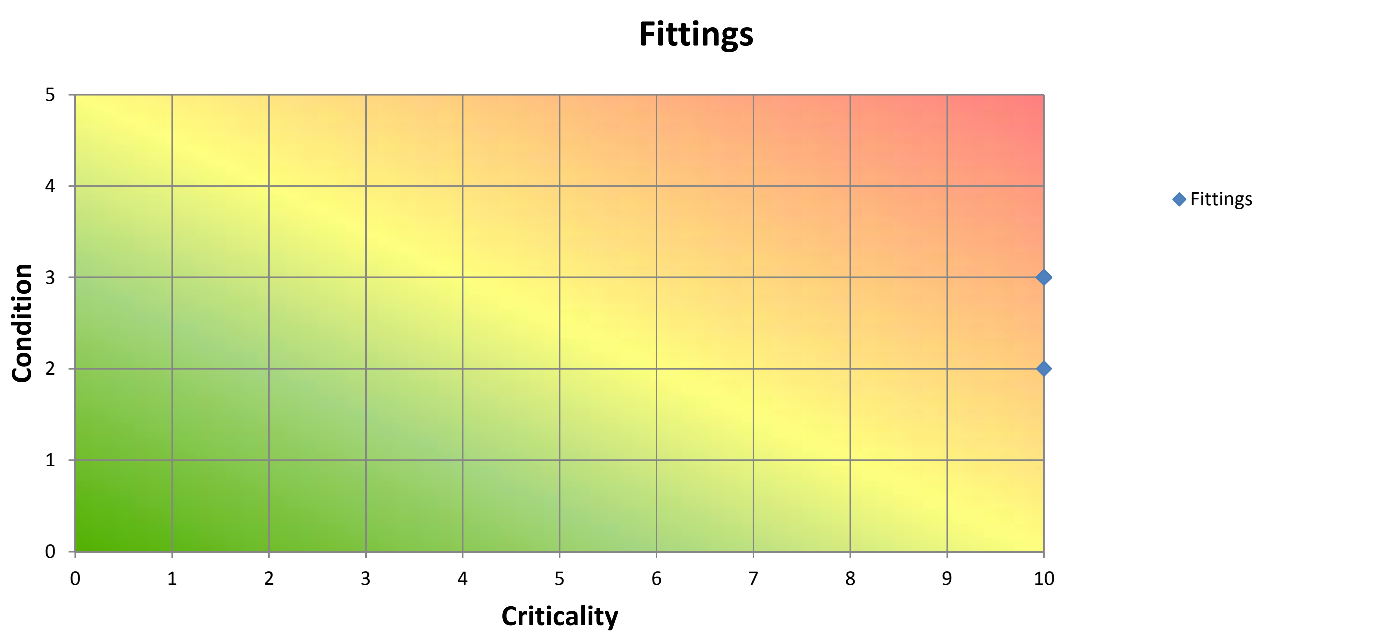
7
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
Criticality
0
1
2
3
4
5
6
7
8
9
10
Fittings

W-VP00000131

City of Winnipeg Asset Name	[redacted]
Feedermain Name	North Transcona
Address of Nearest Building	[redacted]
Feedermain ID	FM028
Easting Northing	[redacted]
Type of chamber Access	
Depth of Chamber	2600
Primary FM Pipe Diameter	600
Smaller Diameter	
Branch Pipes	

Observations:

[redacted]

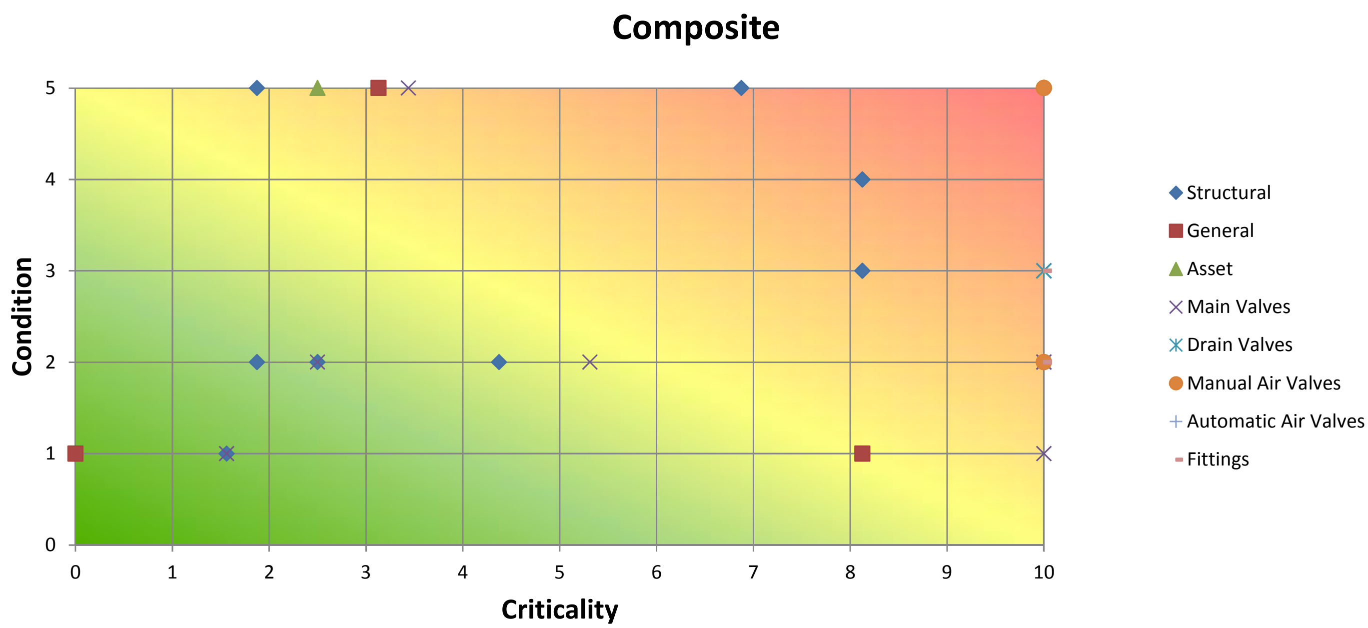
Actions:

replace or refinish valve components, refinish or replace fittings and fasteners, repair access, repair concrete structure, mitigate infiltration, adjust or repair valve box

General Comments:

[redacted]

[redacted]


Composite
Condition
Criticality
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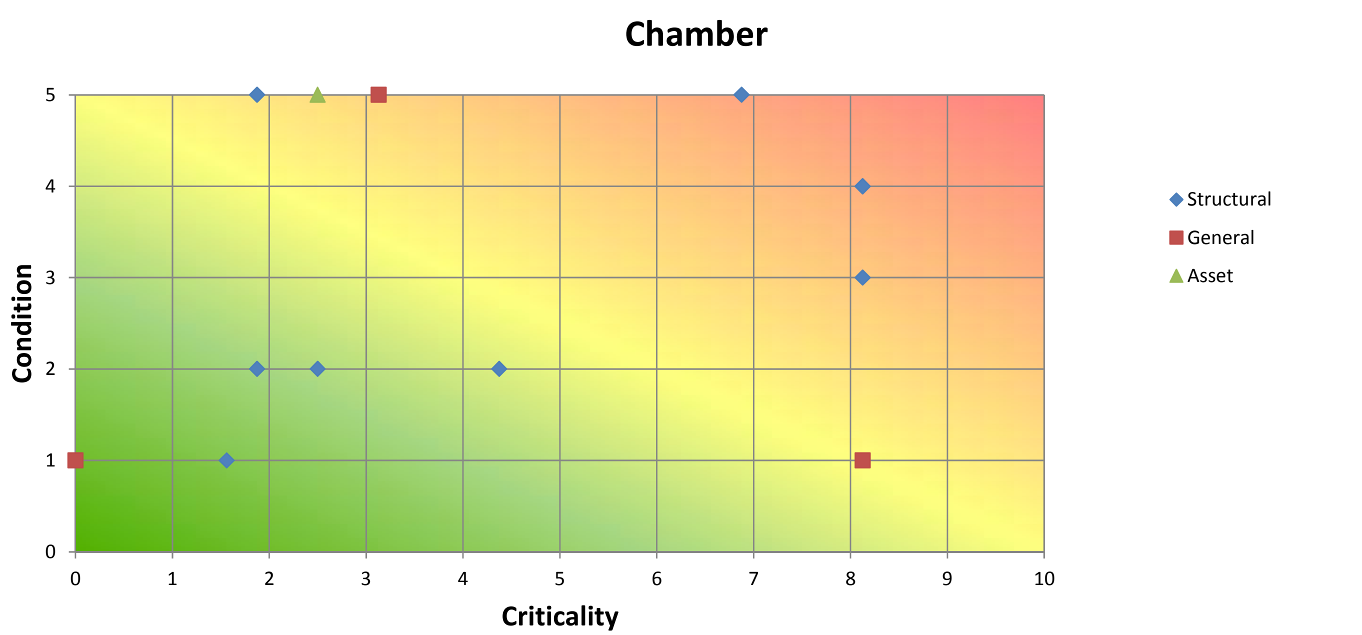
9
10
Structural
General
Asset
Main Valves
Drain Valves
Manual Air Valves
Automatic Air Valves
Fittings


Chamber
Condition
Criticality
0
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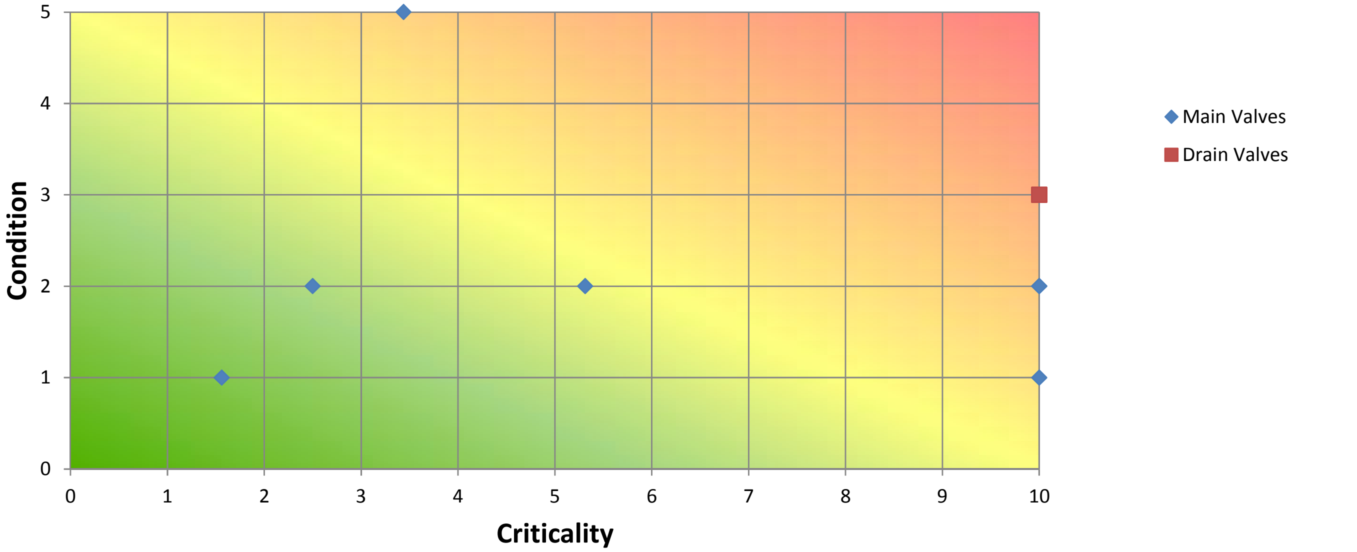
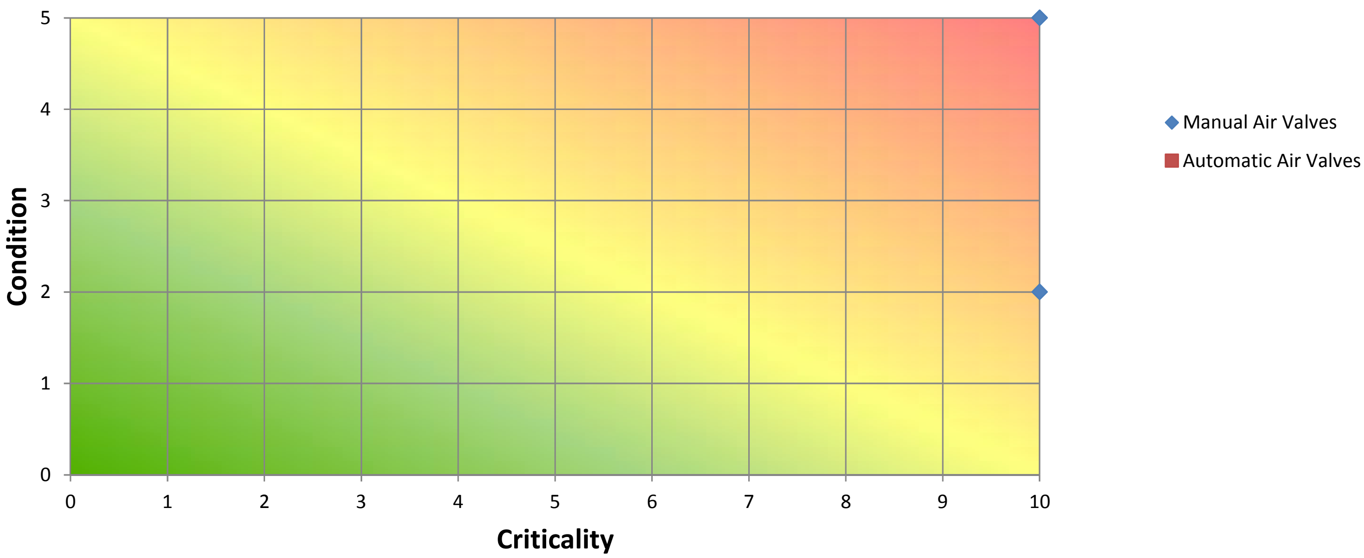
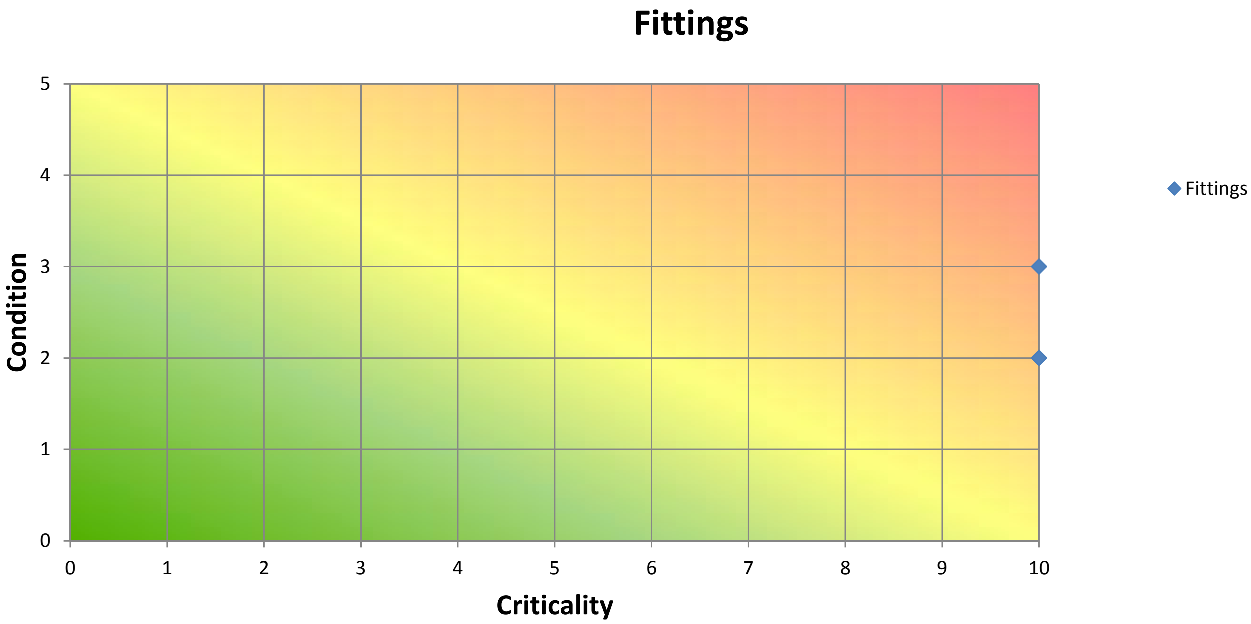
7
8
9
10
Structural
General
Asset

Valves



AirValves




Fittings
5
4
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2
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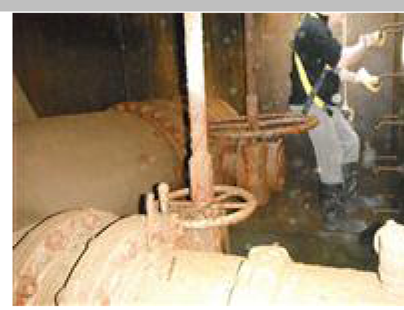
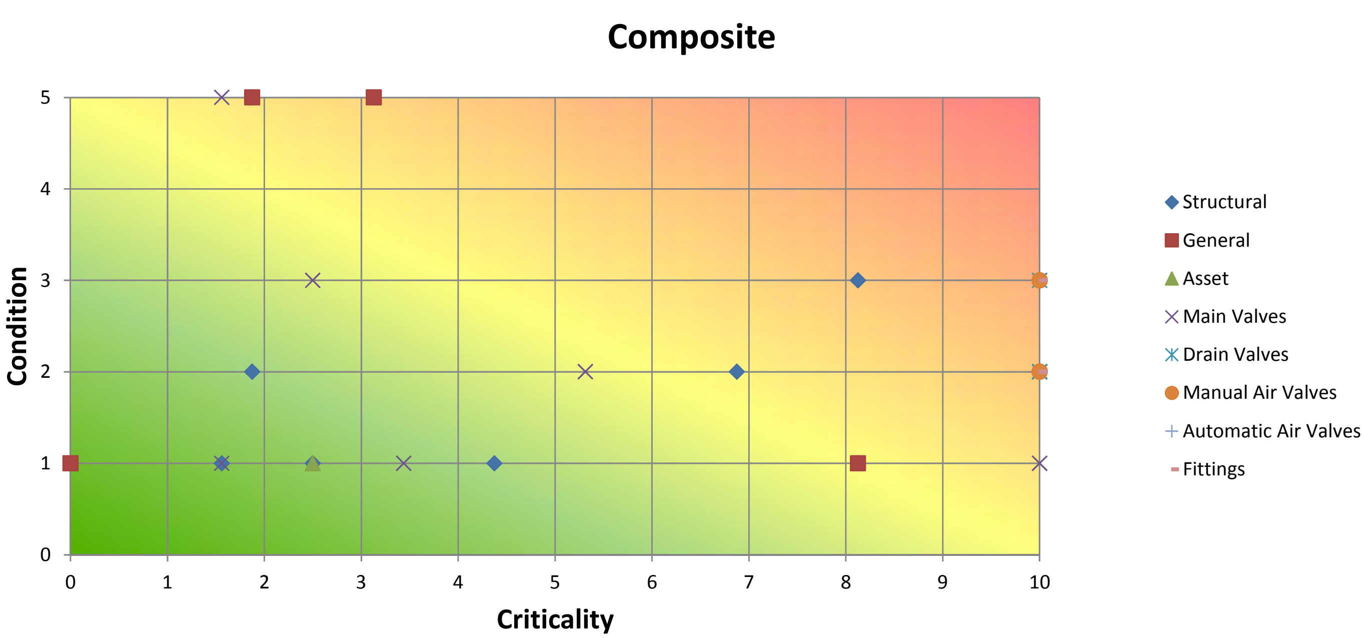
Condition
0
1
2
3
4
5
6
7
8
9
10
Criticality
Fittings

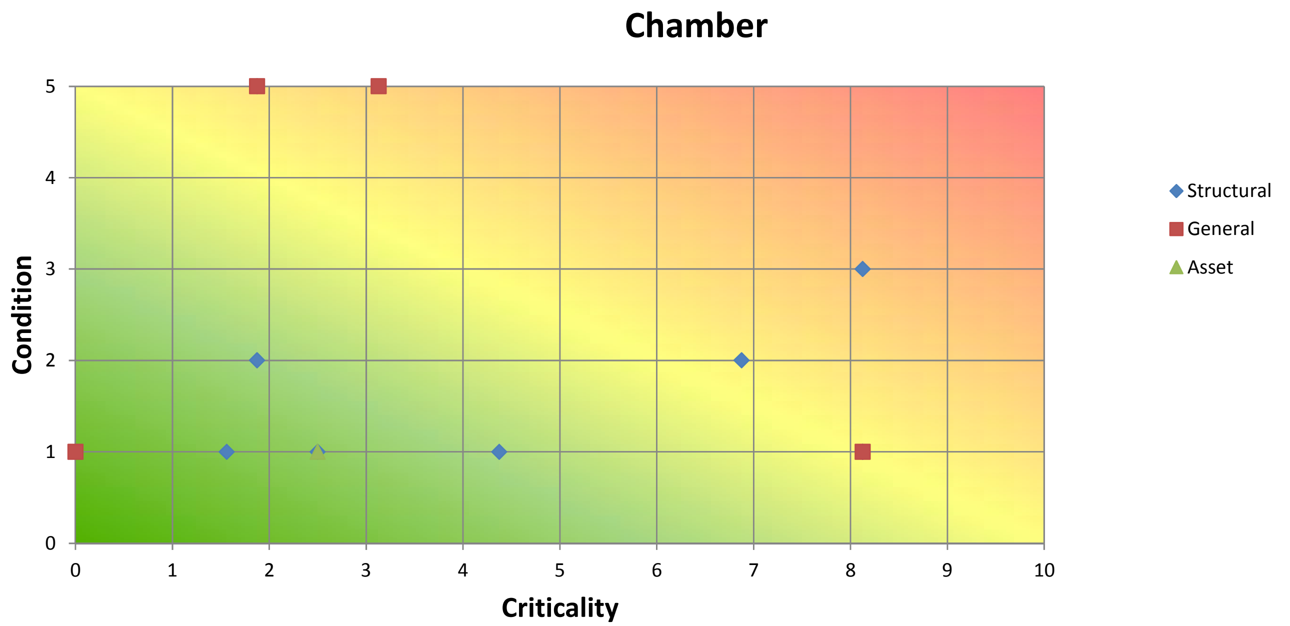
W-VP00000177

City of Winnipeg Asset Name	[redacted]
Feedermain Name	South Ft. Garry
Address of Nearest Building	[redacted]
Feedermain ID	FM024
Easting Northing	[redacted]
Type of chamber Access	
Depth of Chamber	4130
Primary FM Pipe Diameter	750
Smaller Diameter	
Branch Pipes	300 west

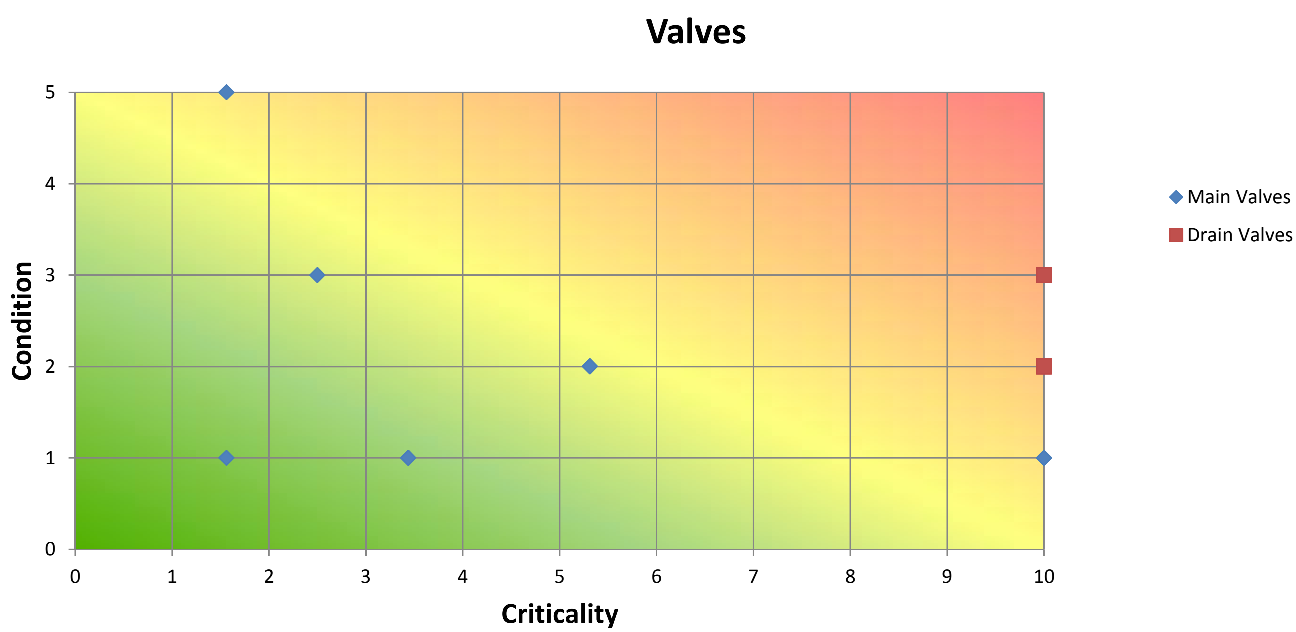
Observations: [redacted]
Actions: replace or refinish valve components, refinish or replace fittings and fasteners, refinish steel beam, repair access, mitigate infiltration
General Comments:







Chamber
Condition
Criticality
0
1
2
3
4
5
6
7
8
9
10
Structural
General
Asset



Valves
Condition
Criticality
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2
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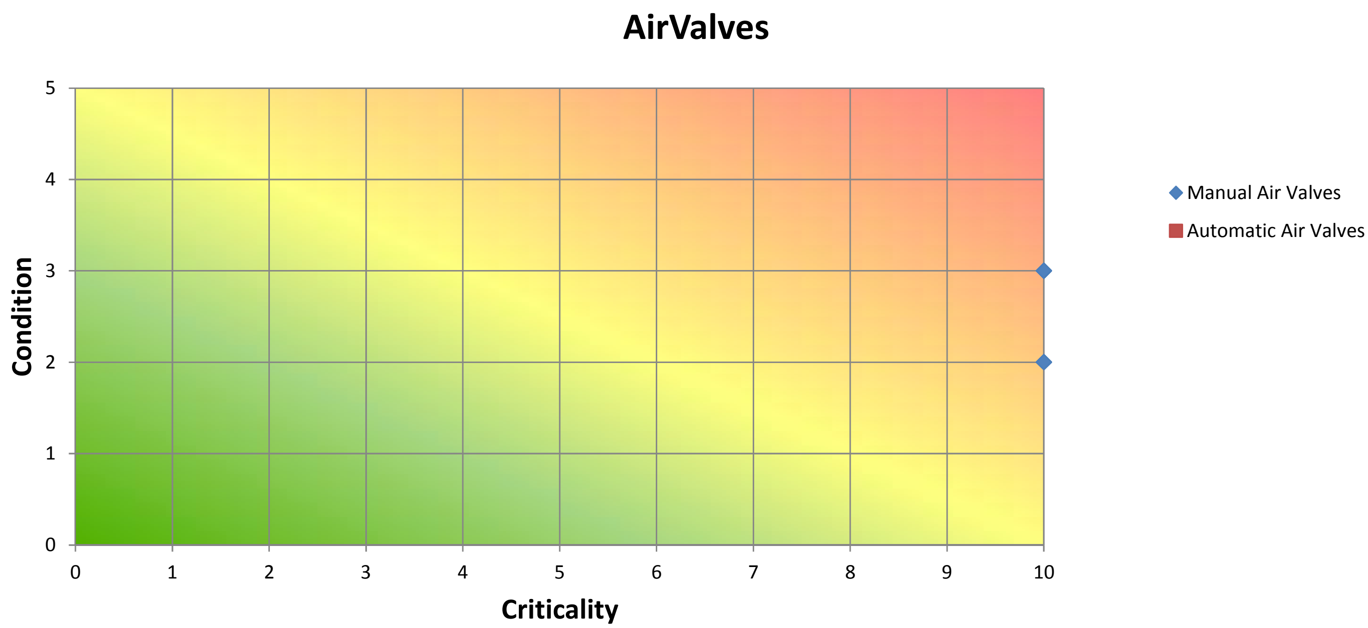
7
8
9
10
Main Valves
Drain Valves


AirValves
Condition
Criticality
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2
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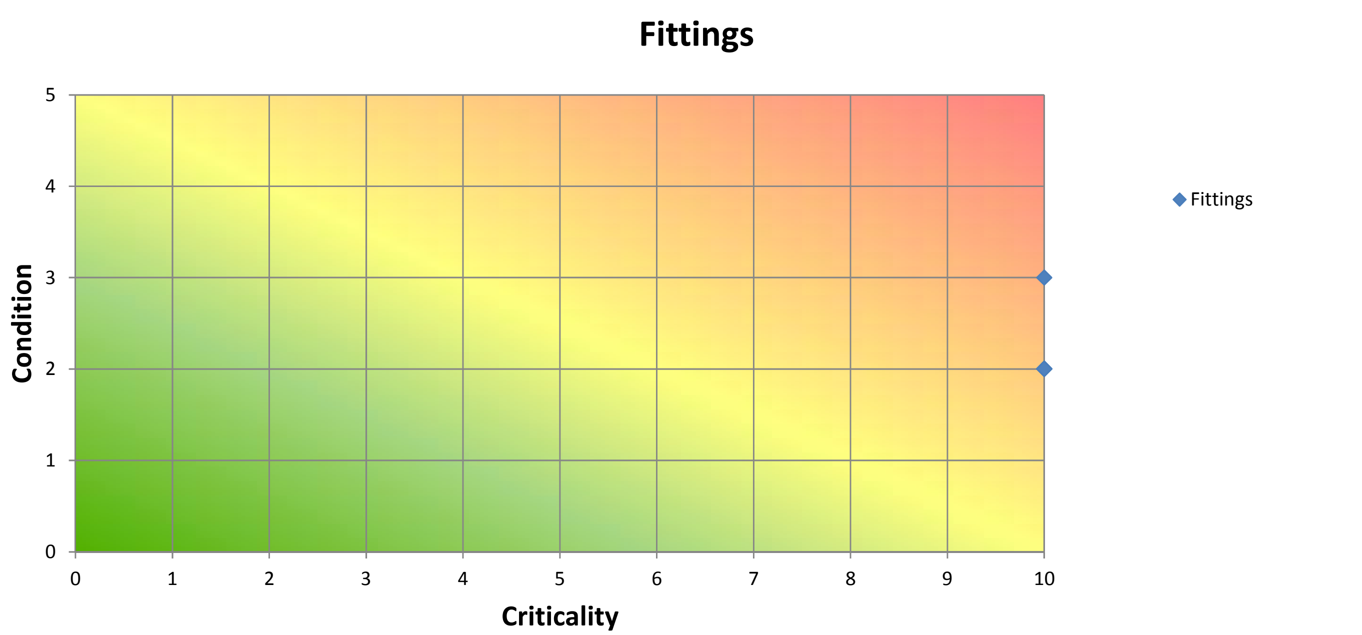
4
5
6
7
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
Criticality
0
1
2
3
4
5
6
7
8
9
10
Fittings

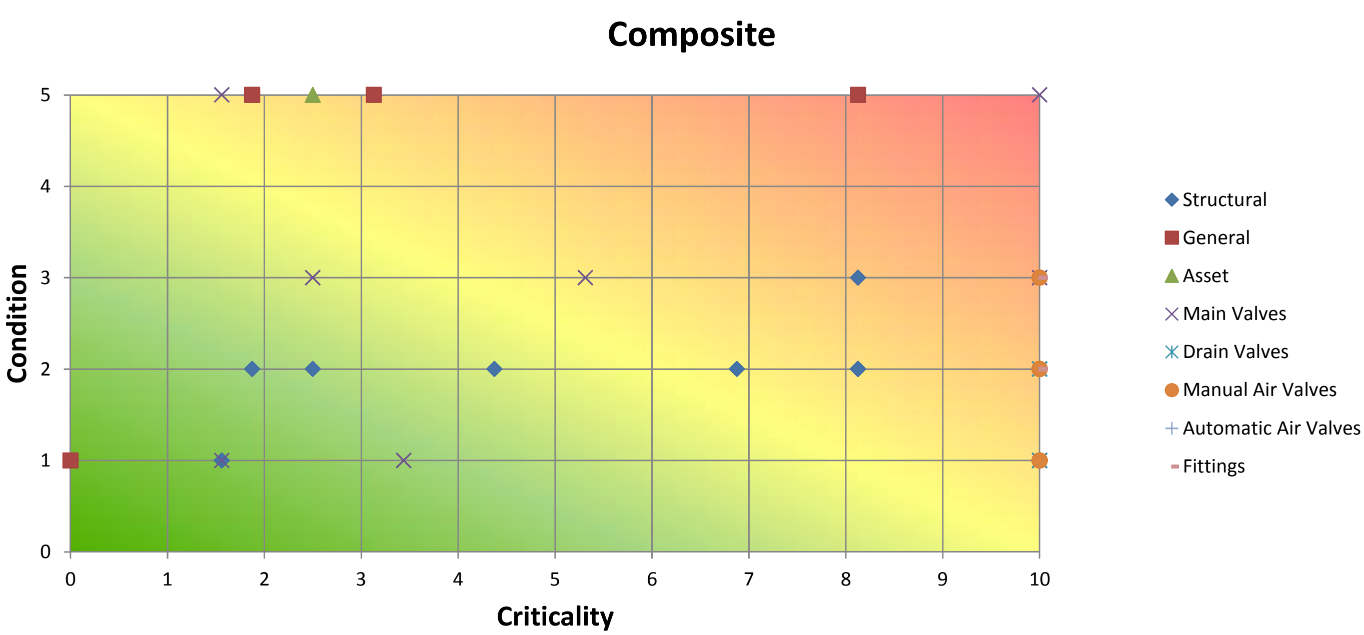
W-VP00000179

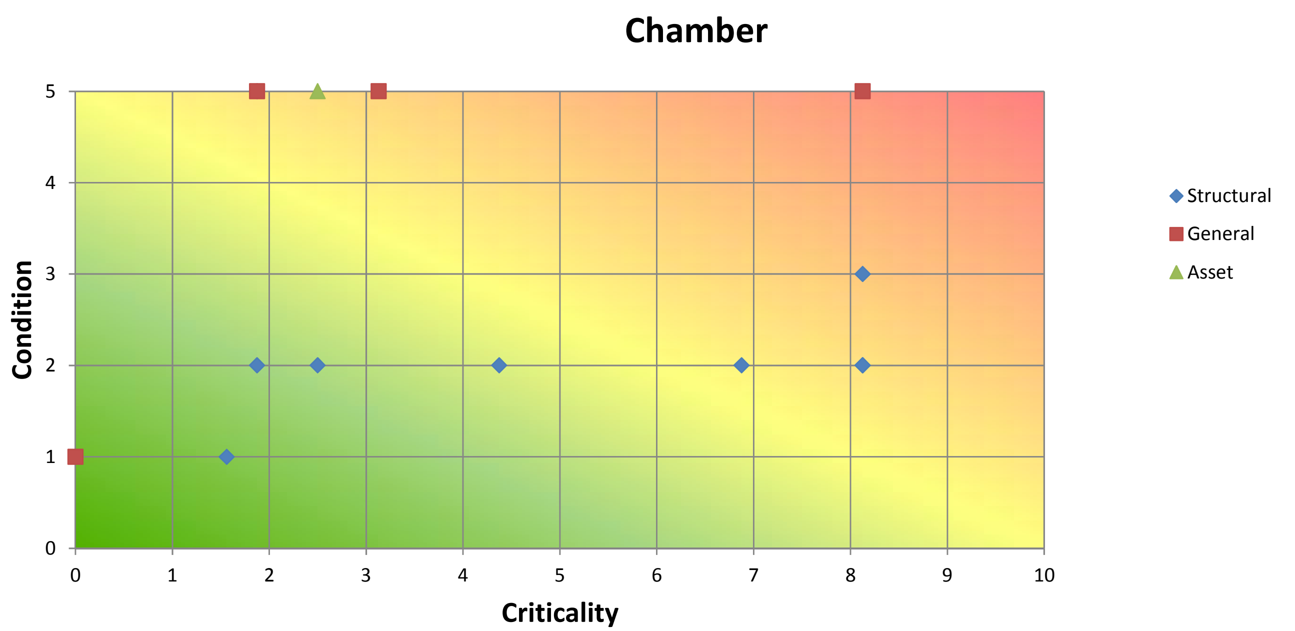
City of Winnipeg Asset Name	
Feedermain Name	Lagimodiere
Address of Nearest Building	
Feedermain ID	FM020
Easting Northing	
Type of chamber Access	
Depth of Chamber	4800
Primary FM Pipe Diameter	600
Smaller Diameter	
Branch Pipes	400 East, 300 West

Observations:

Actions:
replace or refinish valve components, refinish or replace fittings and fasteners, refinish steel, mitigate infiltration, inspect main line valve operational condition

General Comments:
Chamber includes pressure monitoring equipment.




Chamber
Condition
Criticality
0
1
2
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4
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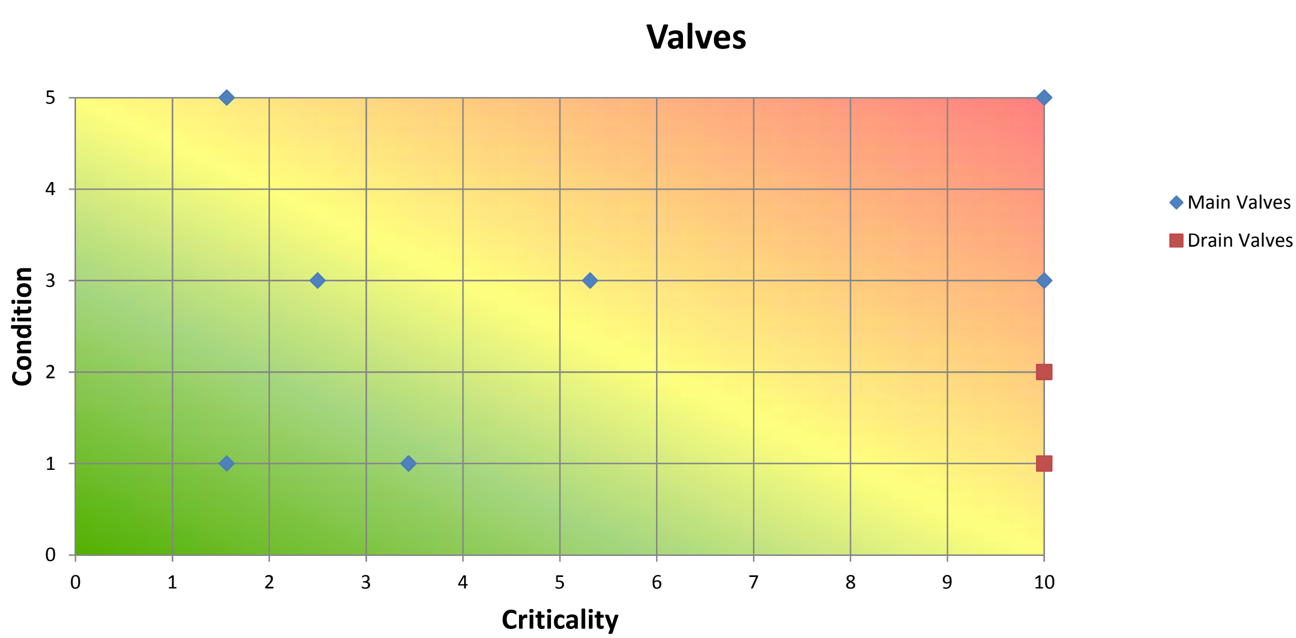
0
1
2
3
4
5
6
7
8
9
10
Structural
General
Asset


Valves
Condition
Criticality
0
1
2
3
4
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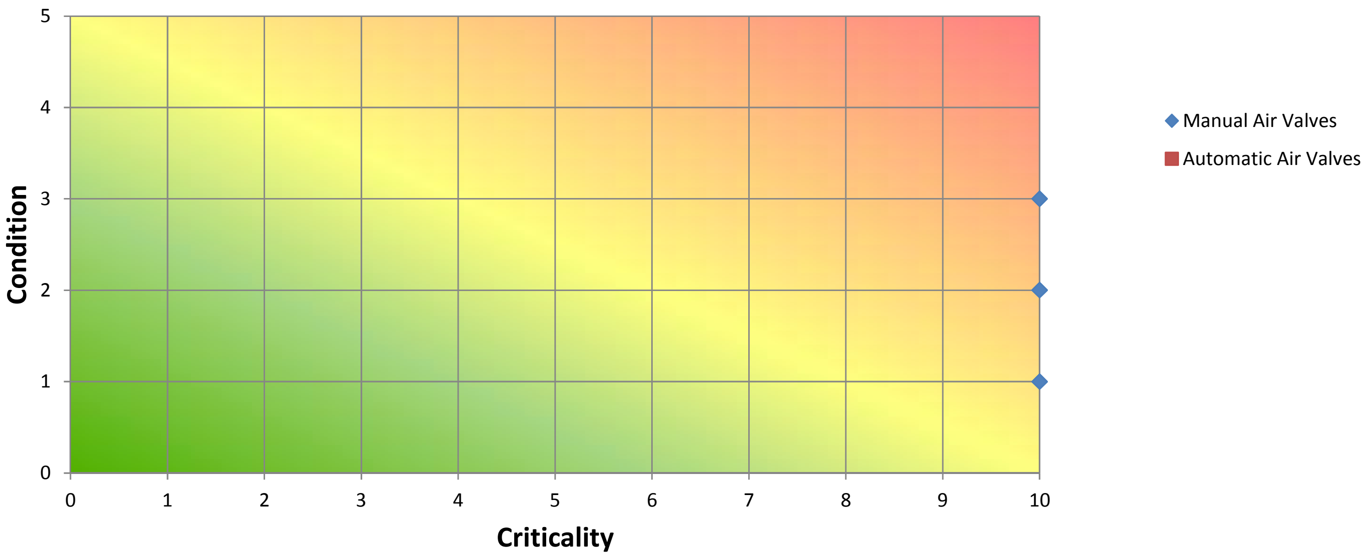
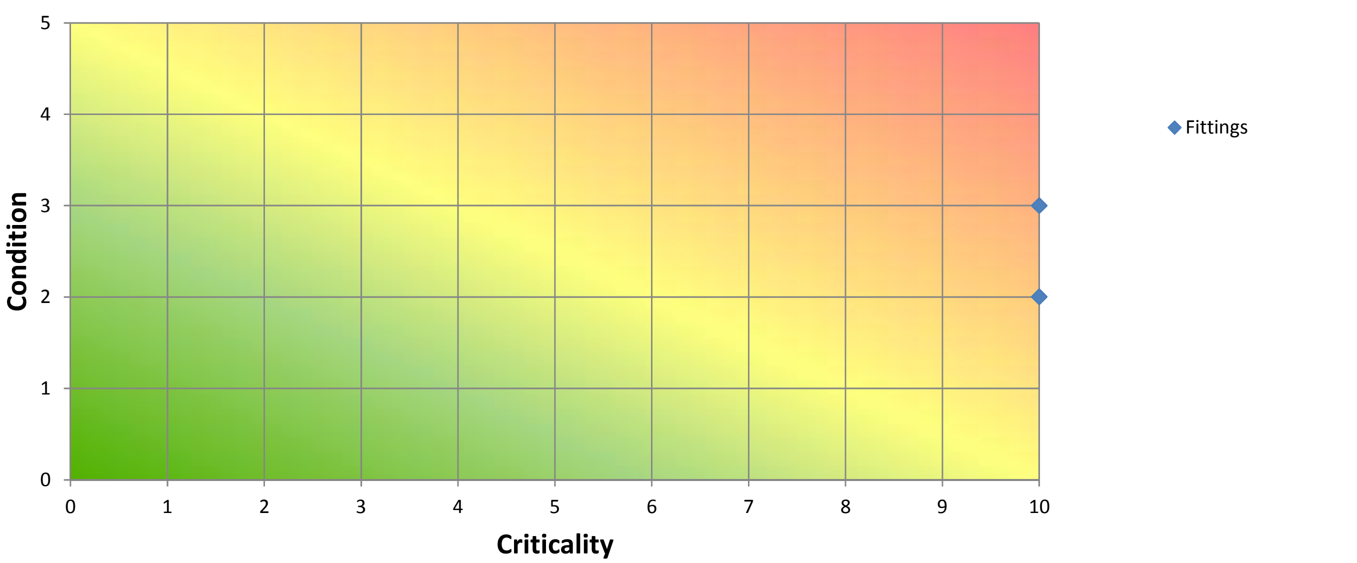
0
1
2
3
4
5
6
7
8
9
10
Main Valves
Drain Valves

AirValves



Fittings



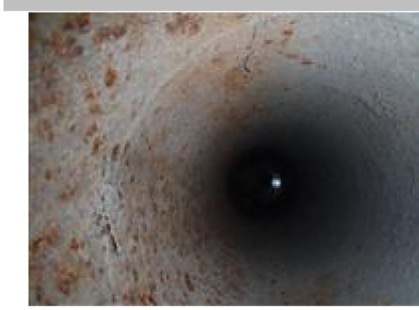
W-VP00000195

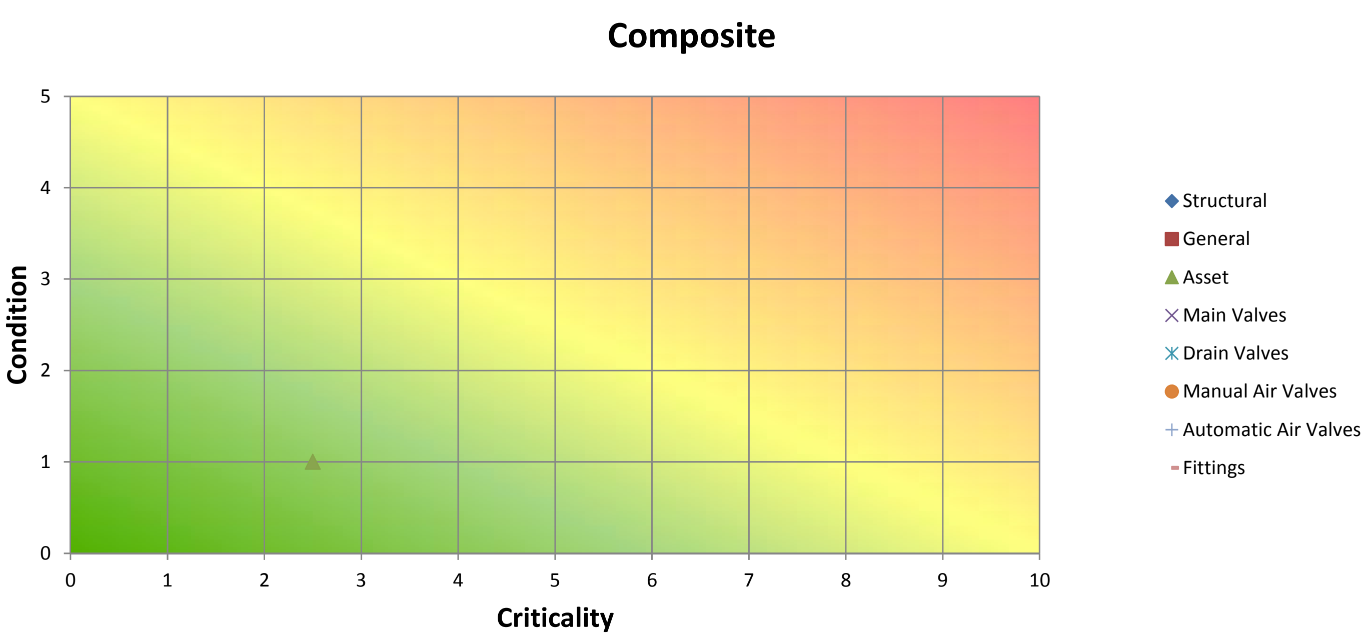
City of Winnipeg Asset Name	[redacted]
Feedermain Name	North Kildonan
Address of Nearest Building	[redacted]
Feedermain ID	FM011
Easting Northing	[redacted]
Type of chamber Access	
Depth of Chamber	
Primary FM Pipe Diameter	
Smaller Diameter	
Branch Pipes	

Observations:
[redacted]

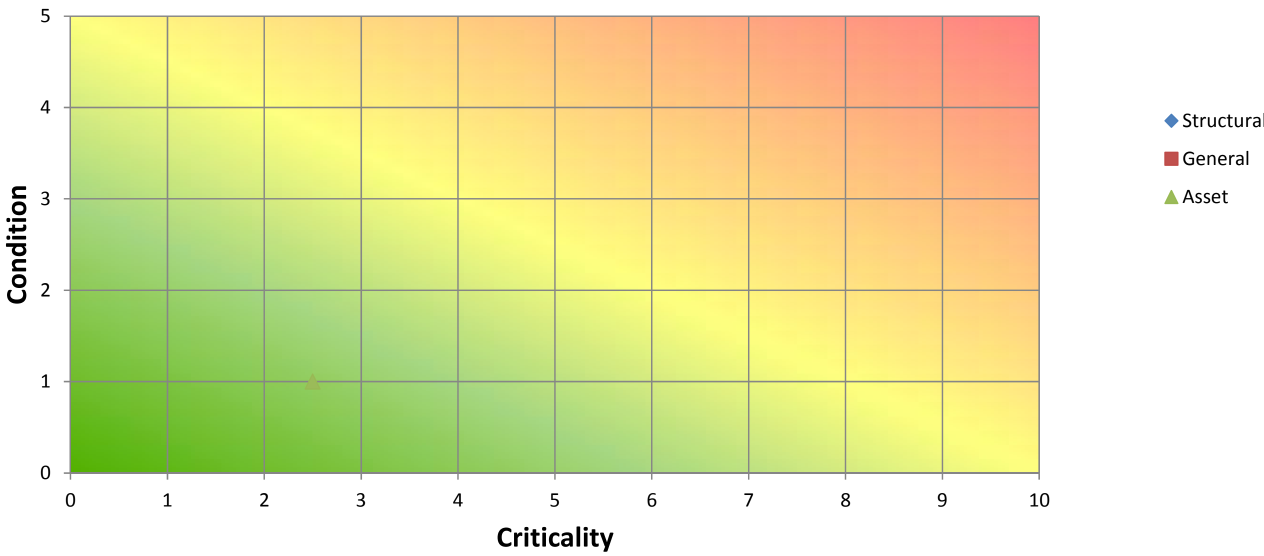
Actions:
determine blow off pipe status, repair valve box

General Comments:





Chamber



5
4
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1
0
Condition
0
1
2
3
4
5
6
7
8
9
10
Criticality
Structural
General
Asset

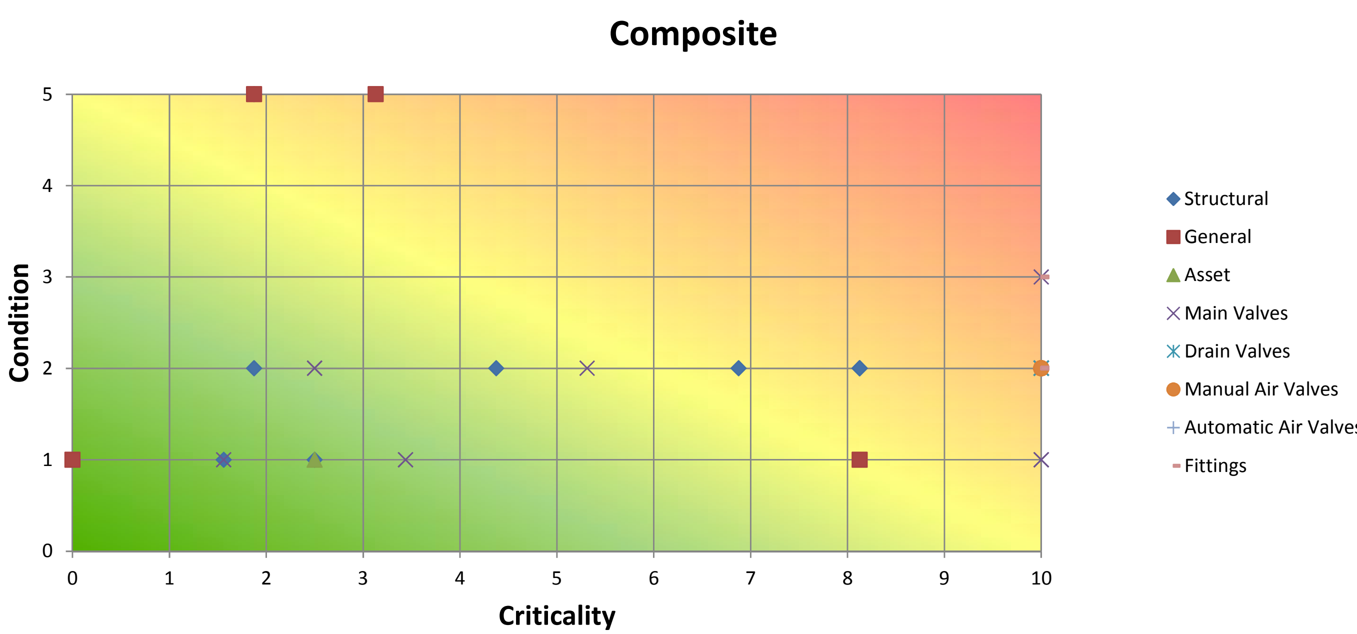
W-VP00000568

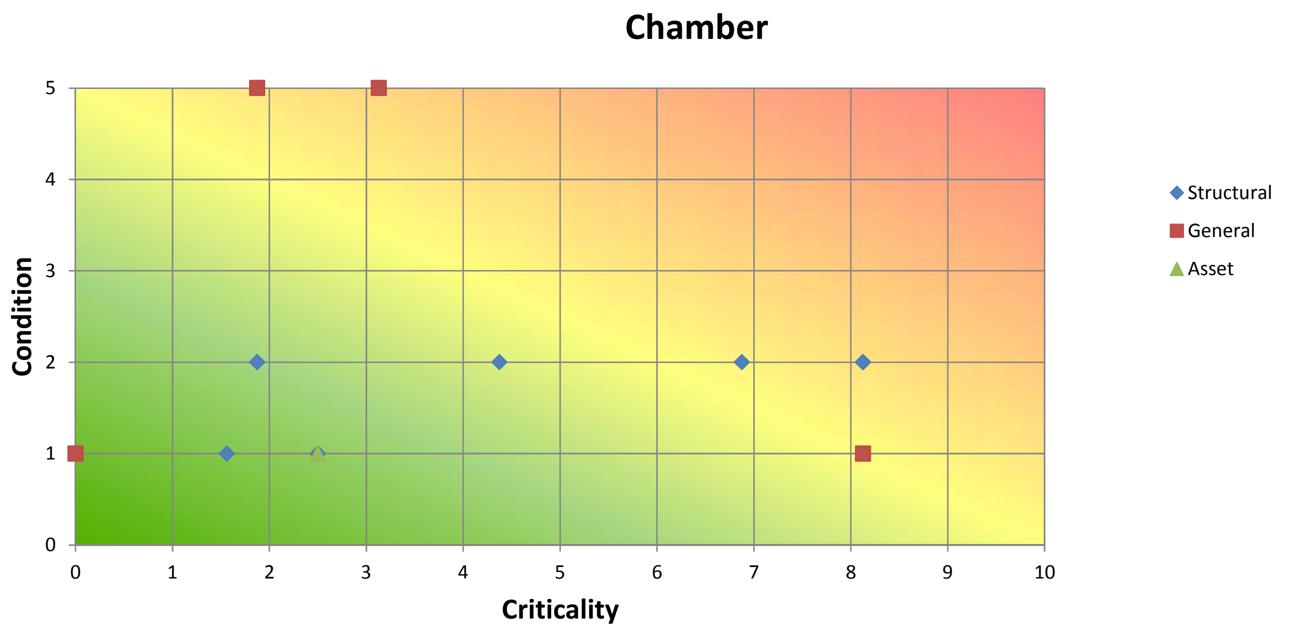
City of Winnipeg Asset Name	
Feedermain Name	Ft. Garry / St. Vital
Address of Nearest Building	
Feedermain ID	FM023
Easting Northing	
Type of chamber Access	
Depth of Chamber	4400
Primary FM Pipe Diameter	600
Smaller Diameter	
Branch Pipes	300 - North

Observations:

Actions:
replace or refinish valve components, refinish or replace fittings and fasteners, mitigate infiltration

General Comments:




Chamber
Condition
Criticality
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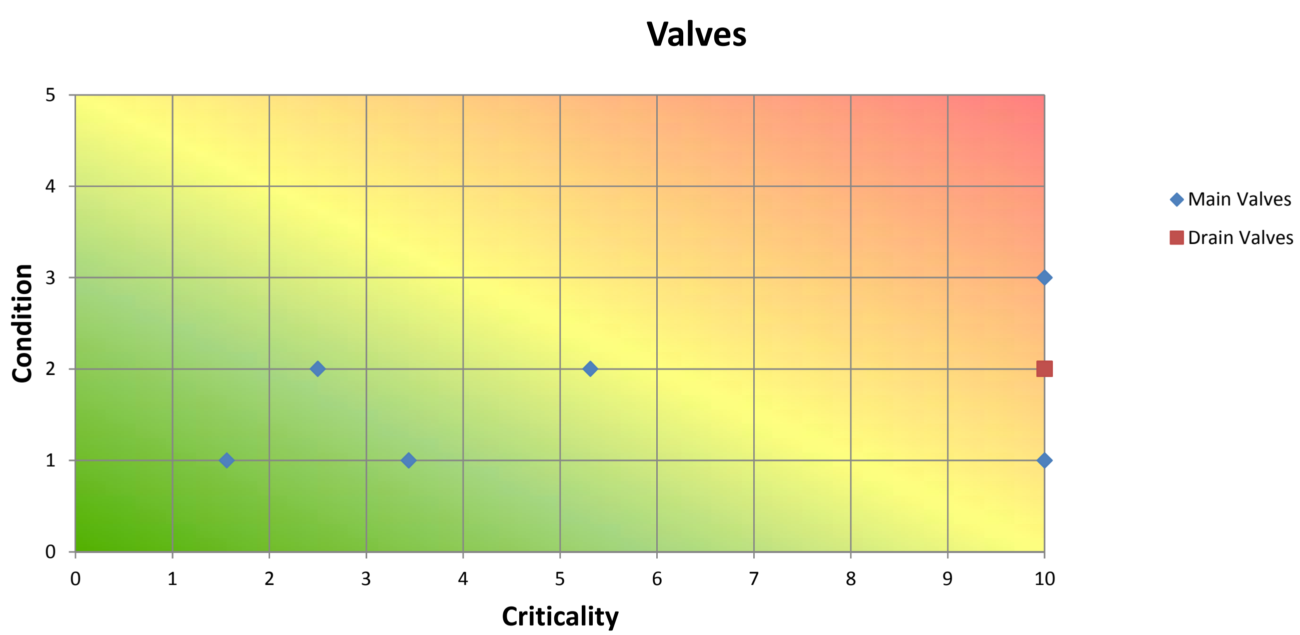
4
5
0
1
2
3
4
5
6
7
8
9
10
Structural
General
Asset


Valves
Condition
Criticality
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2
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8
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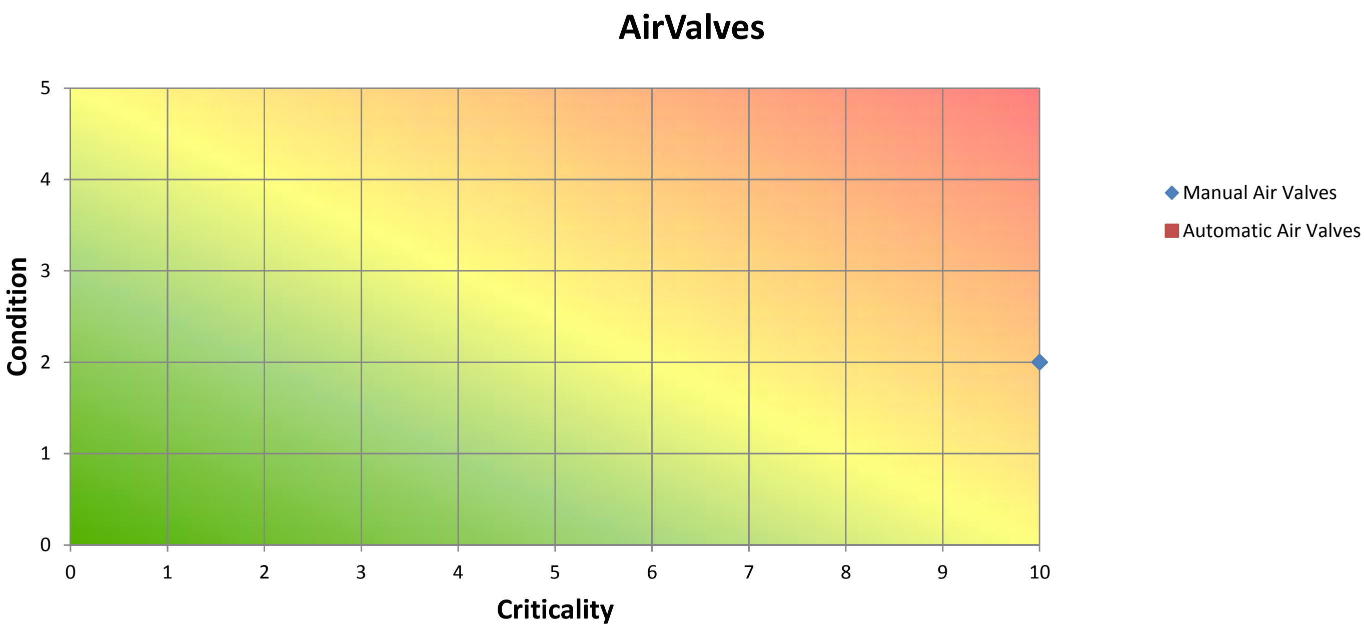
10
Main Valves
Drain Valves


AirValves
Condition
Criticality
0
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3
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5
0
1
2
3
4
5
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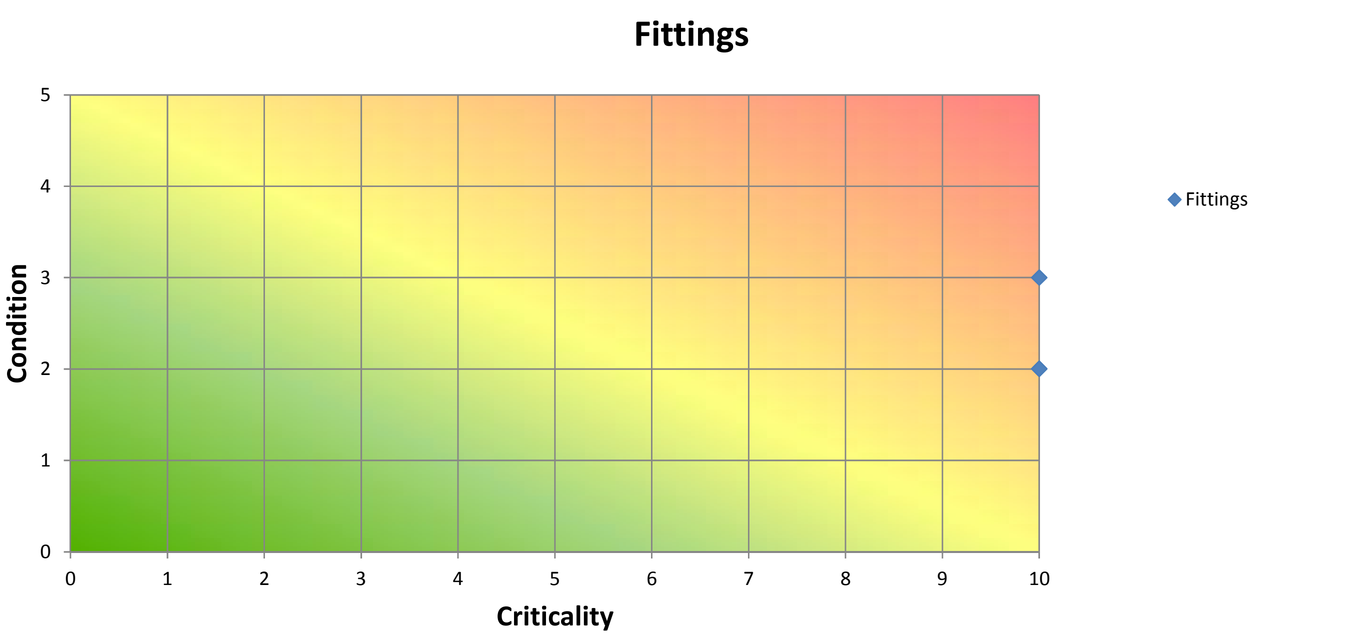
7
8
9
10
Manual Air Valves
Automatic Air Valves


Fittings
Condition
Criticality
0
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2
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4
5
0
1
2
3
4
5
6
7
8
9
10
Fittings

D2b Automatic Air Relief Valves 2015 03 04

Branch I Aqueduct Automatic Air Release Valves

Air Valve or Pressure MH#	Location	Remarks	Dated Checked	Checked By
#102 Air Realease Valve		- 33" Lid - 2"blowoff GV		
#103 Pressure MH		- 33" Lid - No blowoff		
#104 Pressure MH		- 33" Lid - No blowoff		
#105 Air Realease Valve		- 33" Lid - 2"blowoff GV		
#106 Pressure MH		- 33" Lid - No blowoff		
#107 Pressure MH		- 33" Lid - No blowoff		
#108 Air Realease Valve		- 33" Lid - 2"blowoff GV		
#109 Automatic Air Realease Valve		- 33" Lid -1-6" - 8 hole GV & Tee, -1-3"-4 hole GV		
TBV Pit Automatic Air Realease Valve		Info Required		
#114 Automatic Air Realease Valve		33" Lid 1-8" - 8 hole GV New Airvalve installed summer 2006 Loader to lift cover		

#116 Automatic Air Realease Valve		33" Lid 1-8" - 8 hole GV New Airvalve installed summer 2006 Loader to lift cover		
#118 Air Realease Valve		33" Lid 1-8" - 8 hole GV New Airvalve installed summer 2006 Loader to lift cover		
#125 Air Realease Valve		24" Lid 1-2" Blowoff GV 1-6" Blowoff GV		
#126 Air Realease Valve		2-2" BVBlowoff		
#127 Air Realease Valve		2-2" BVBlowoff		
#137 Automatic Air Realease Valve		33" Lid 1-8" - 8 hole GV New Airvalve installed summer 2006 Loader to lift cover		
#163 Automatic Air Realease Valve		New Automatic Air release valve chamber built 2006, Floodway expansion Project		
		New Automatic Air release valve chamber built 2006, Floodway expansion Project		
		New Automatic Air release valve chamber built 2006, Floodway expansion Project		
#157 Air Realease Valve		1-2"GV Blowoff Requires Crazy Wrench		

Branch II Aqueduct Automatic Air Release Valves

Valve #	Location	Dated Checked
1	[redacted]	
2		
3		
4		
5		
6		
7		
8		

Branch ii Aqueduct Air Blowoffs

Valve #	Location	
1	[redacted]	
2		

D2c Inoperable Valves List

Inoperable Values List

Service Request Status	Service Request No	Created Date	Problem Street Name	Problem Description
ACTIVE	1325423	1/25/2014 13:24		
ACTIVE	1324904	1/20/2014 11:45		
ACTIVE	1296185	6/25/2013 10:43		
ACTIVE	1294204	6/12/2013 12:03		
ACTIVE	1291811	5/28/2013 11:45		
ACTIVE	1291482	5/25/2013 16:08		
ACTIVE	1252152	6/19/2012 16:36		
ACTIVE	1248521	5/21/2012 14:37		
ACTIVE	1198816	2/16/2011 16:30		
ACTIVE	1136888	6/20/2009 16:05		

Inoperable Values List

Service Request Status	Service Request No	Created Date	Problem Street Name	Problem Description
ACTIVE	1123062	3/13/2009 17:01		
ACTIVE	933060	6/22/2007 8:59		
ACTIVE	717558	6/17/2005 8:41		

AECOM

D3 Hydraulic Modeling of Distribution System

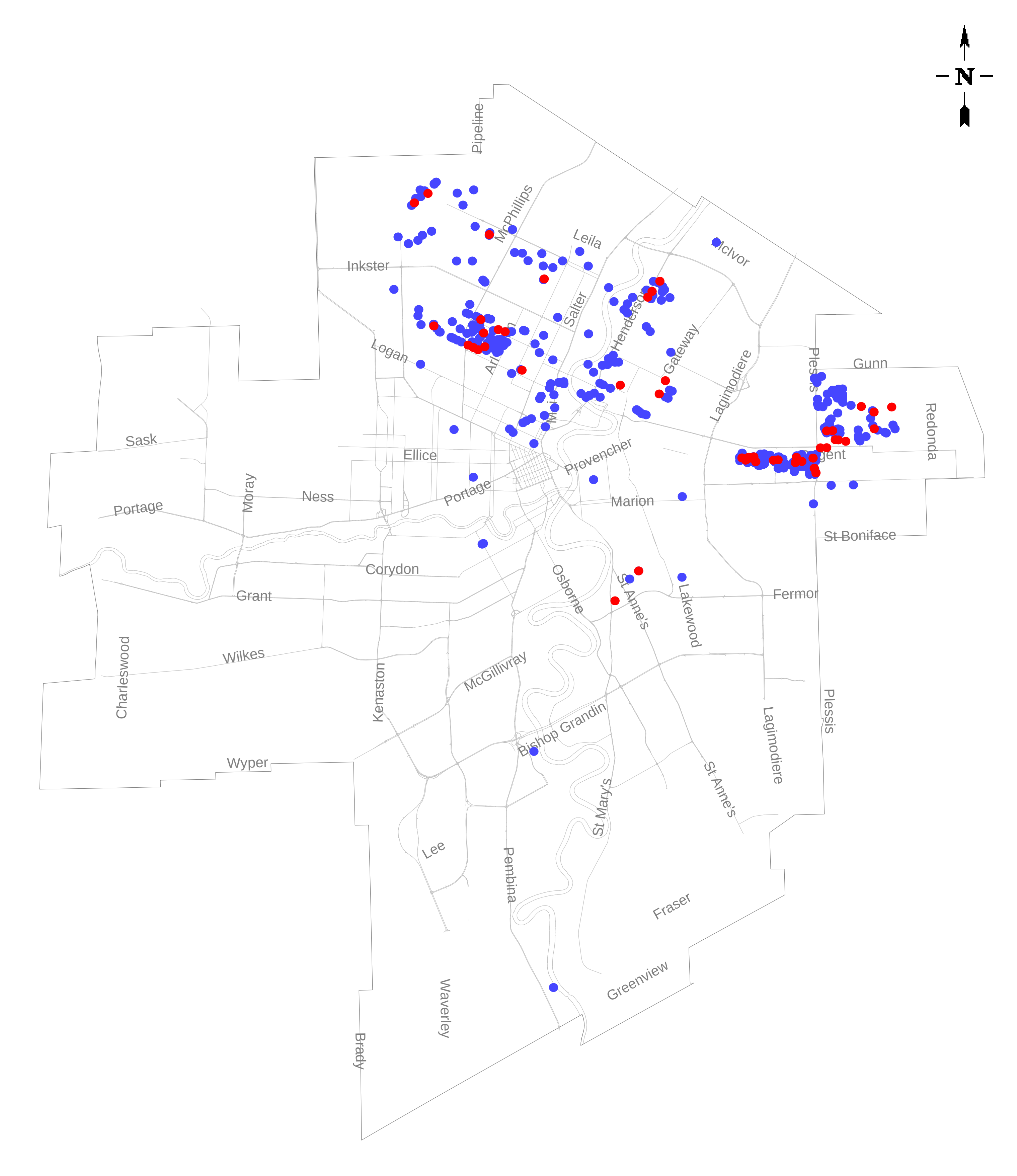
D3a Results from EPANET Model Trace Analysis for January 26, 2015 Sampling

This section has been intentionally removed.

D3b Results from EPANET Water Age Analysis for January 26, 2015 Sampling

This section has been intentionally removed.

D3c Discoloured Water 311 Calls from January 18, 2015



MAP LEGEND

- Service Requests (SRs)
- Information Requests (IRs)

Winnipeg

WATER AND WASTE DEPARTMENT
WATER SERVICES DIVISION

CREATED: Jan 22, 2015	SCALE: 1:150,000

Discoloured Water Calls
for January 18, 2015

D3d Hydraulic Model Analysis for October 7, 2013 Distribution Sampling

This section has been intentionally removed.

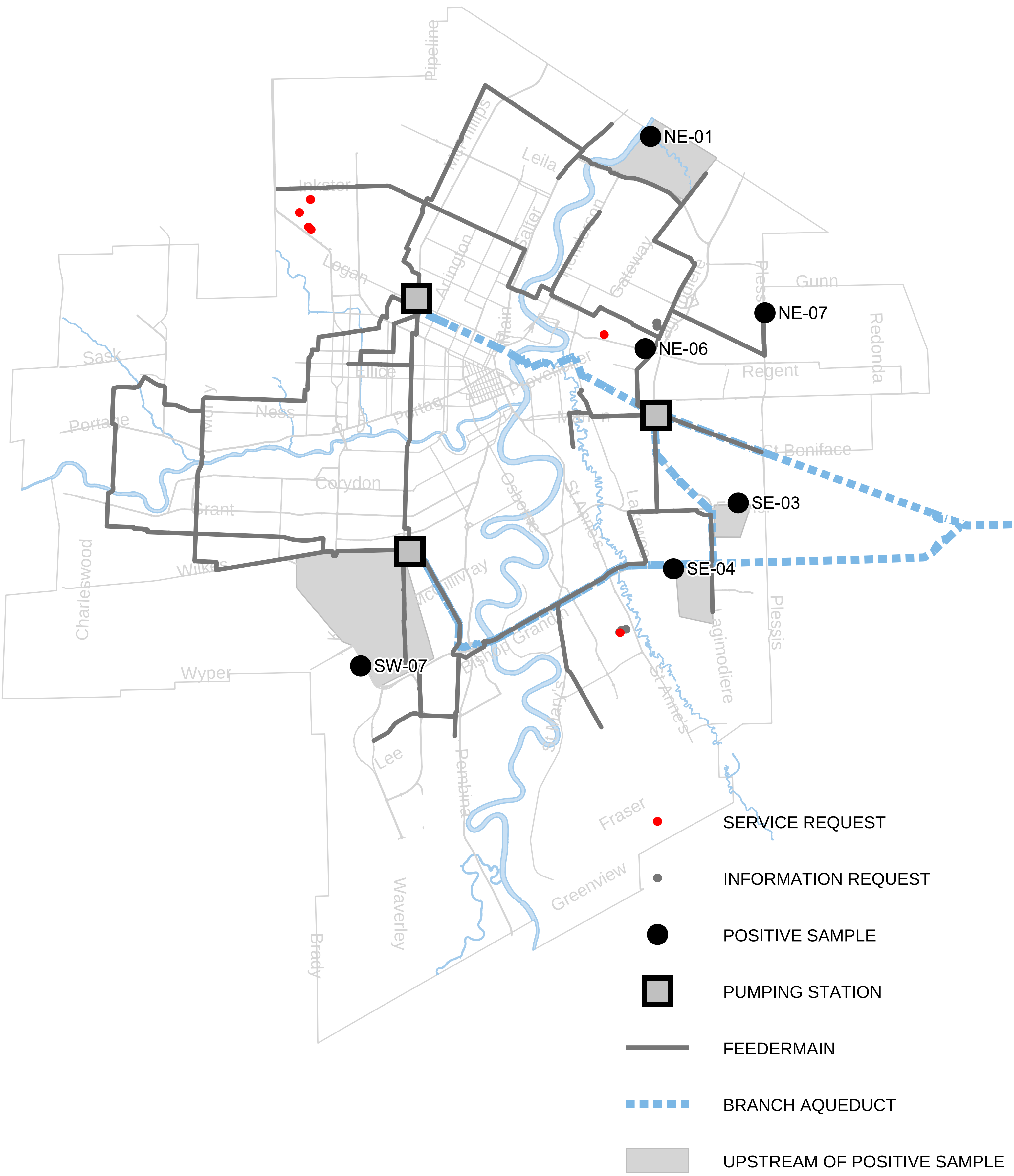
D3e Hydraulic Model Analysis for May 26, 2014 Distribution Sampling

This section has been intentionally removed.

D4 Day-By Day Discoloured Water Call Maps Jan 12-Jan 26, 2015

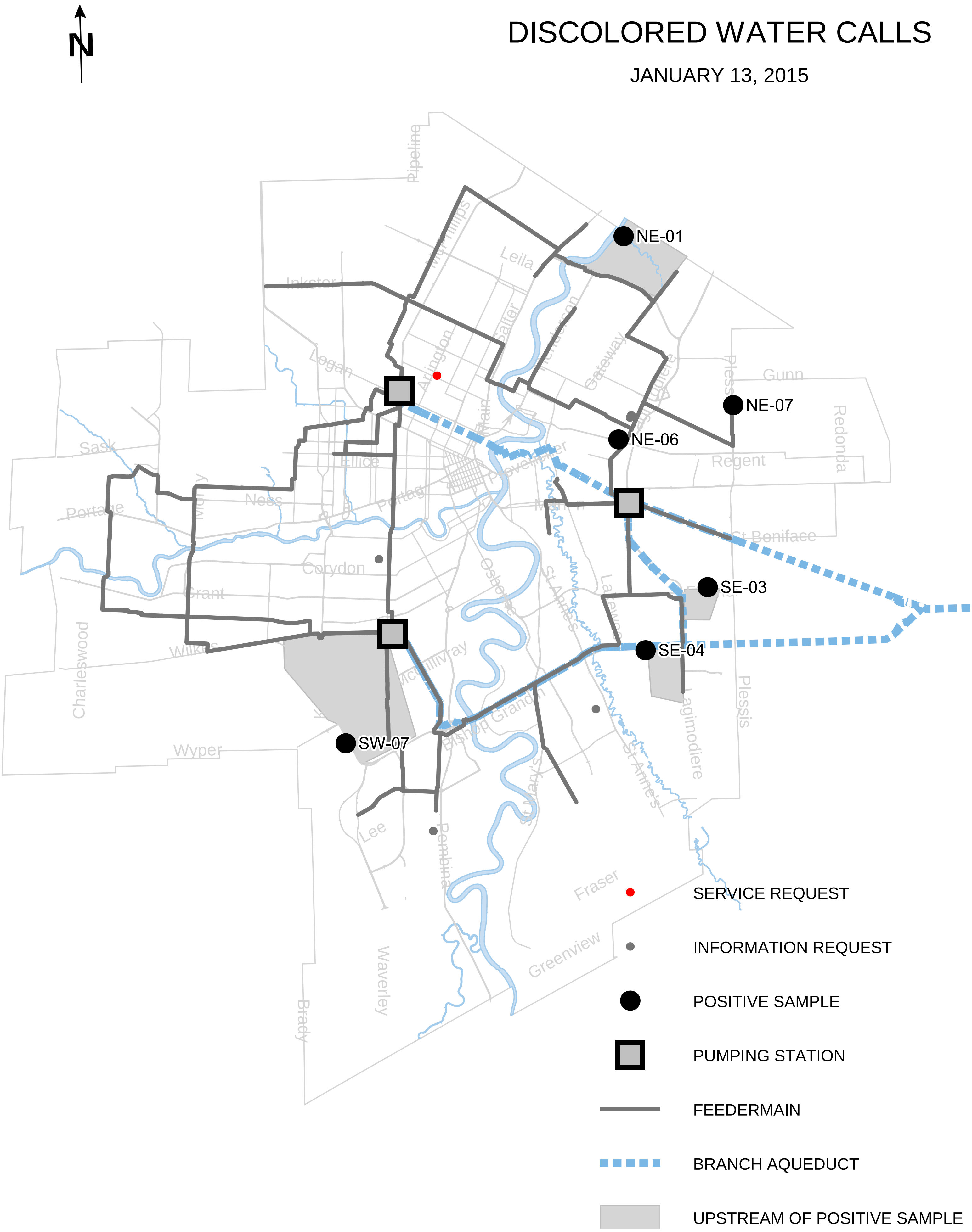
DISCOLORED WATER CALLS

JANUARY 12, 2015



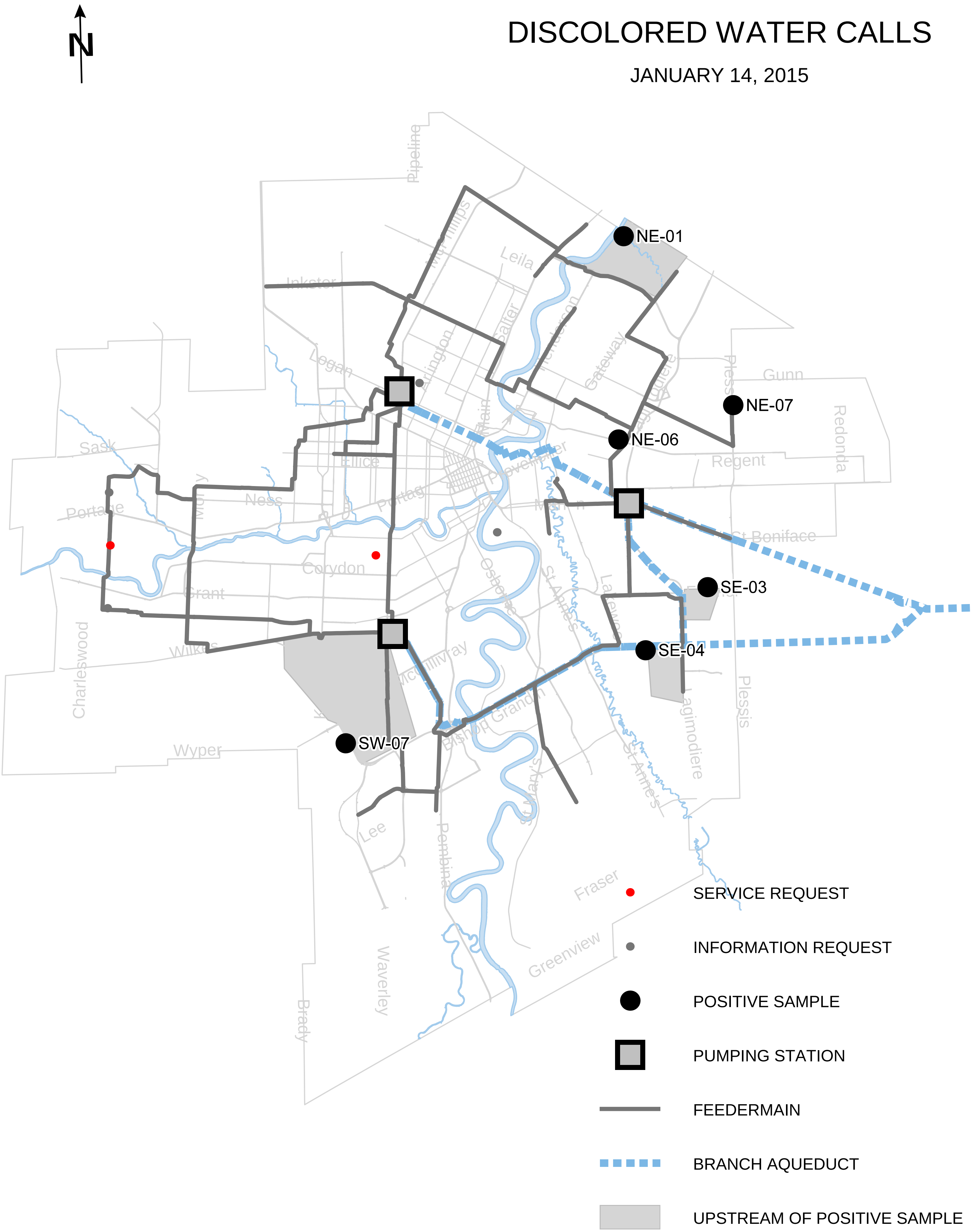
DISCOLORED WATER CALLS

JANUARY 13, 2015



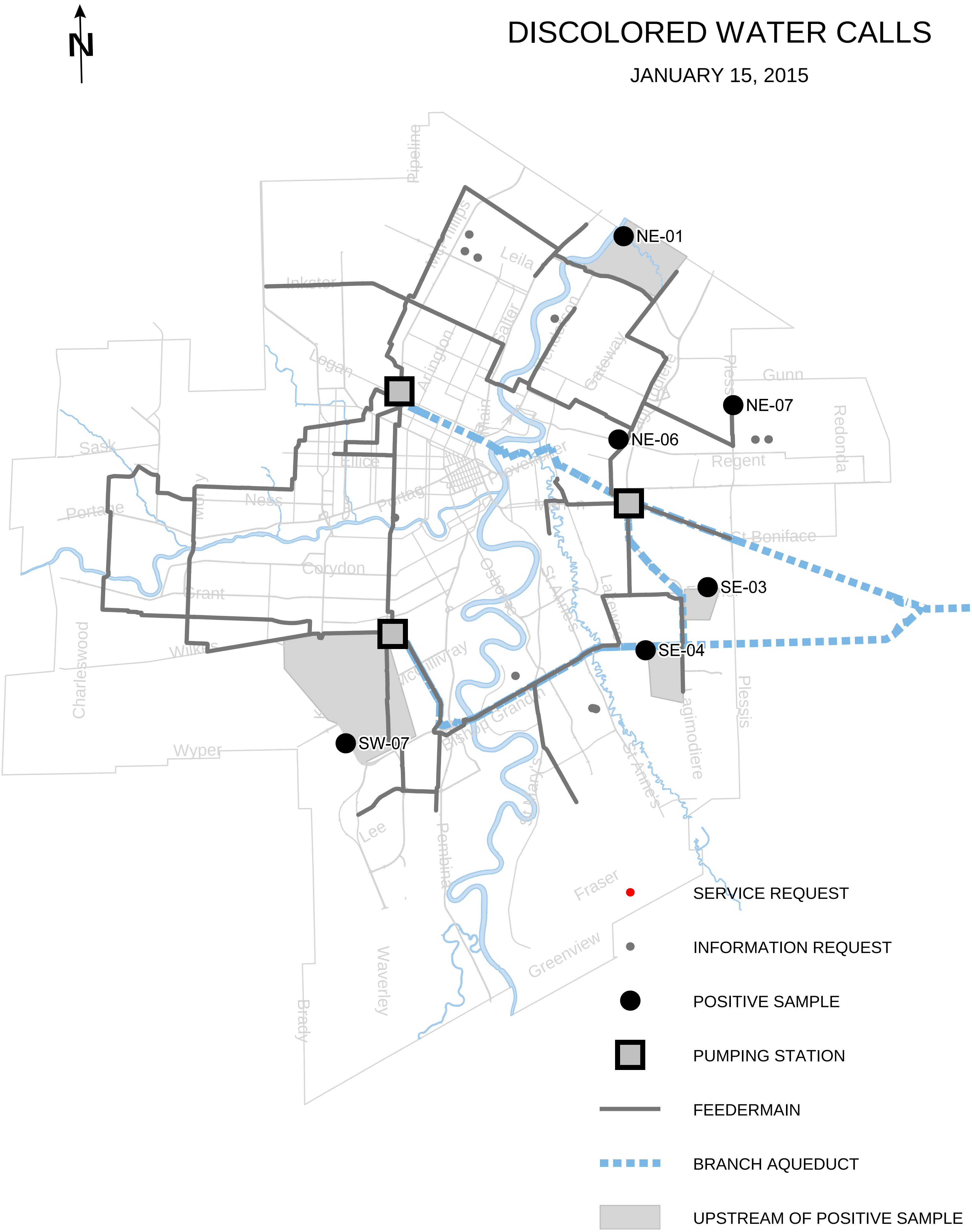
DISCOLORED WATER CALLS

JANUARY 14, 2015



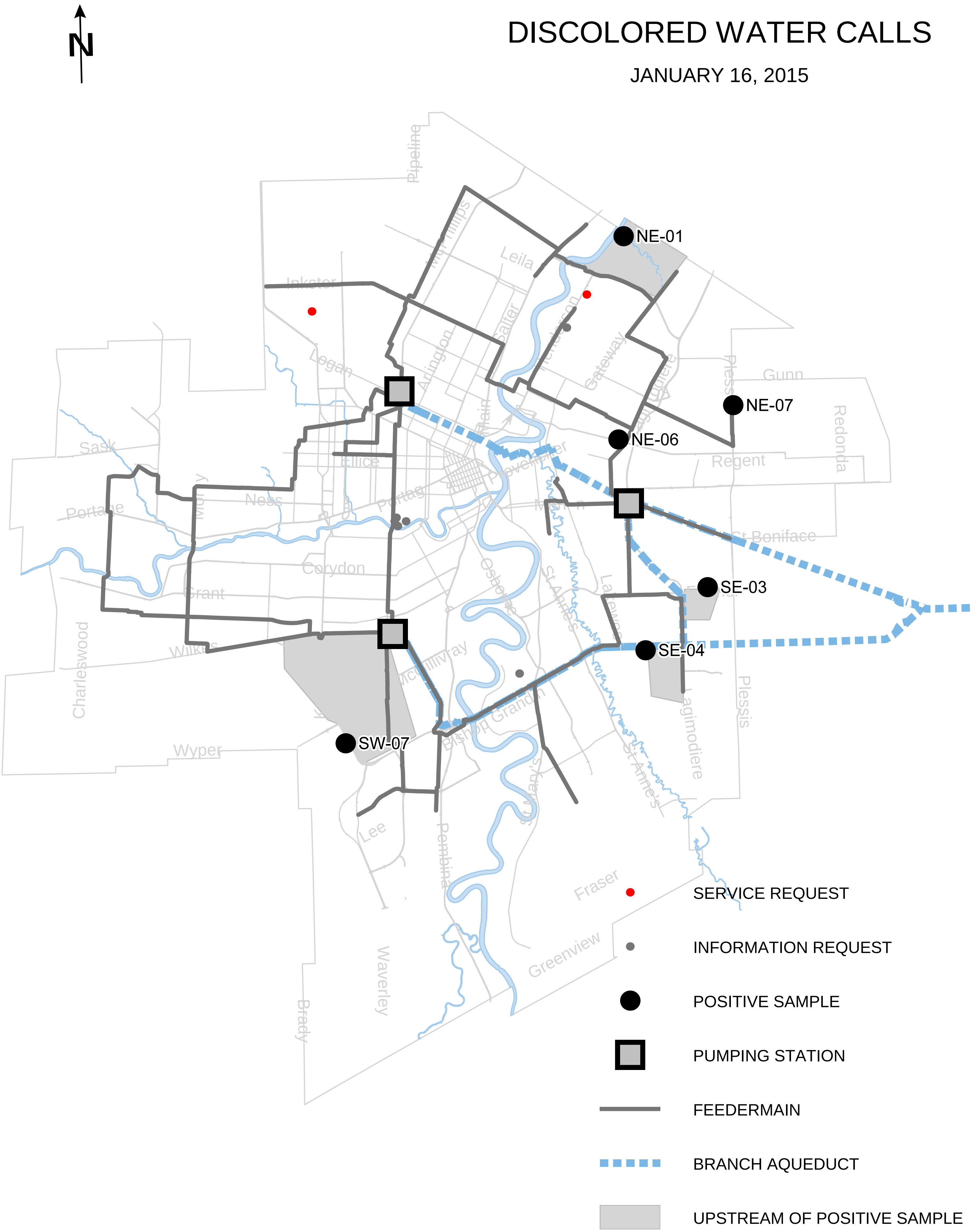
DISCOLORED WATER CALLS

JANUARY 15, 2015



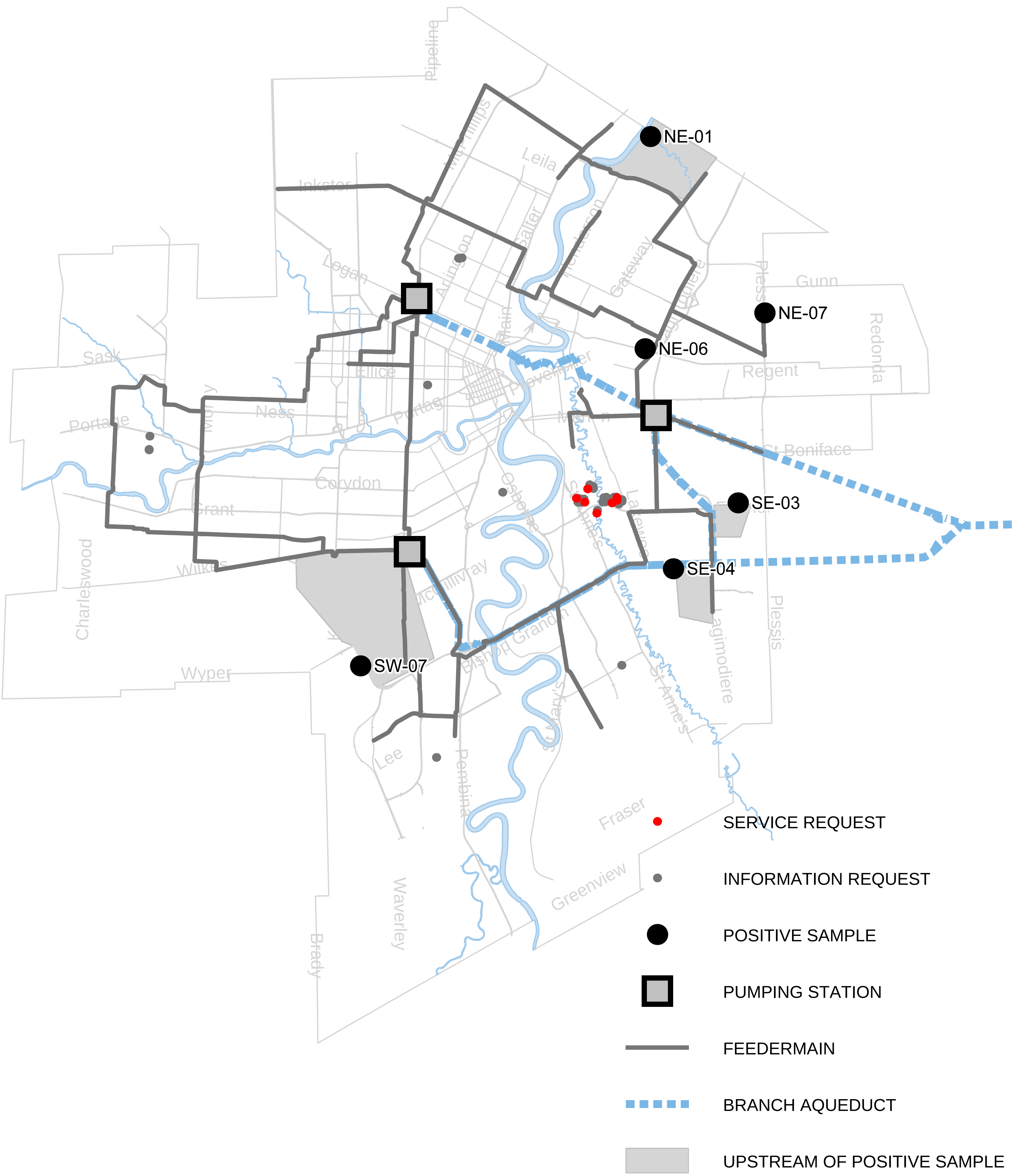
DISCOLORED WATER CALLS

JANUARY 16, 2015



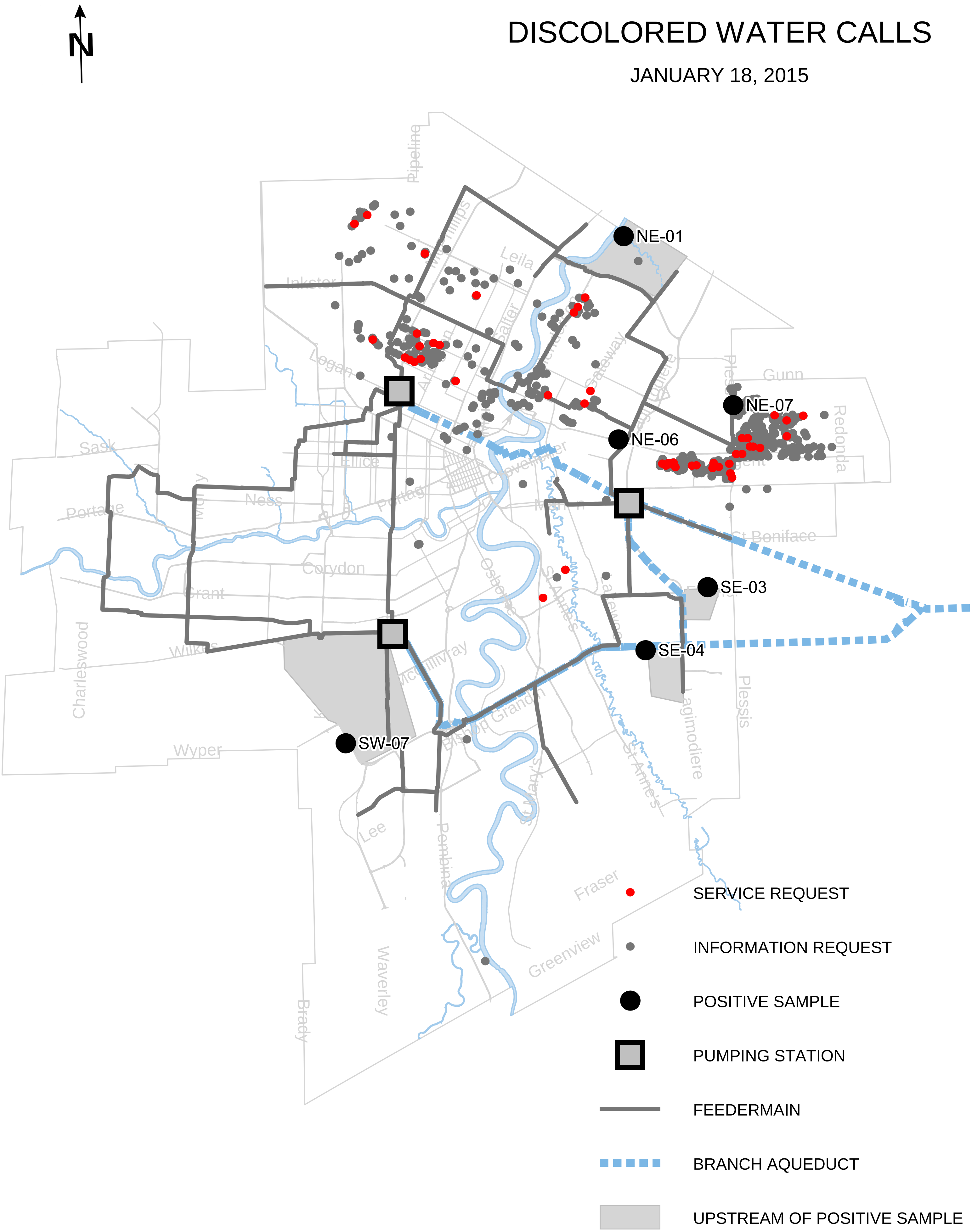
DISCOLORED WATER CALLS

JANUARY 17, 2015



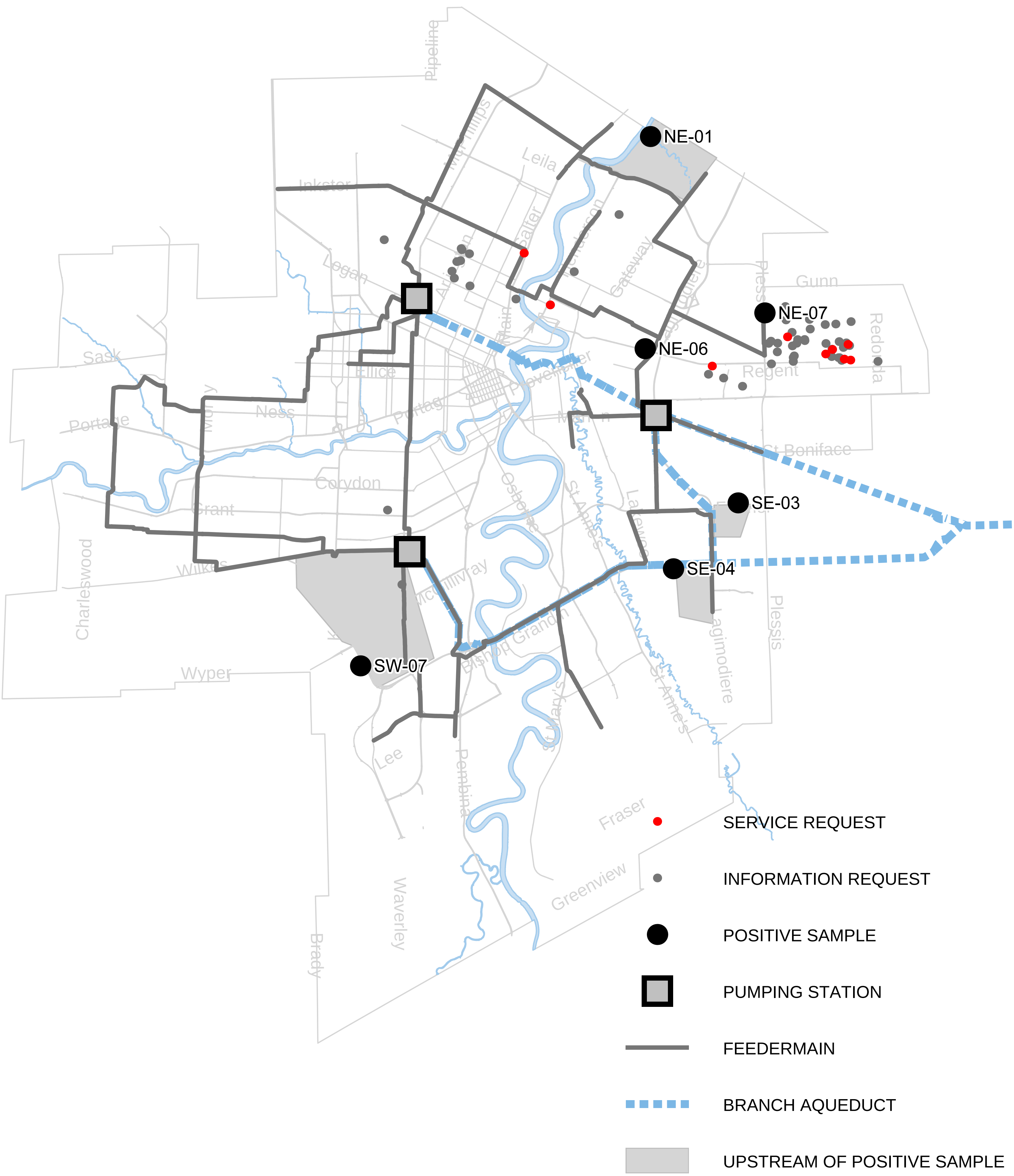
DISCOLORED WATER CALLS

JANUARY 18, 2015



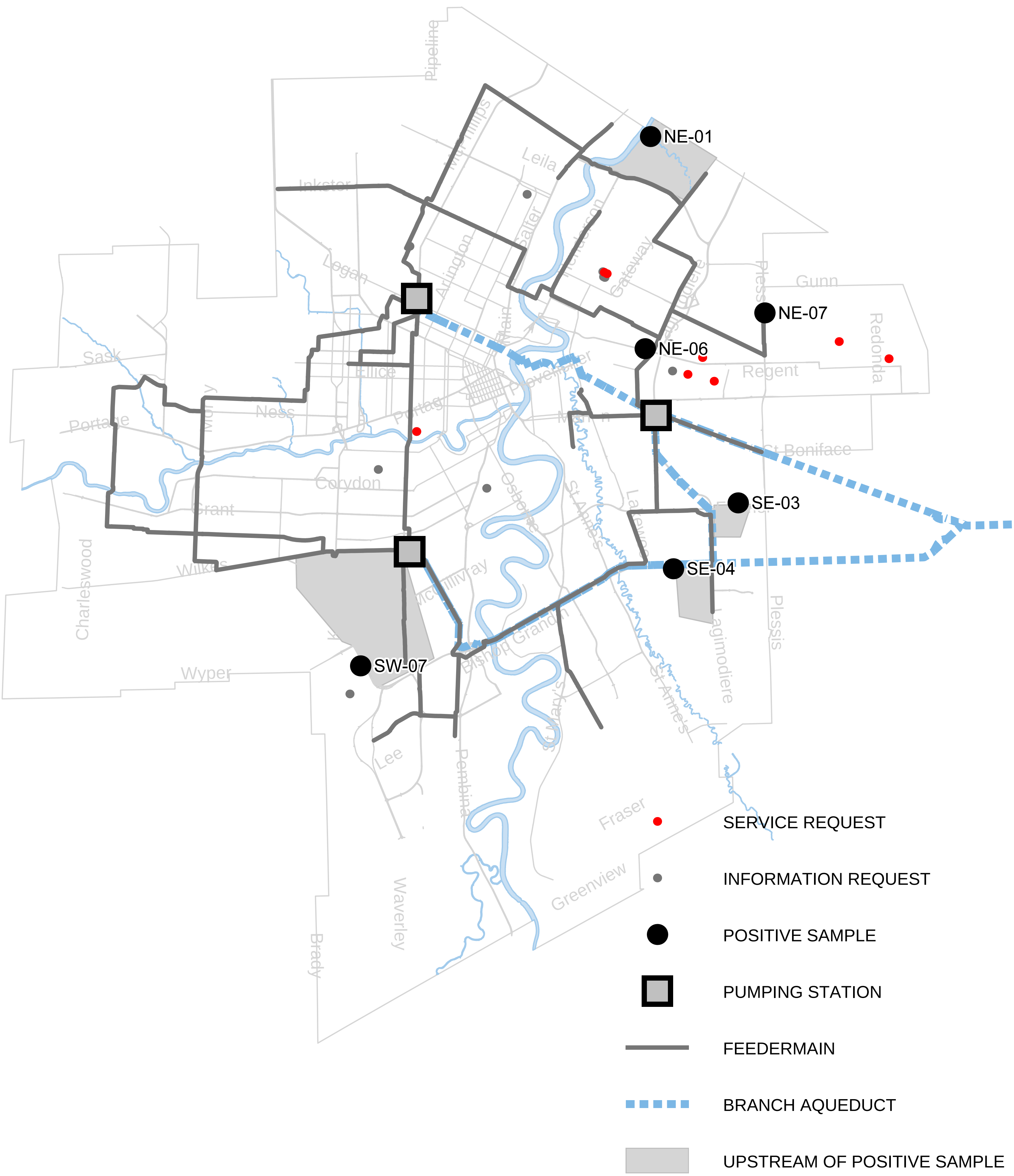
DISCOLORED WATER CALLS

JANUARY 19, 2015



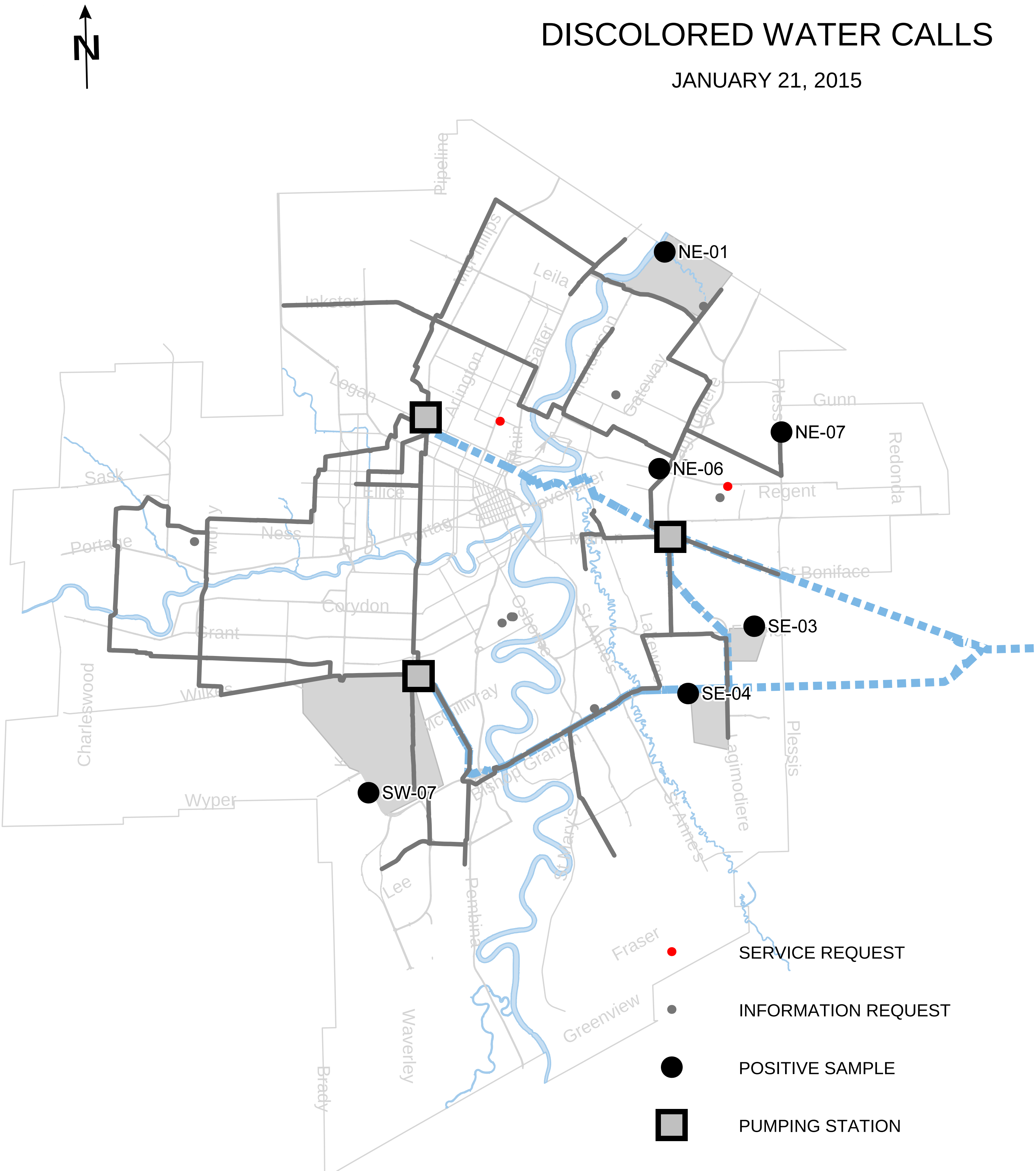
DISCOLORED WATER CALLS

JANUARY 20, 2015



DISCOLORED WATER CALLS

JANUARY 21, 2015



SERVICE REQUEST

INFORMATION REQUEST

POSITIVE SAMPLE

PUMPING STATION

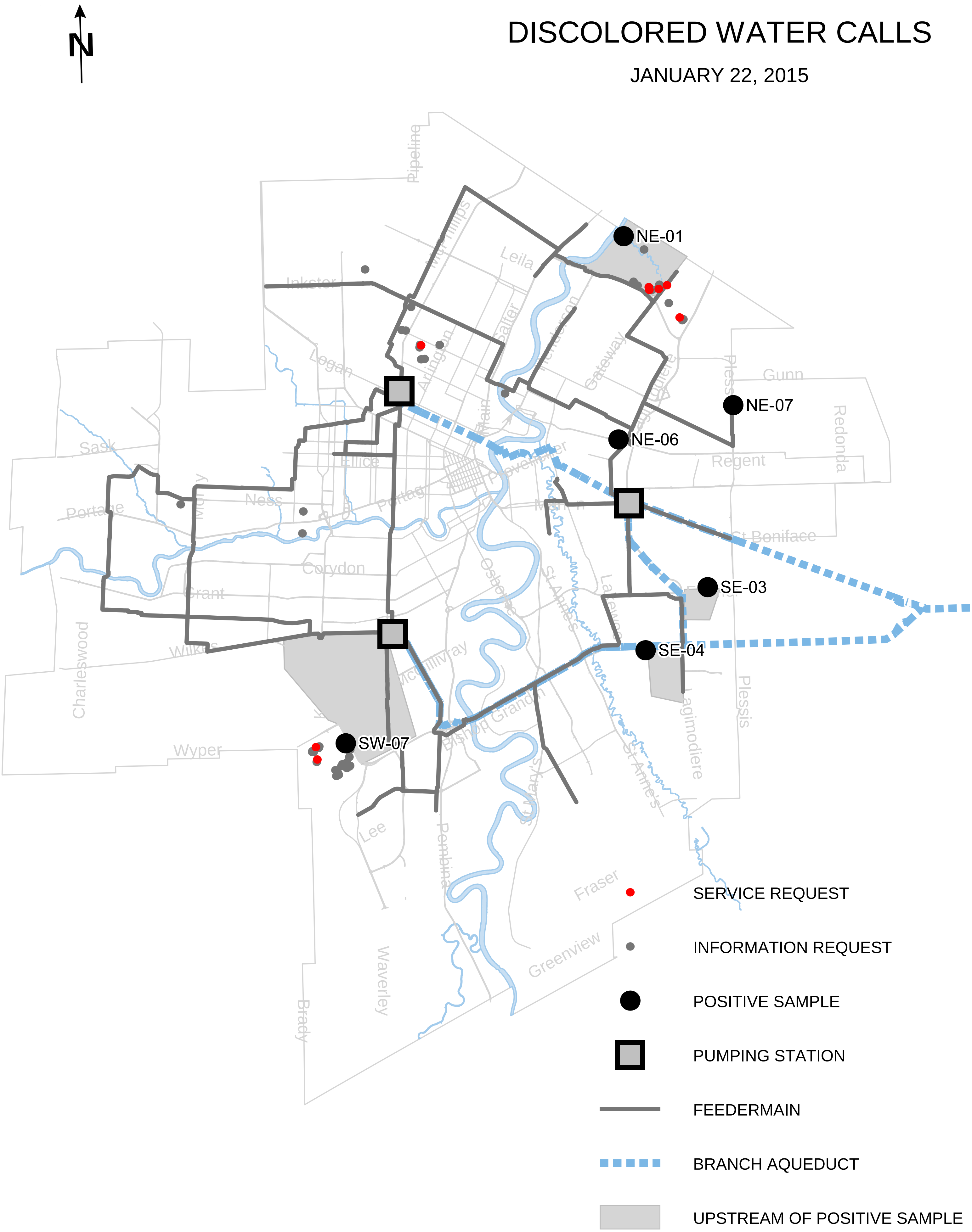
FEEDERMAIN

BRANCH AQUEDUCT

UPSTREAM OF POSITIVE SAMPLE

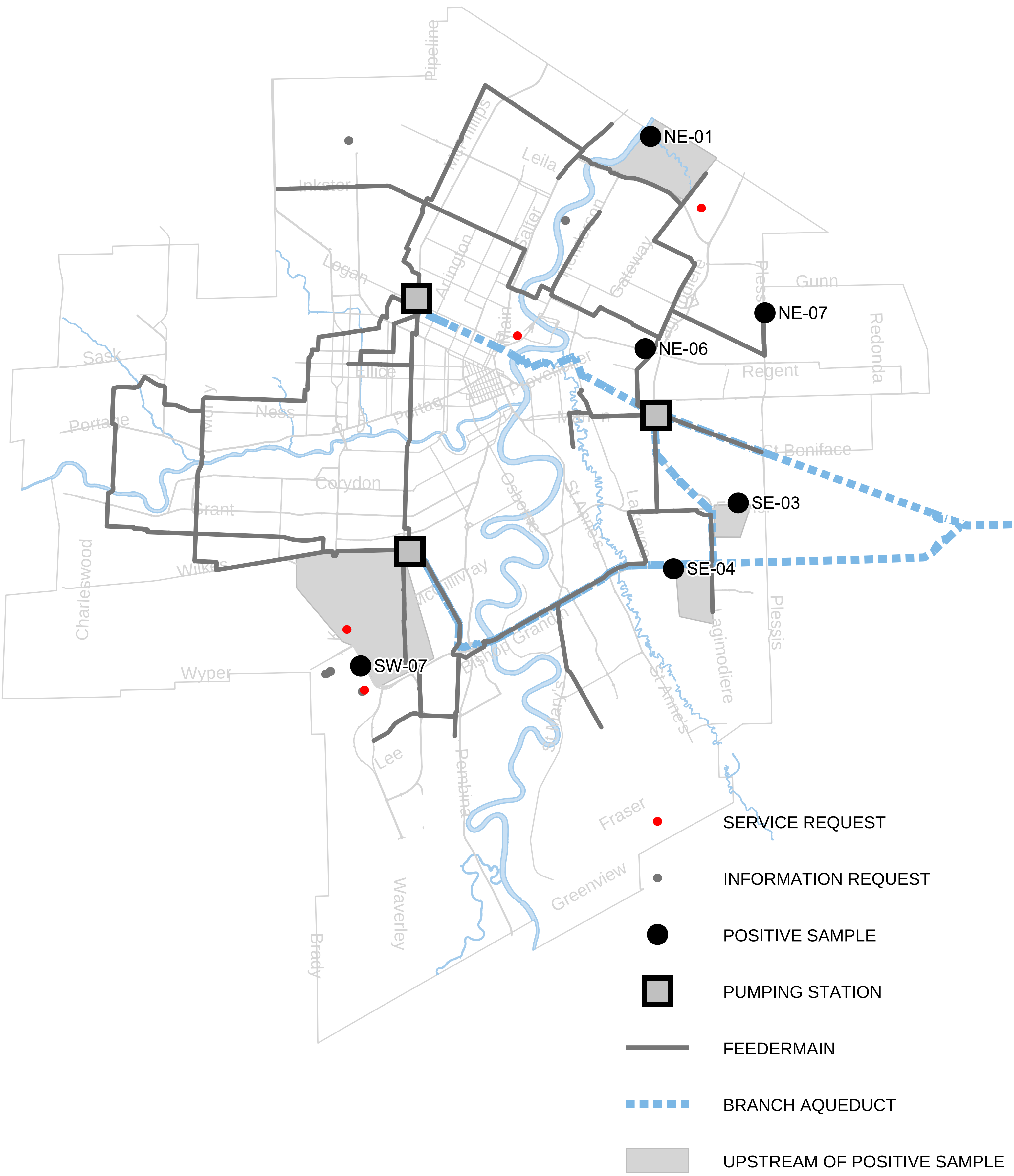
DISCOLORED WATER CALLS

JANUARY 22, 2015



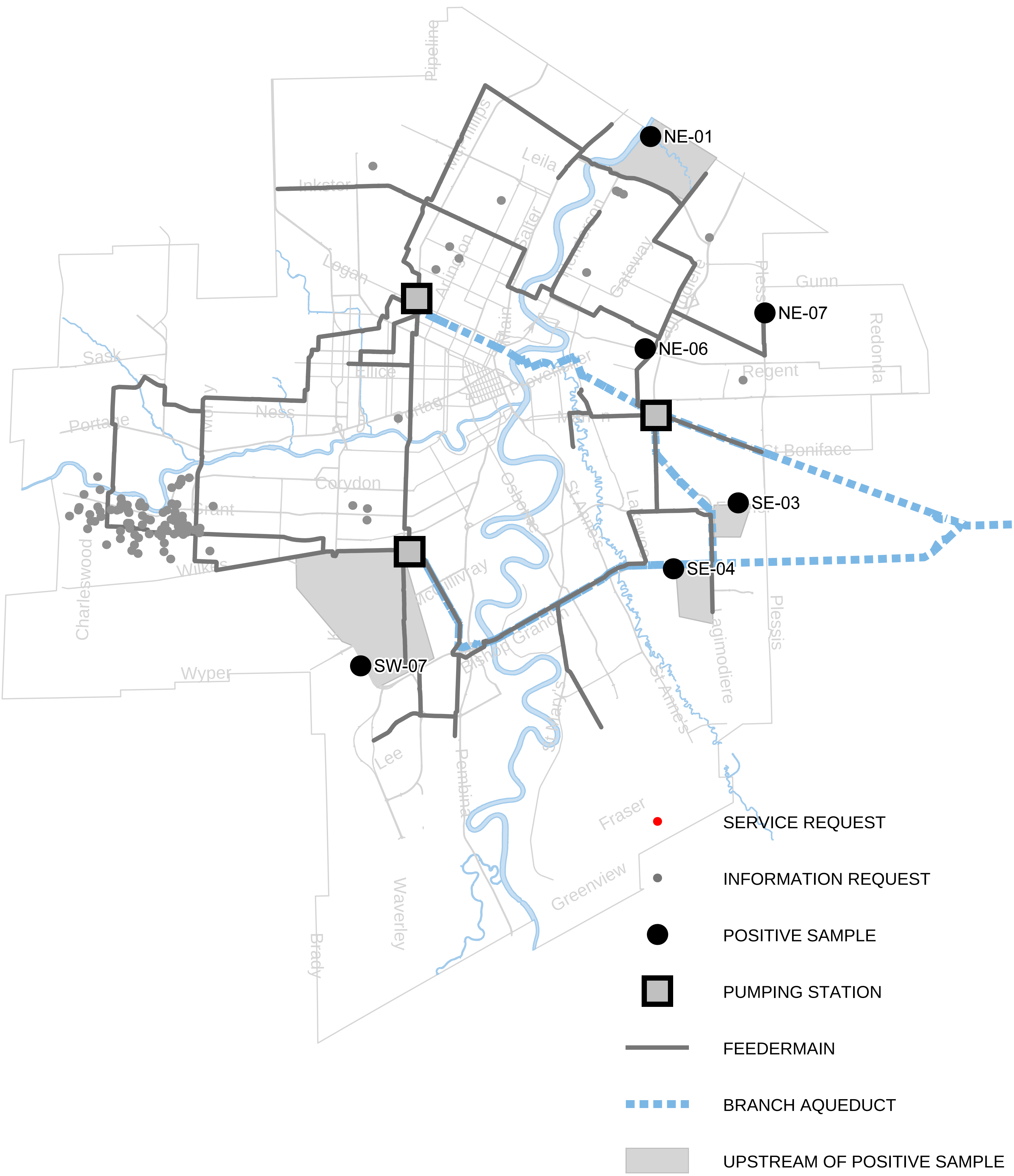
DISCOLORED WATER CALLS

JANUARY 23, 2015



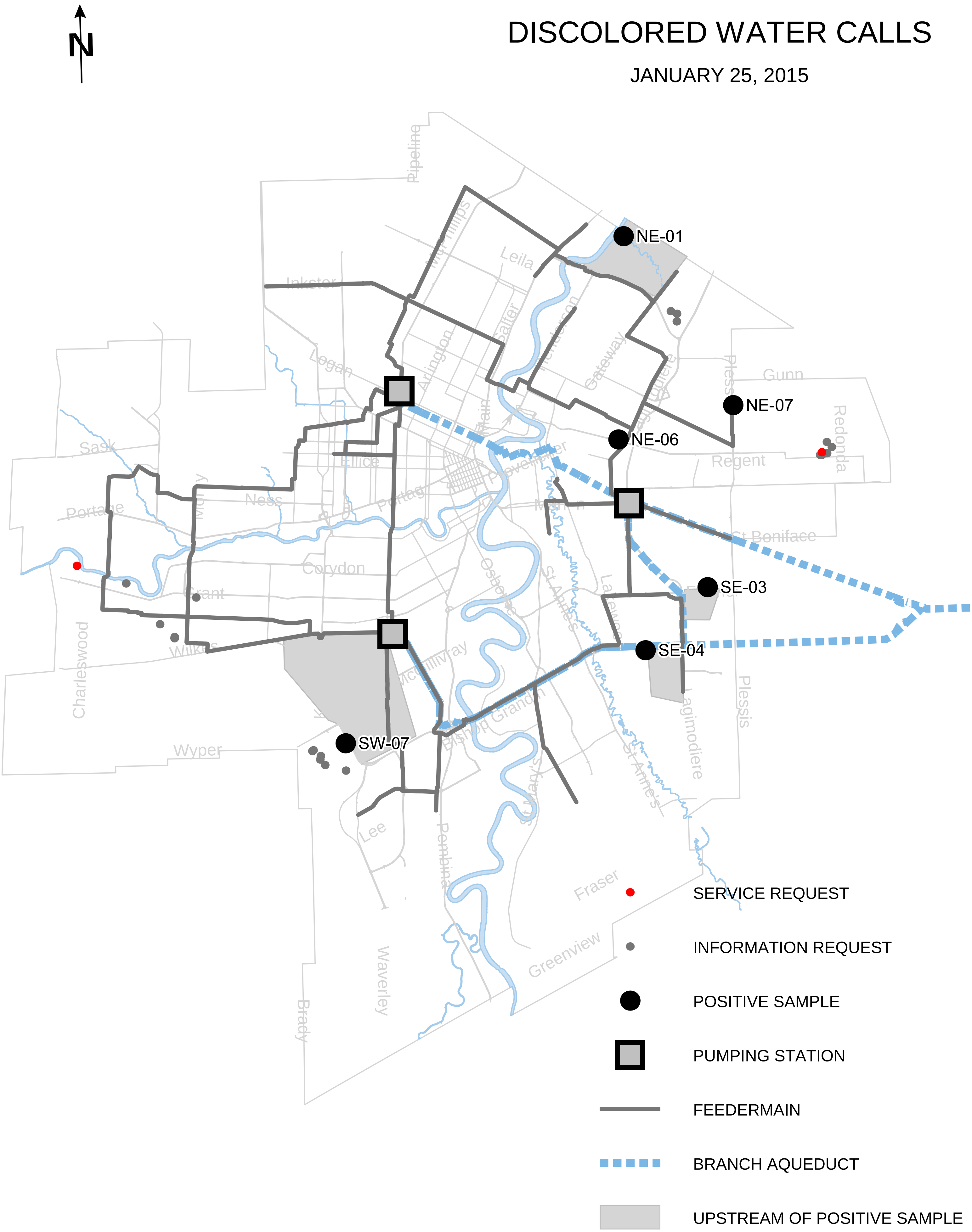
DISCOLORED WATER CALLS

JANUARY 24, 2015



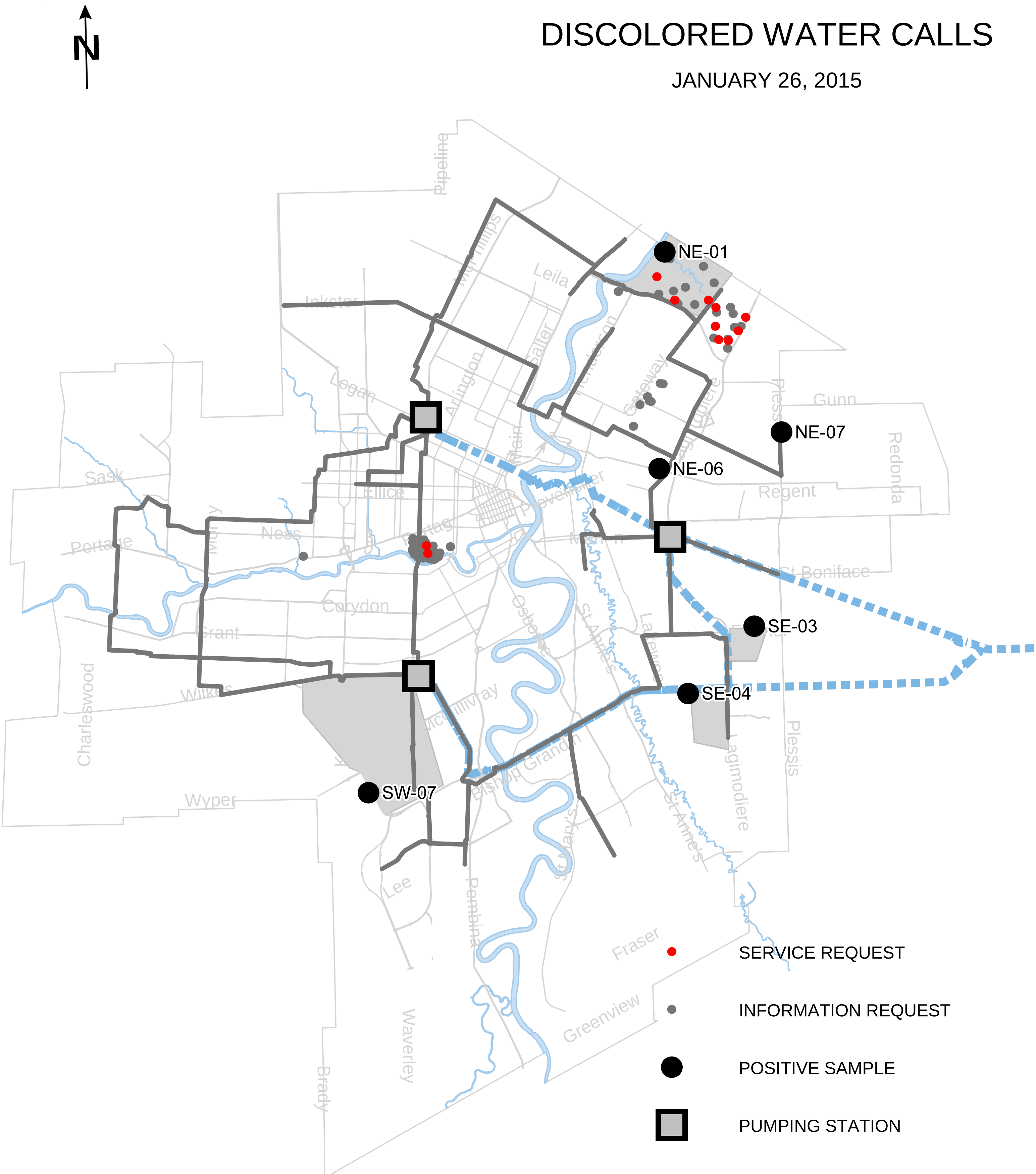
DISCOLORED WATER CALLS

JANUARY 25, 2015



DISCOLORED WATER CALLS

JANUARY 26, 2015



Appendix E

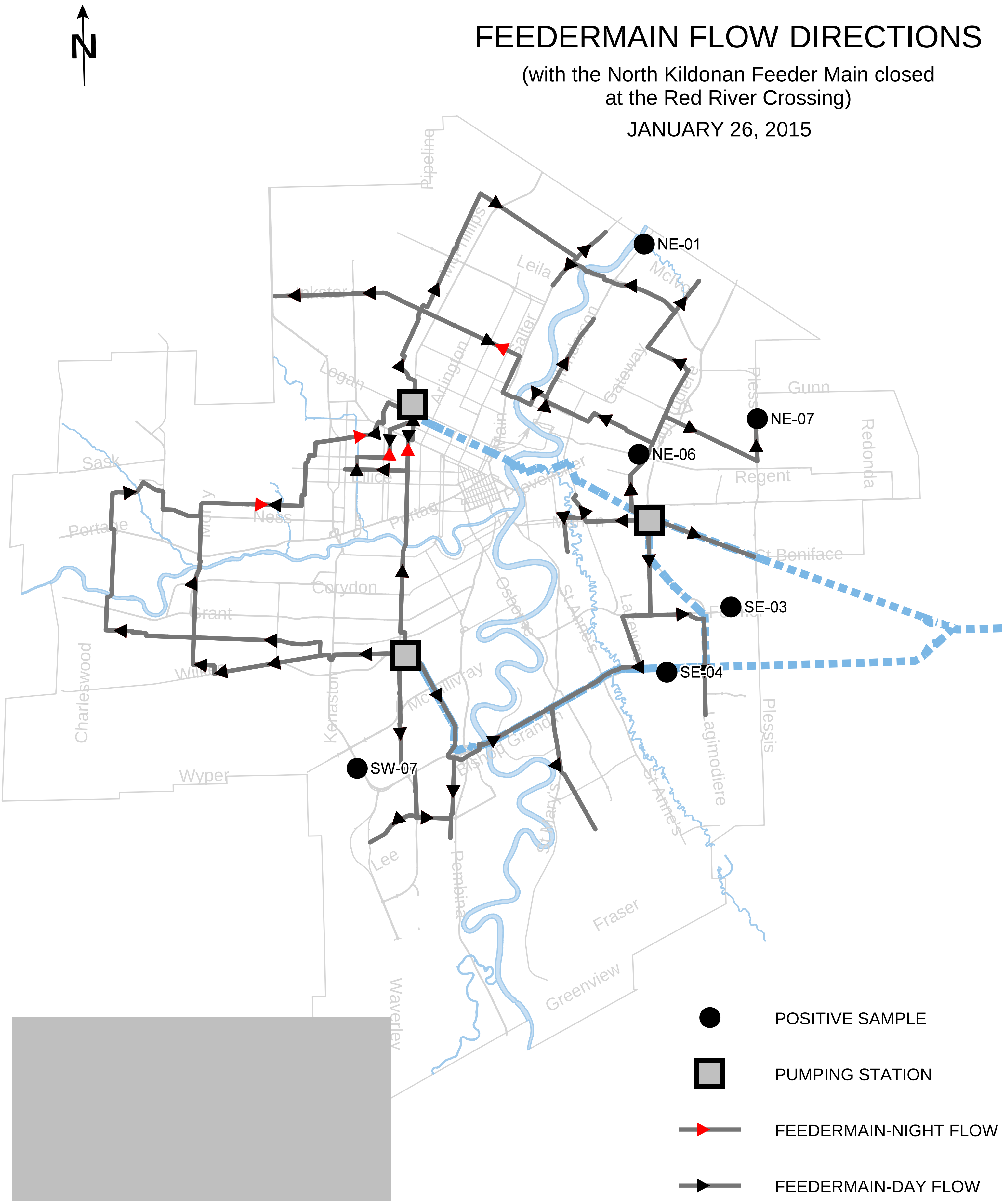
Operations and Maintenance Data (available in e-format upon request)

E1 Graphic Review of Collected Data

FEEDERMAIN FLOW DIRECTIONS

(with the North Kildonan Feeder Main closed
at the Red River Crossing)

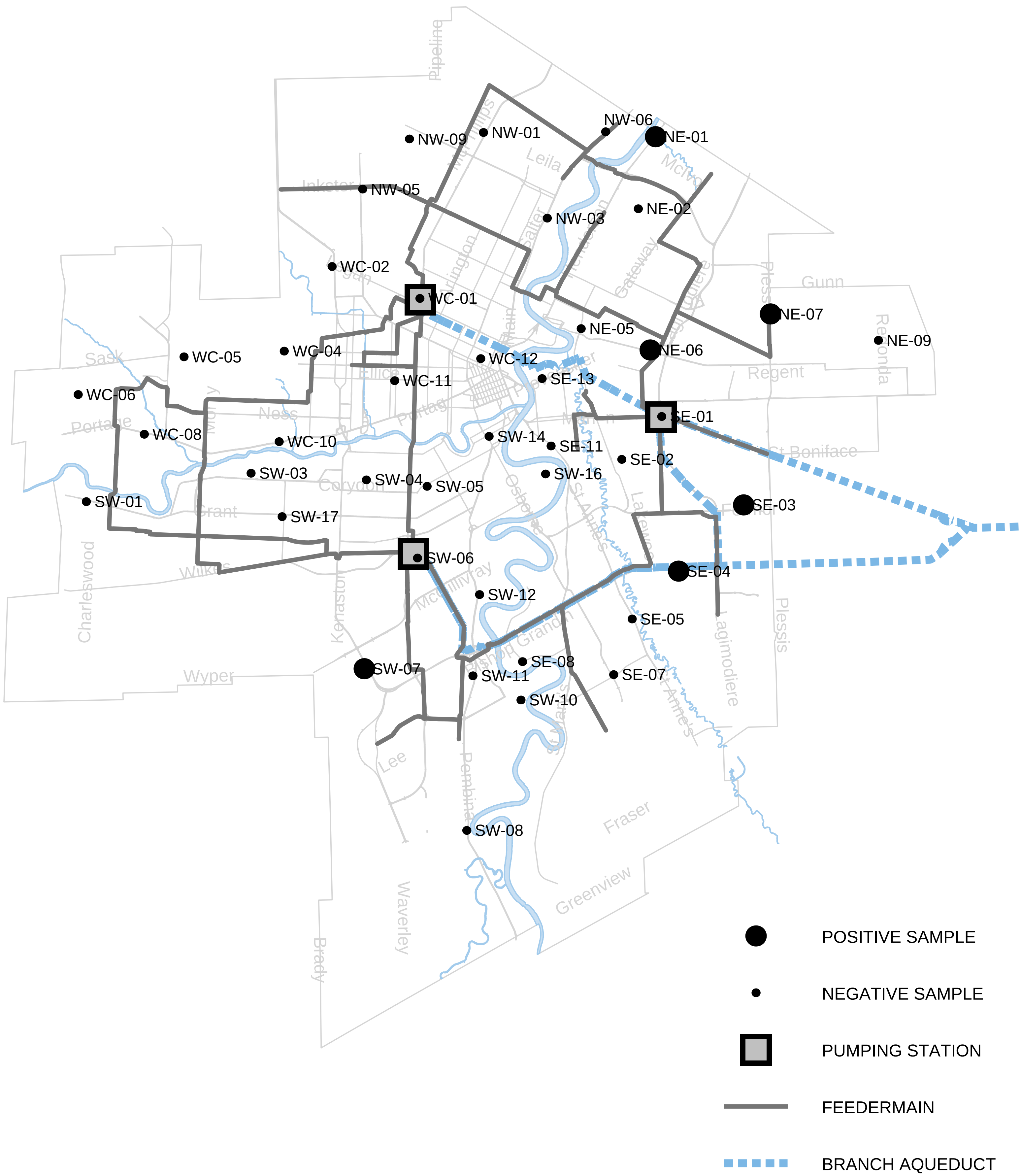
JANUARY 26, 2015



*Estimated water age measured
from MacLean Pumping Station

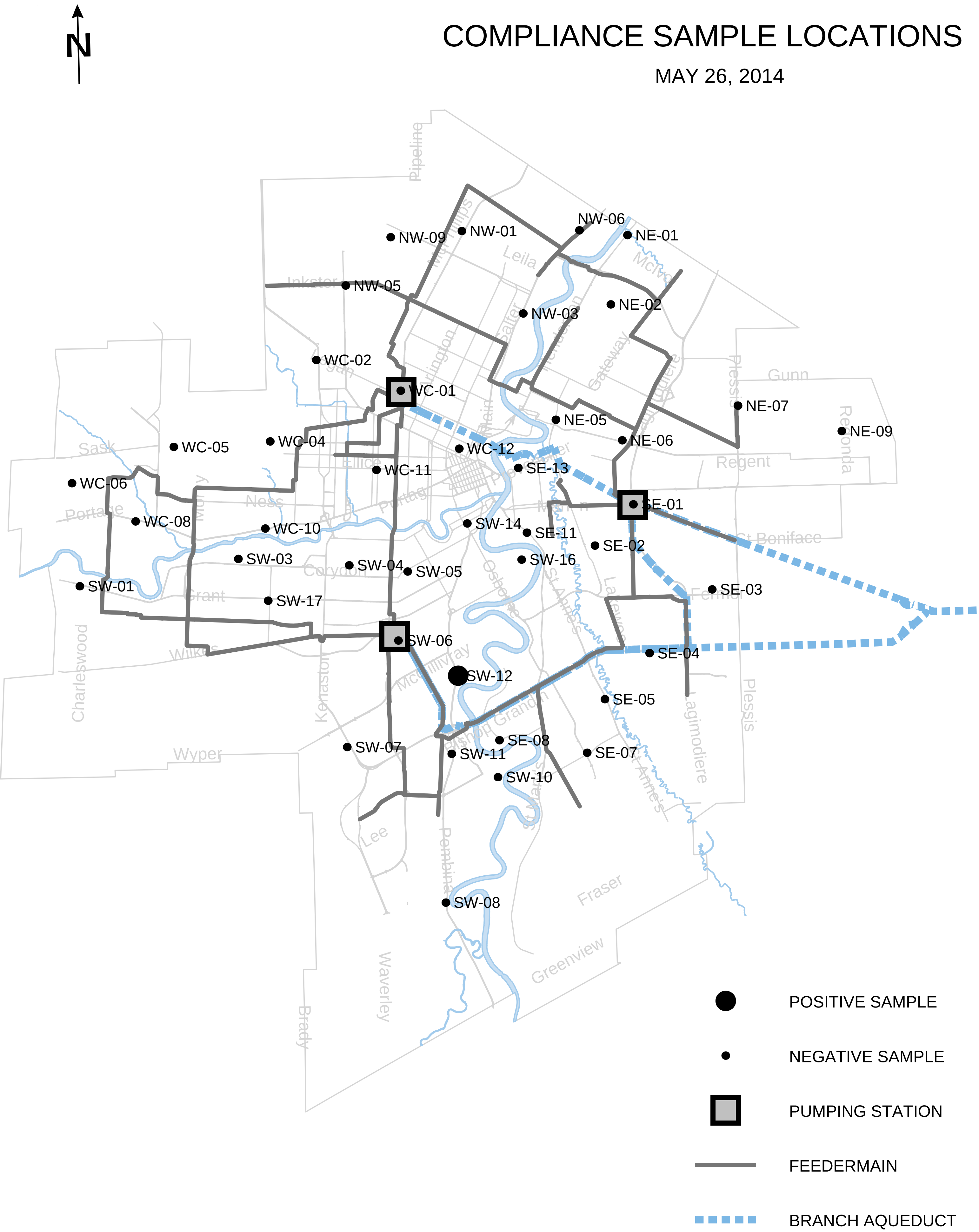
COMPLIANCE SAMPLE LOCATIONS

JANUARY 26, 2015



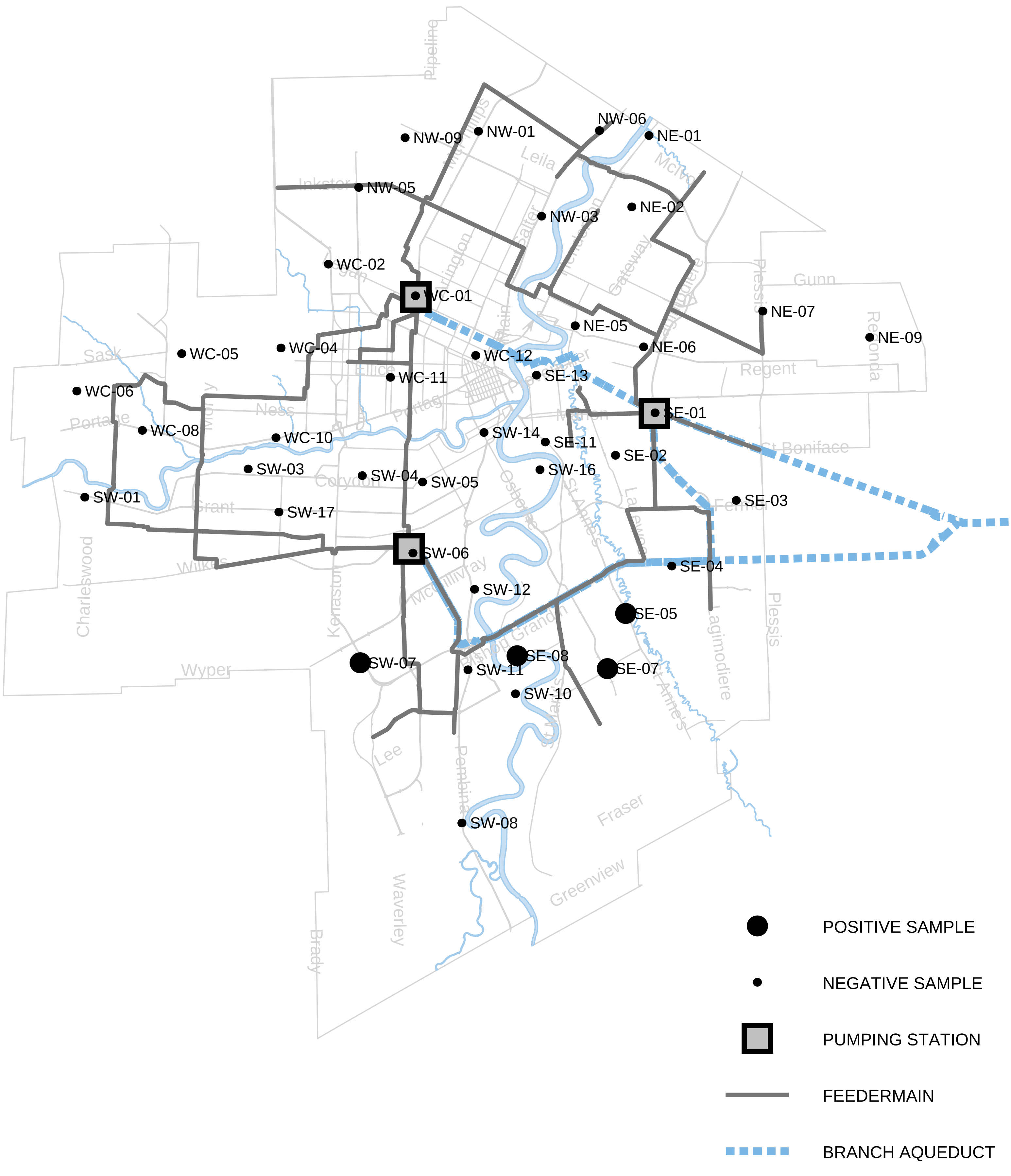
COMPLIANCE SAMPLE LOCATIONS

MAY 26, 2014



COMPLIANCE SAMPLE LOCATIONS

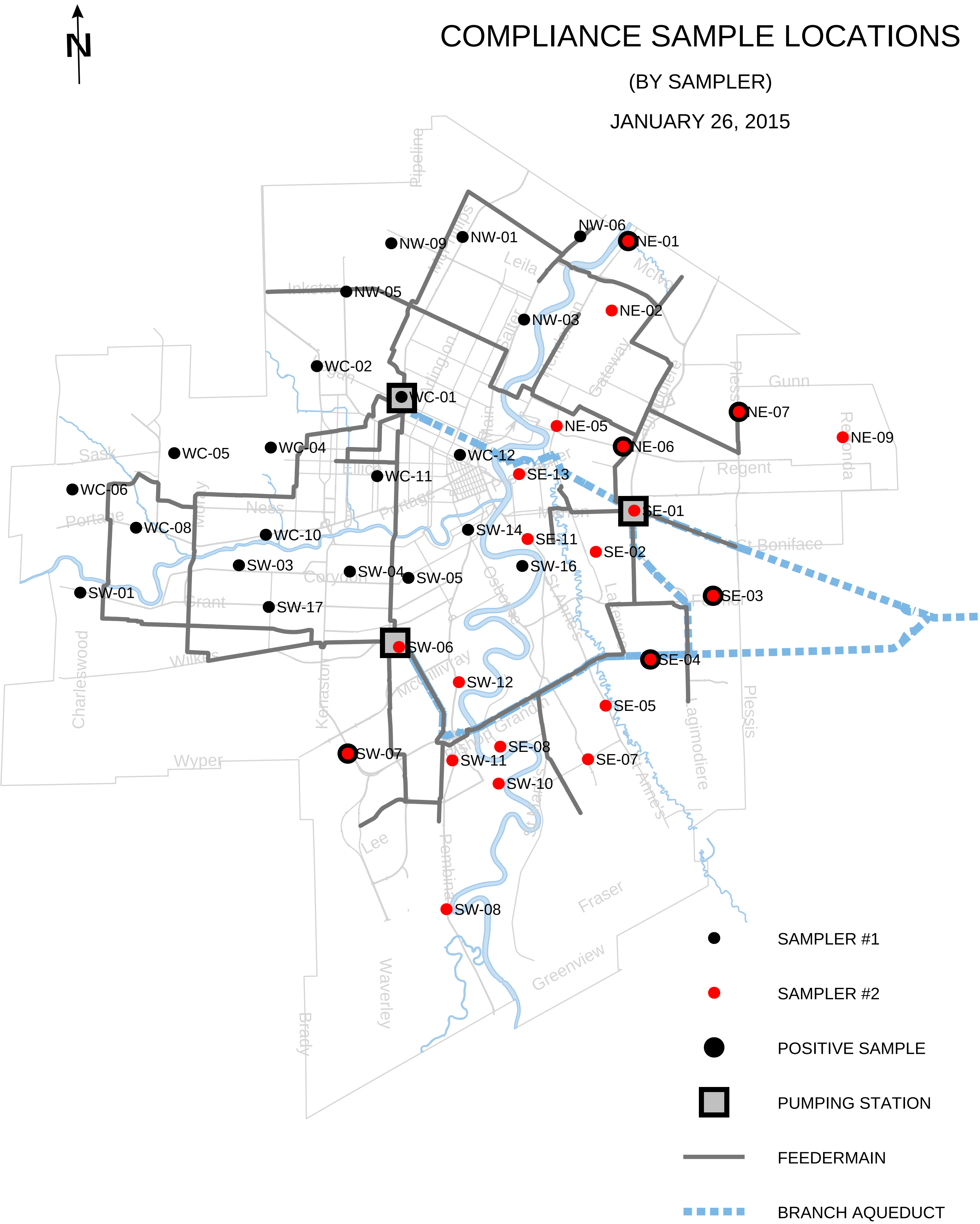
OCTOBER 7, 2013



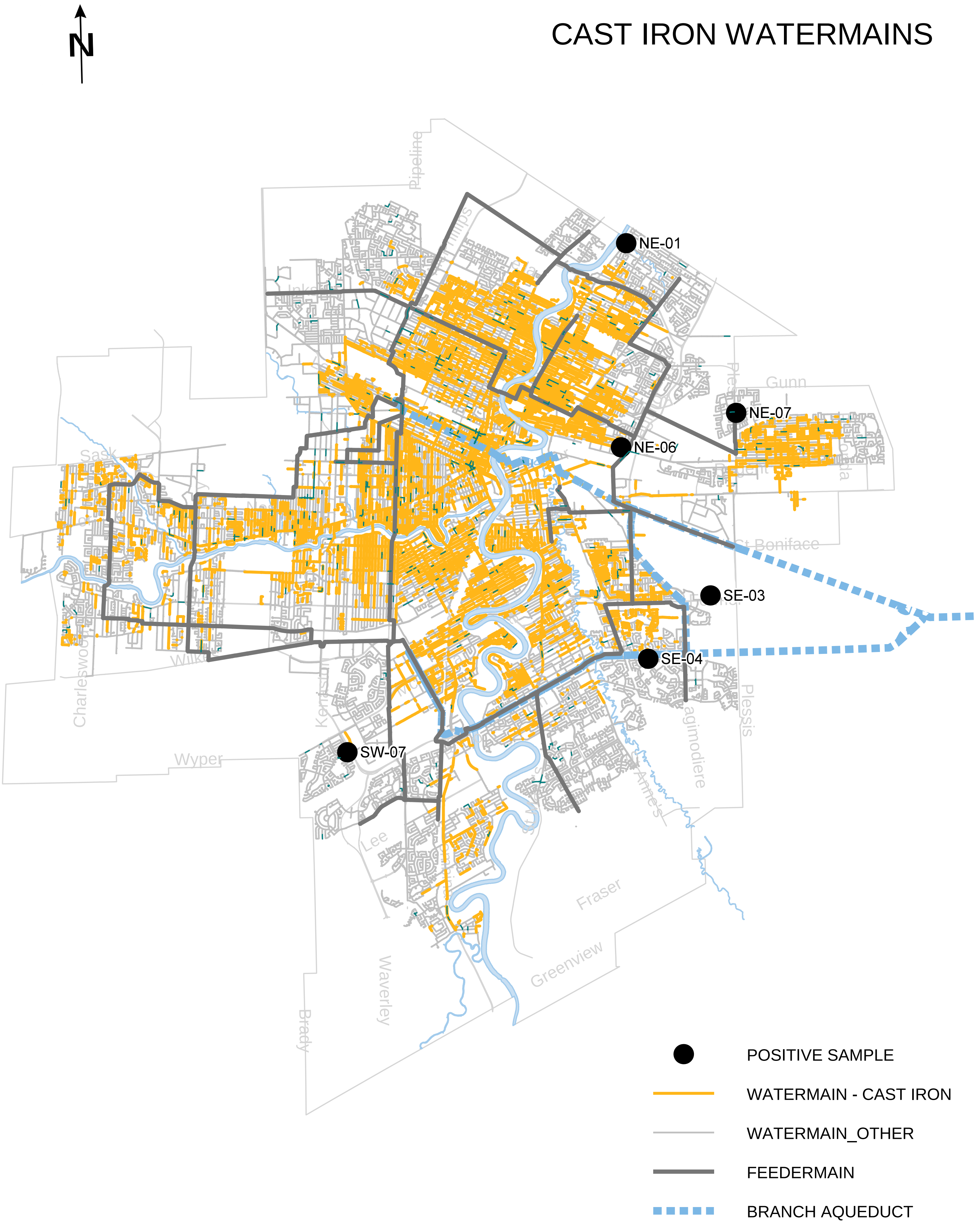
COMPLIANCE SAMPLE LOCATIONS

(BY SAMPLER)

JANUARY 26, 2015

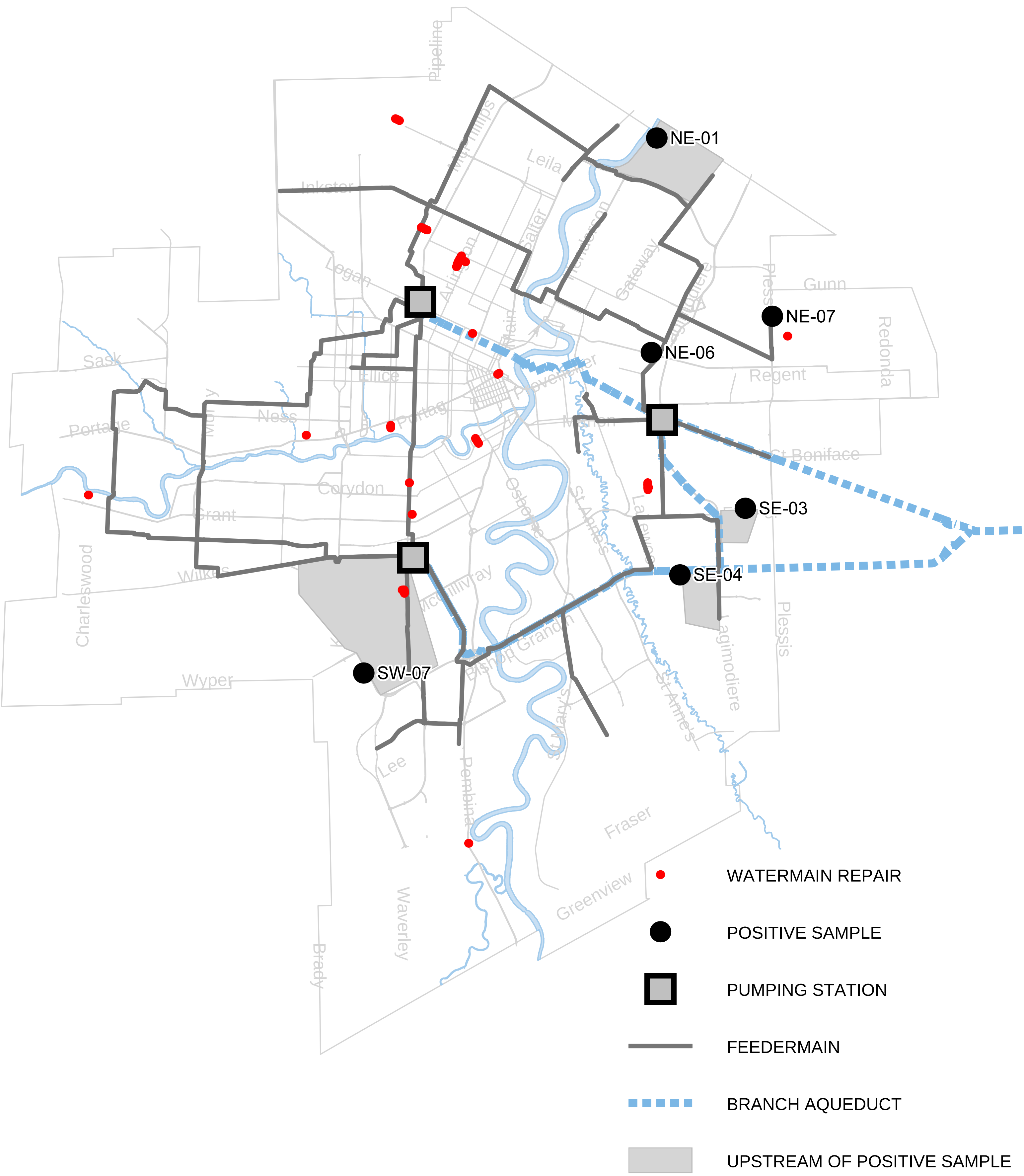


CAST IRON WATERMAINS



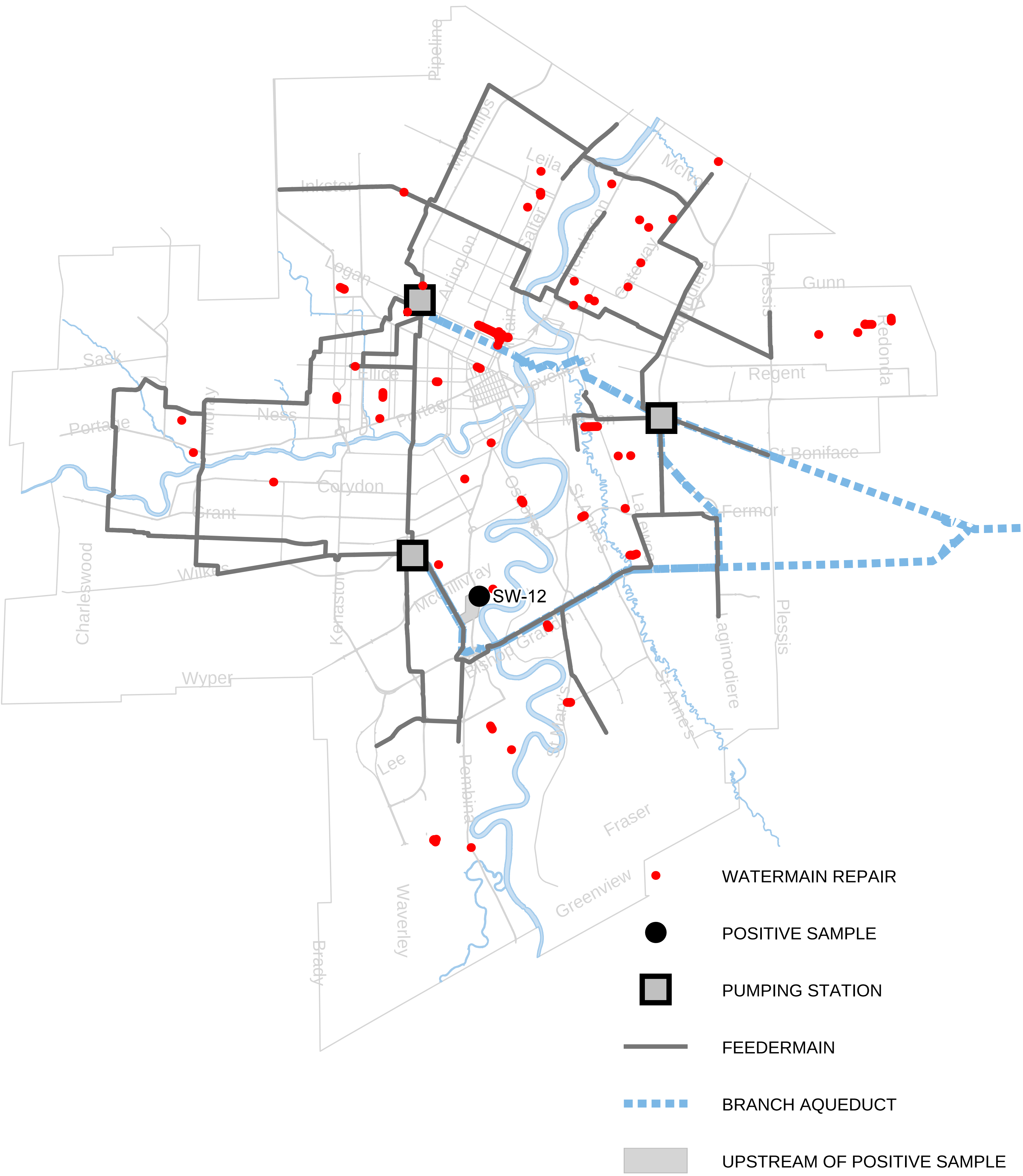
WATERMAIN REPAIRS

JANUARY 12 - 26, 2015



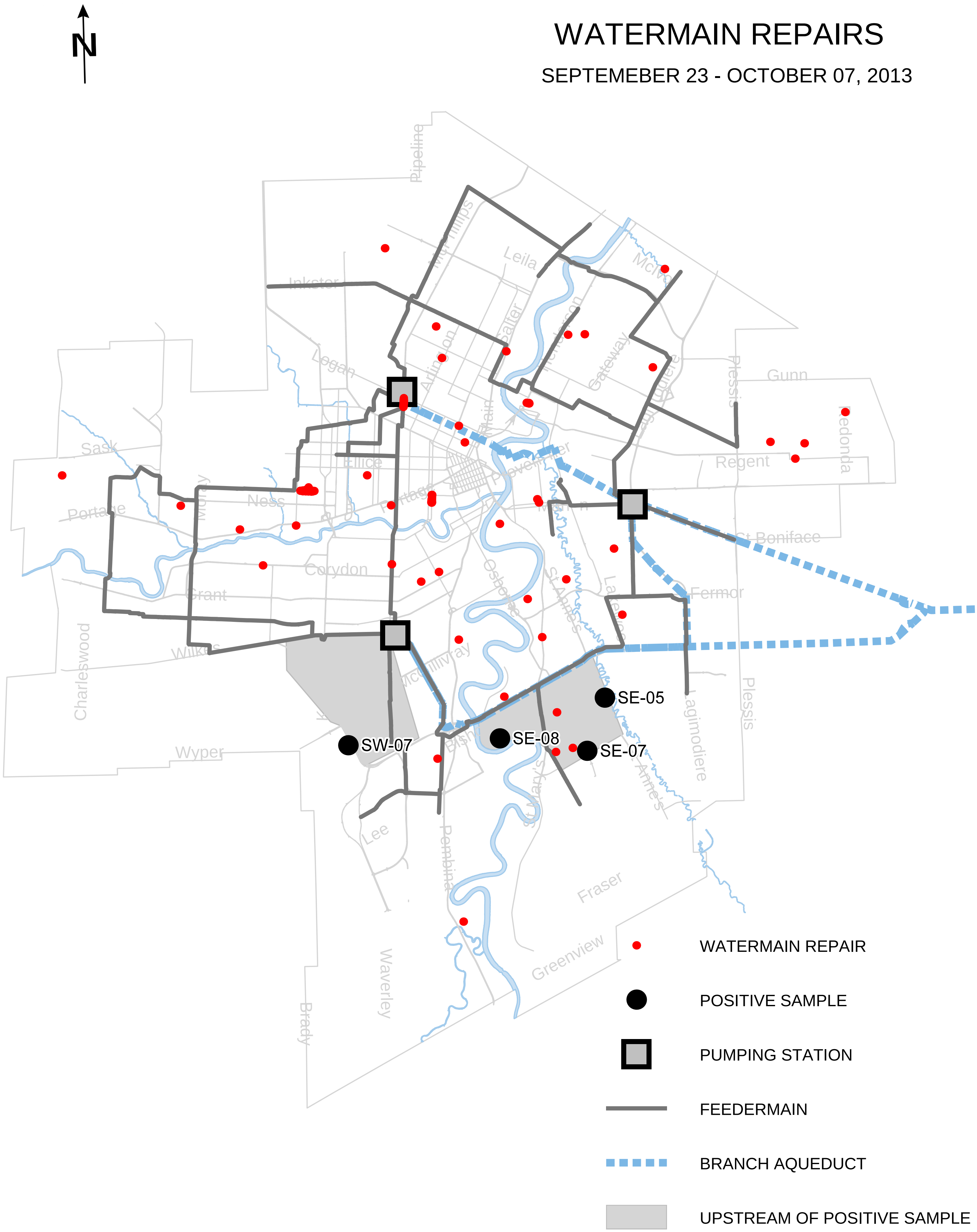
WATERMAIN REPAIRS

MAY 12- 26, 2014



WATERMAIN REPAIRS

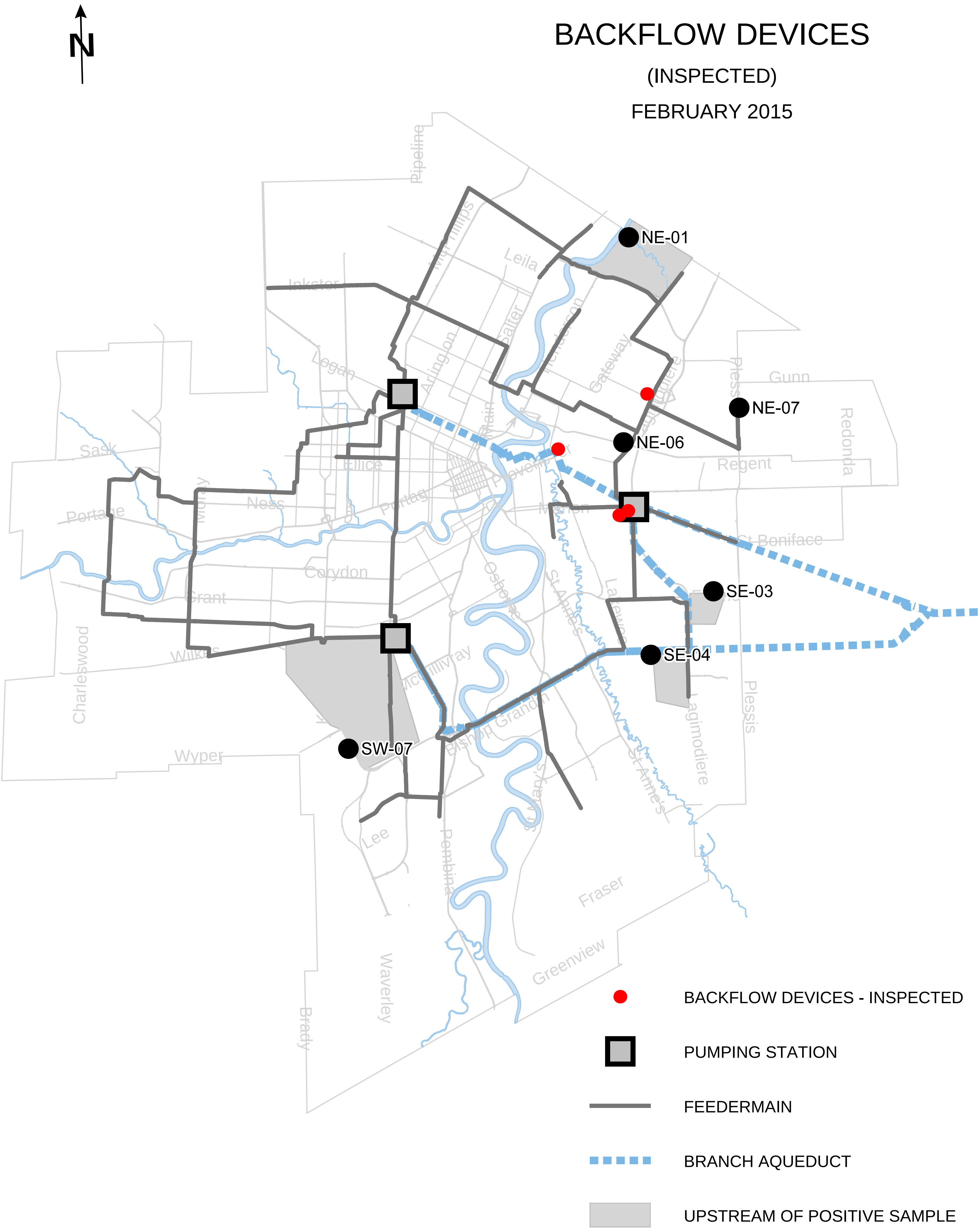
SEPTEMEBER 23 - OCTOBER 07, 2013



BACKFLOW DEVICES

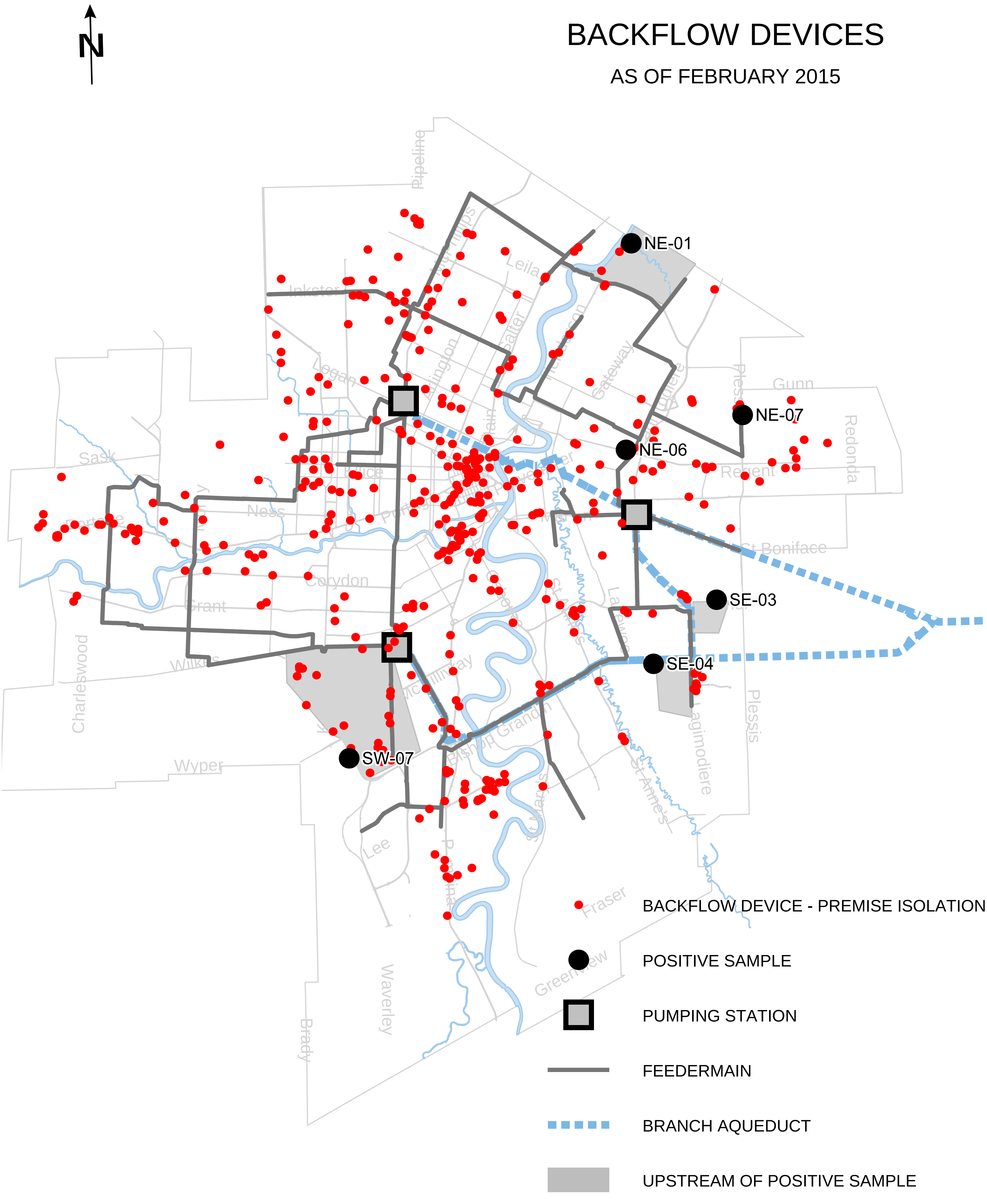
(INSPECTED)

FEBRUARY 2015



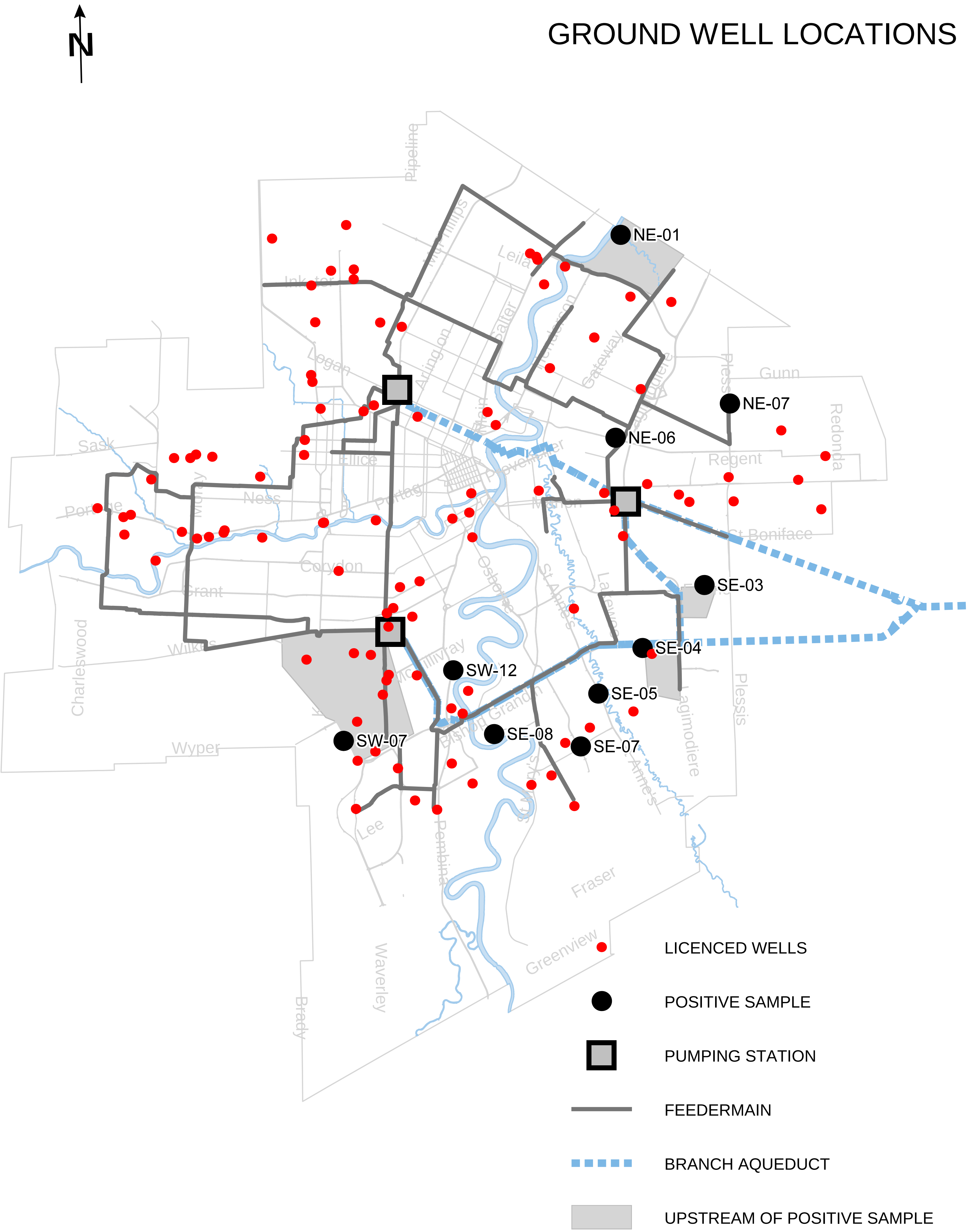
BACKFLOW DEVICES

AS OF FEBRUARY 2015



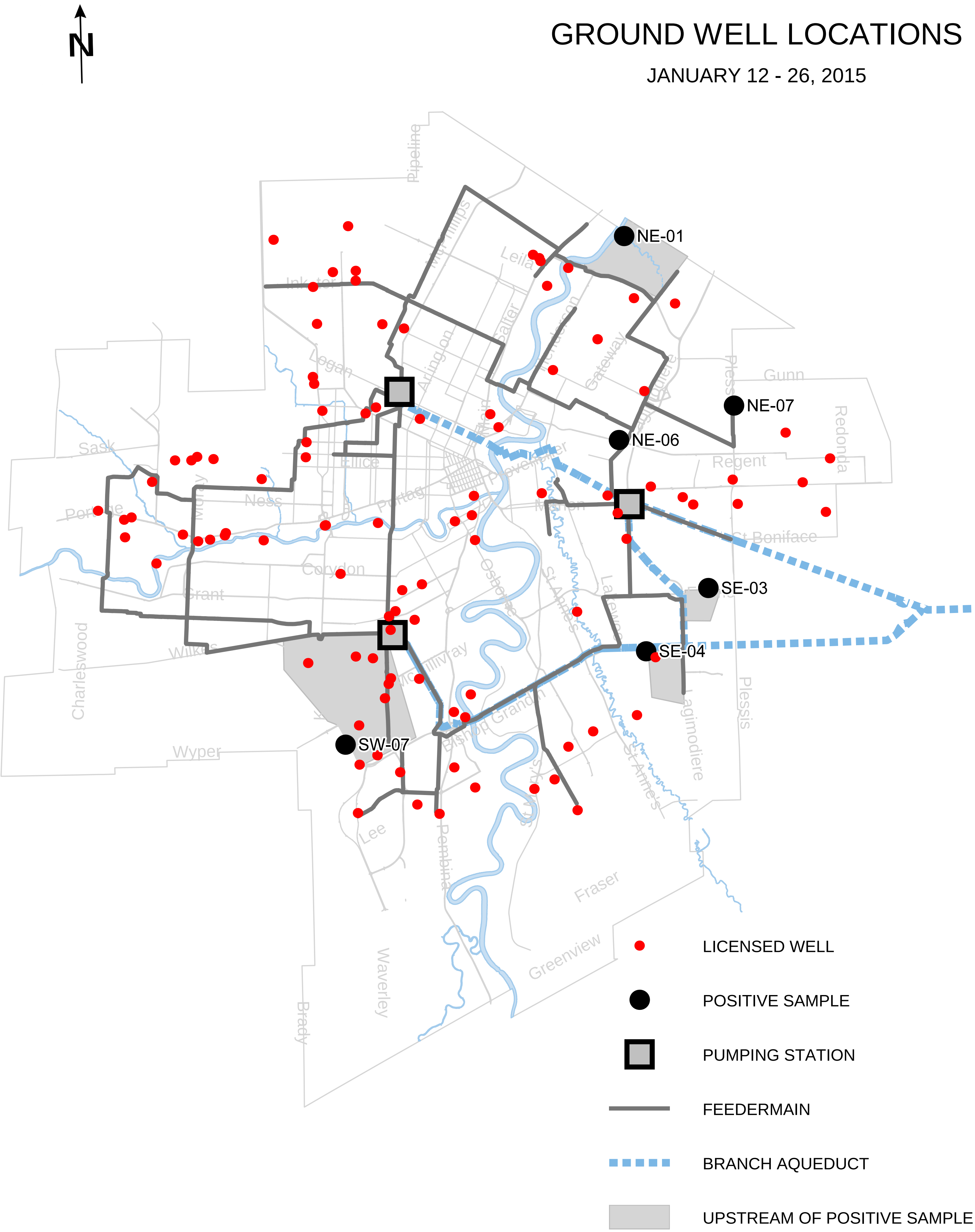
*PREMISE LOCATION= HIGH RISK

GROUND WELL LOCATIONS



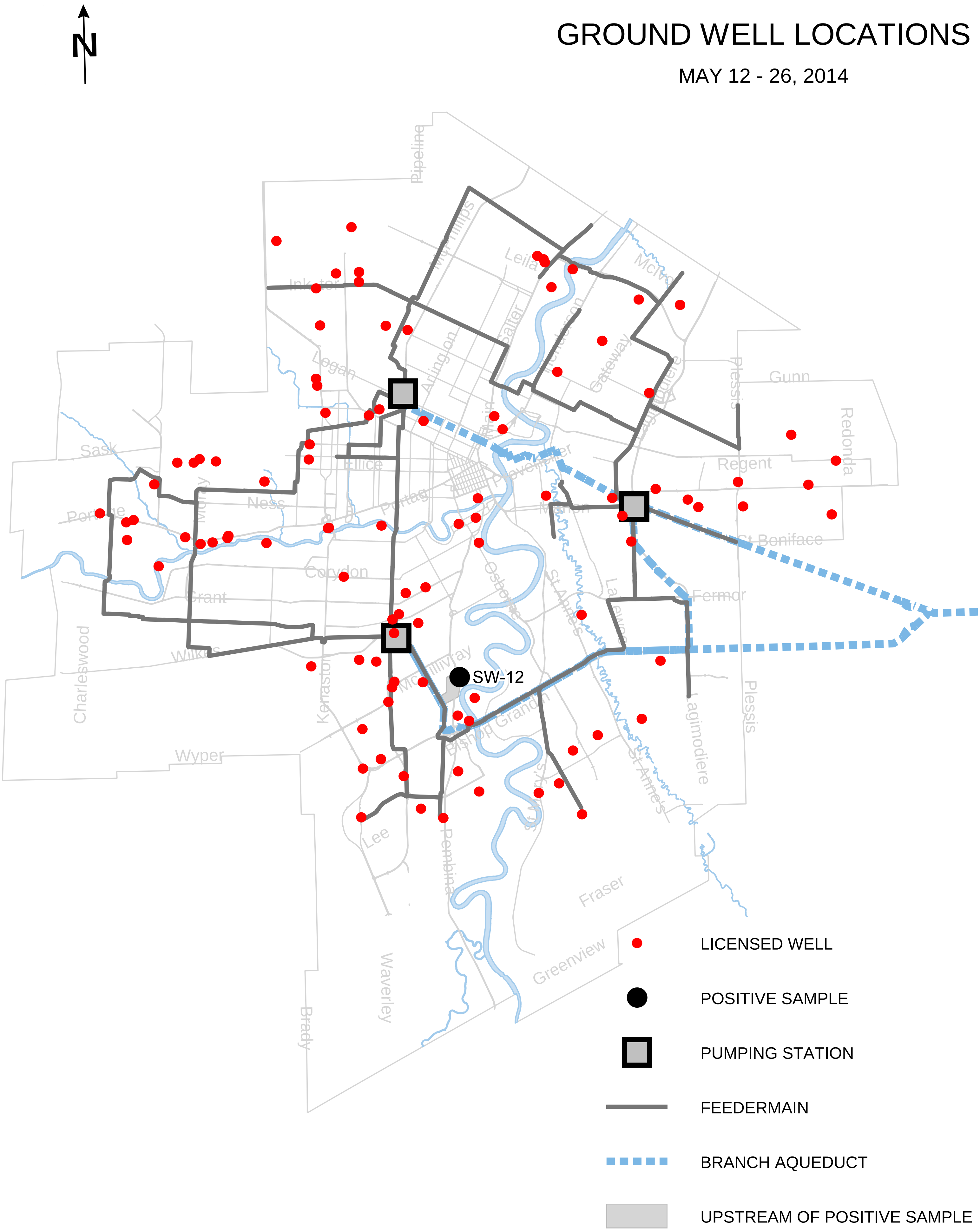
GROUND WELL LOCATIONS

JANUARY 12 - 26, 2015



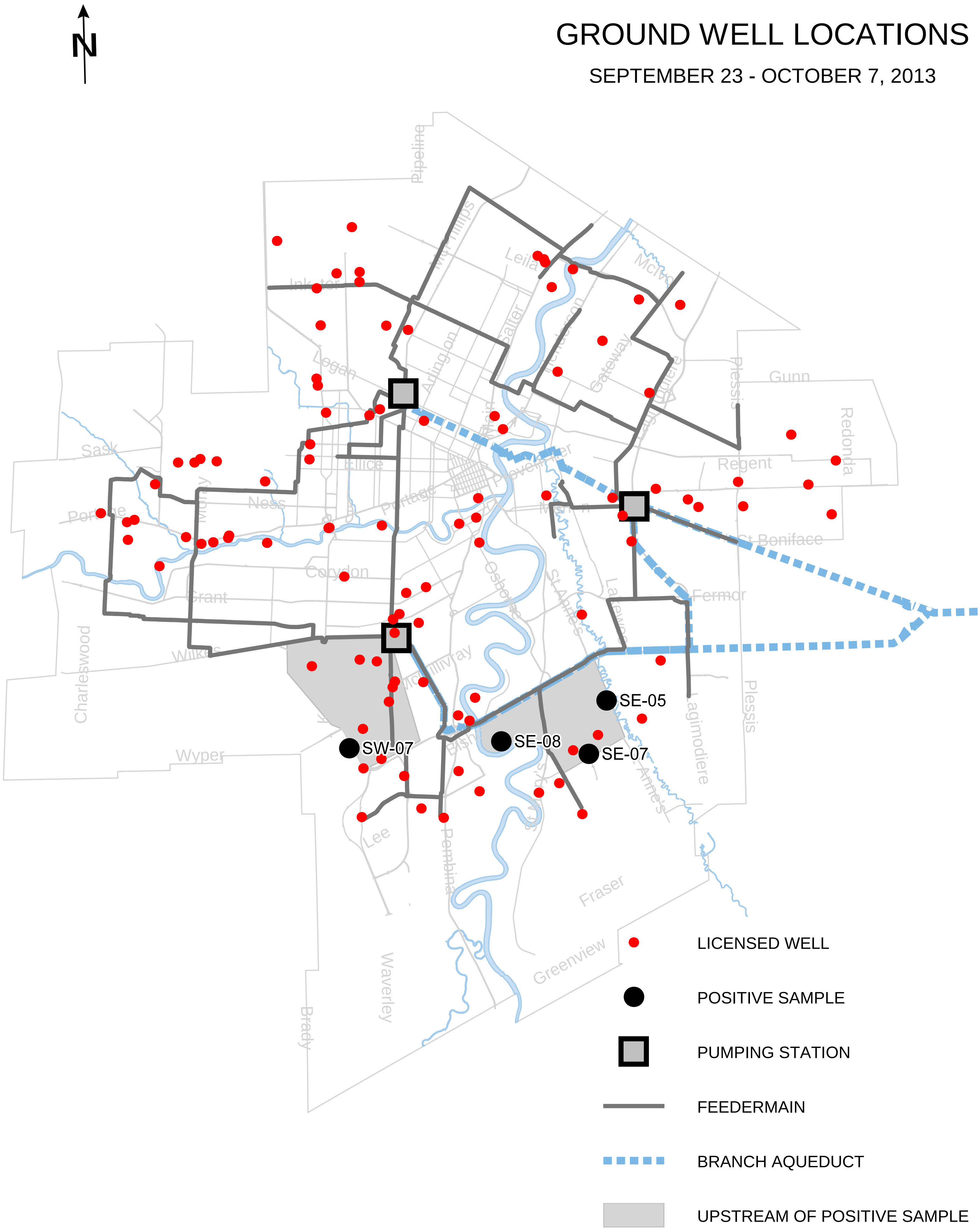
GROUND WELL LOCATIONS

MAY 12 - 26, 2014



GROUND WELL LOCATIONS

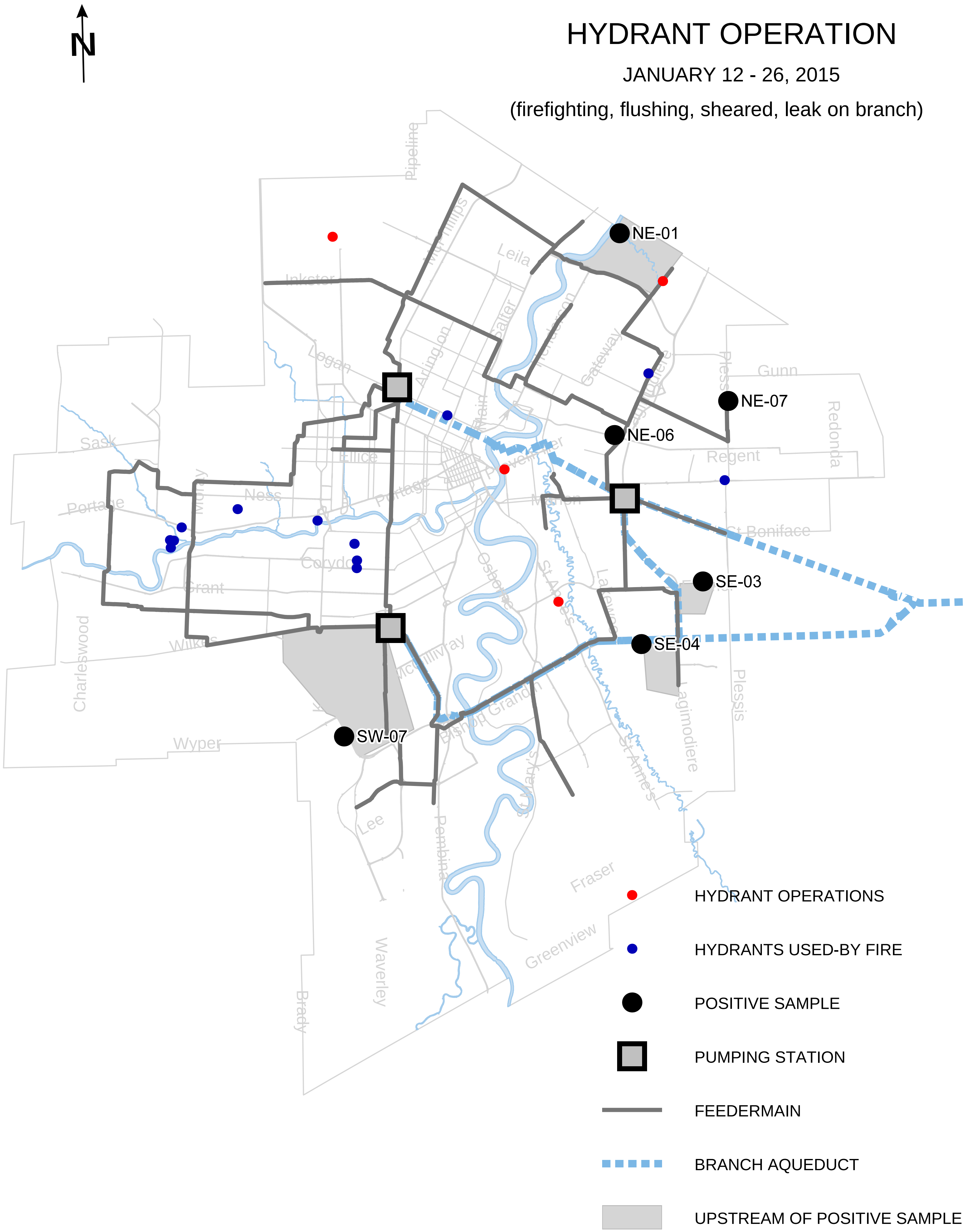
SEPTEMBER 23 - OCTOBER 7, 2013



HYDRANT OPERATION

JANUARY 12 - 26, 2015

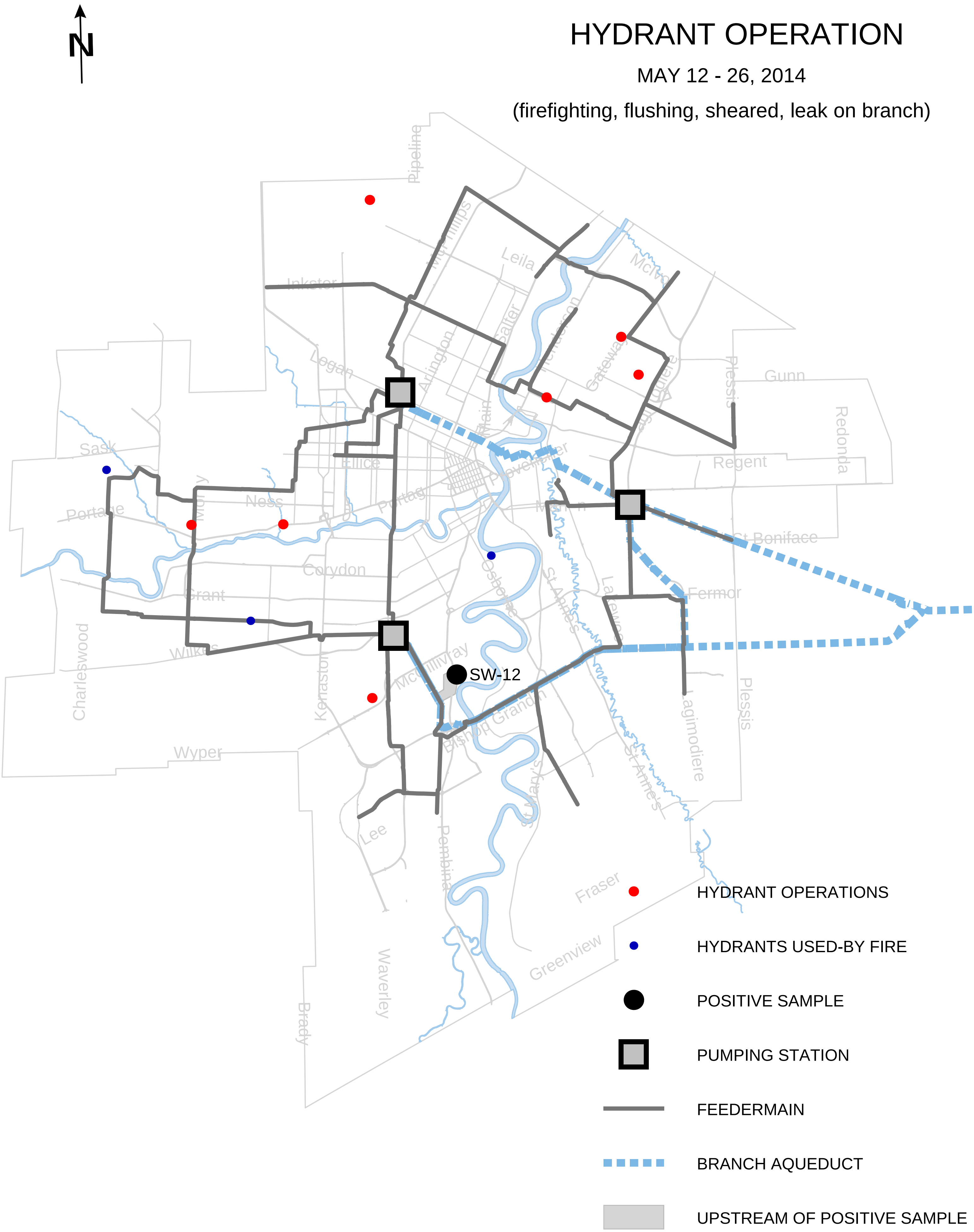
(firefighting, flushing, sheared, leak on branch)



HYDRANT OPERATION

MAY 12 - 26, 2014

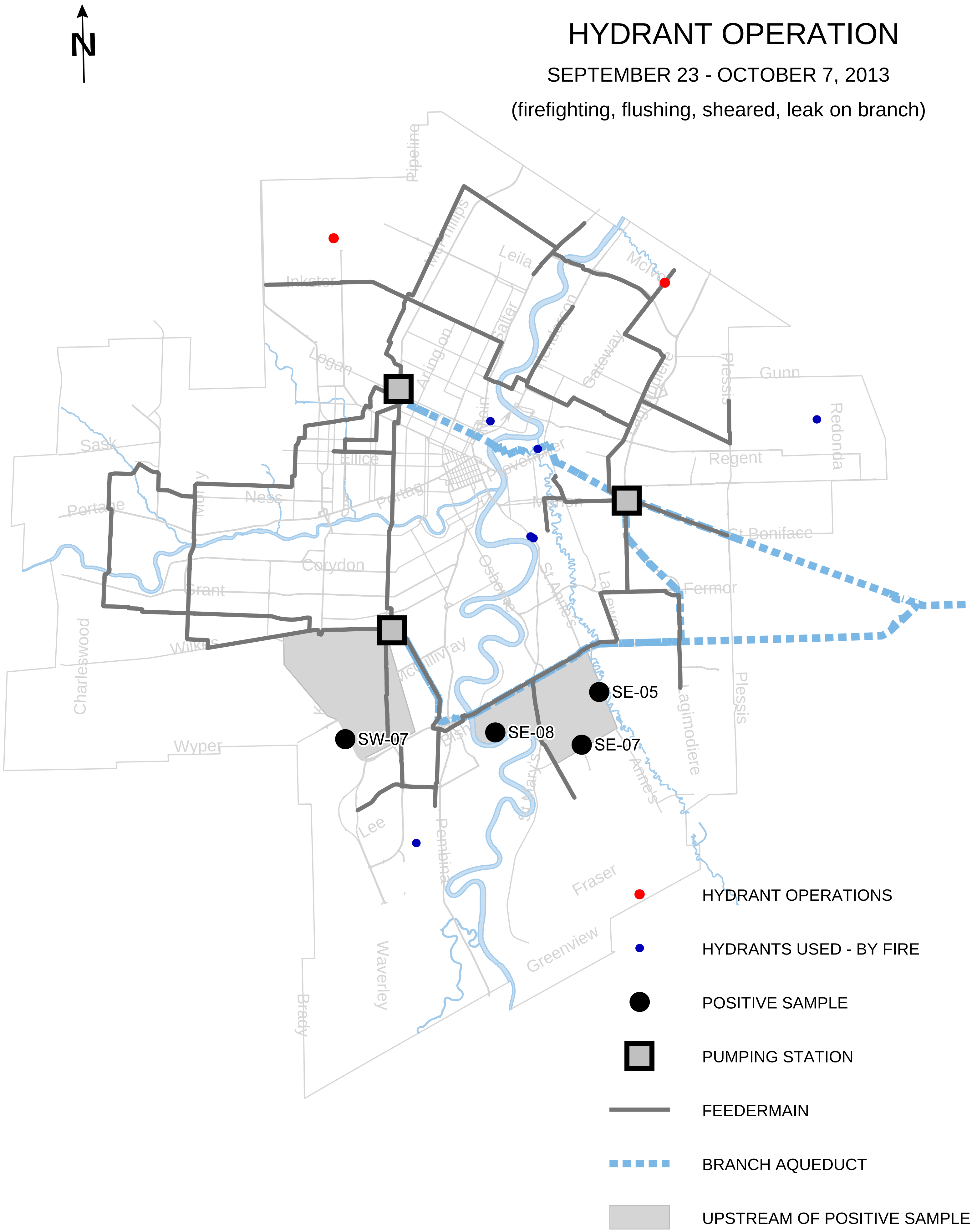
(firefighting, flushing, sheared, leak on branch)



HYDRANT OPERATION

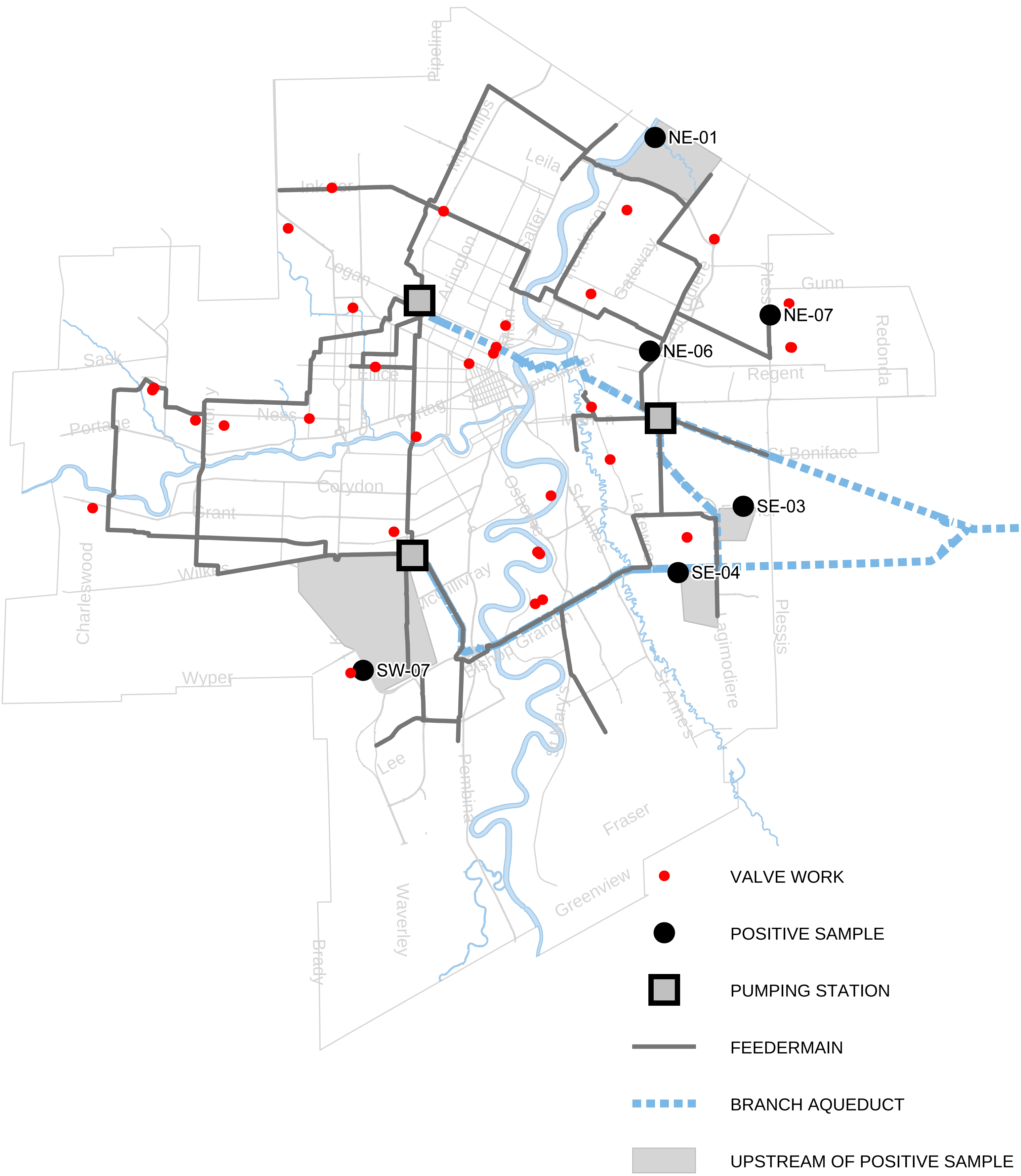
SEPTEMBER 23 - OCTOBER 7, 2013

(firefighting, flushing, sheared, leak on branch)



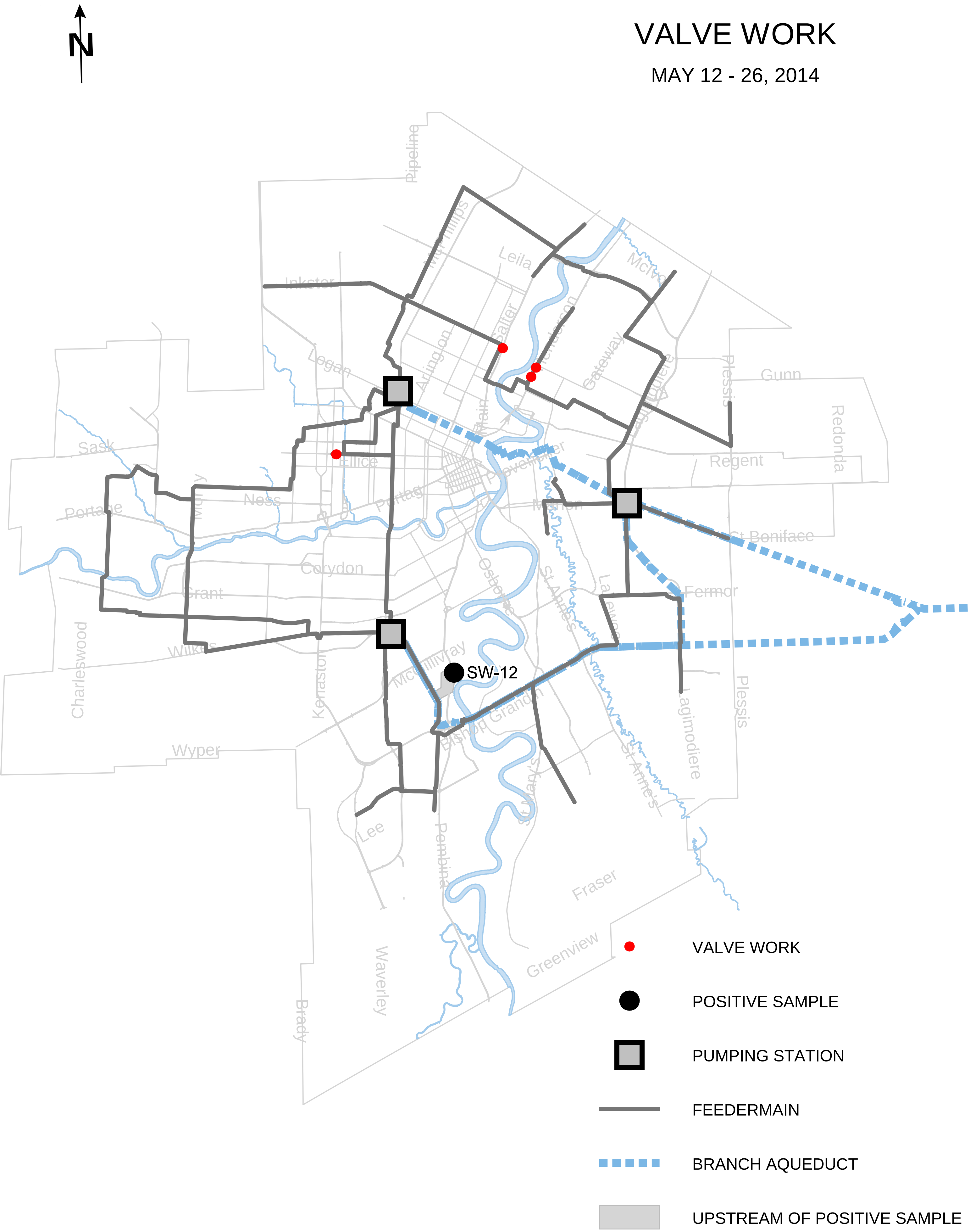
VALVE WORK

JANUARY 12 - 26, 2015



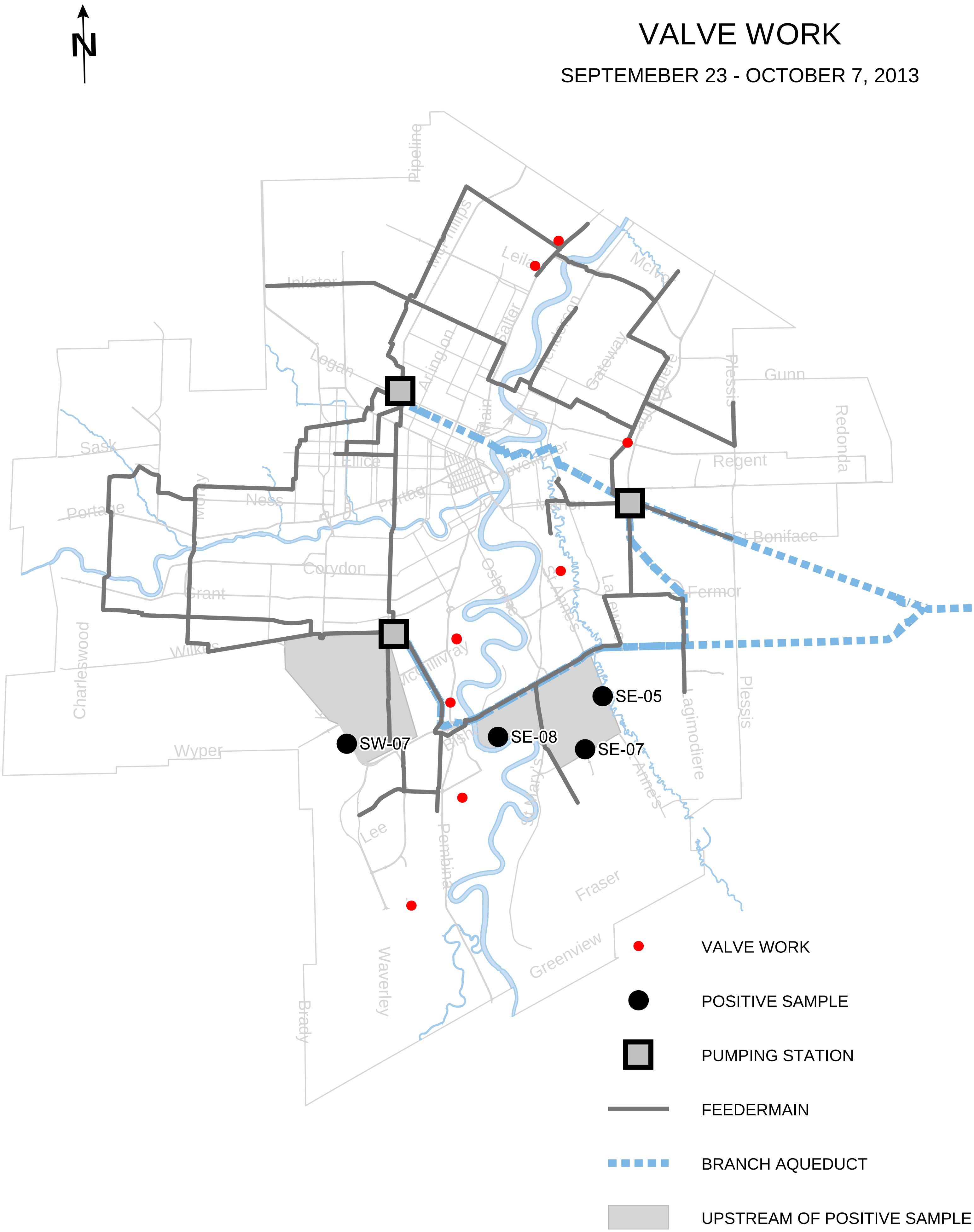
VALVE WORK

MAY 12 - 26, 2014



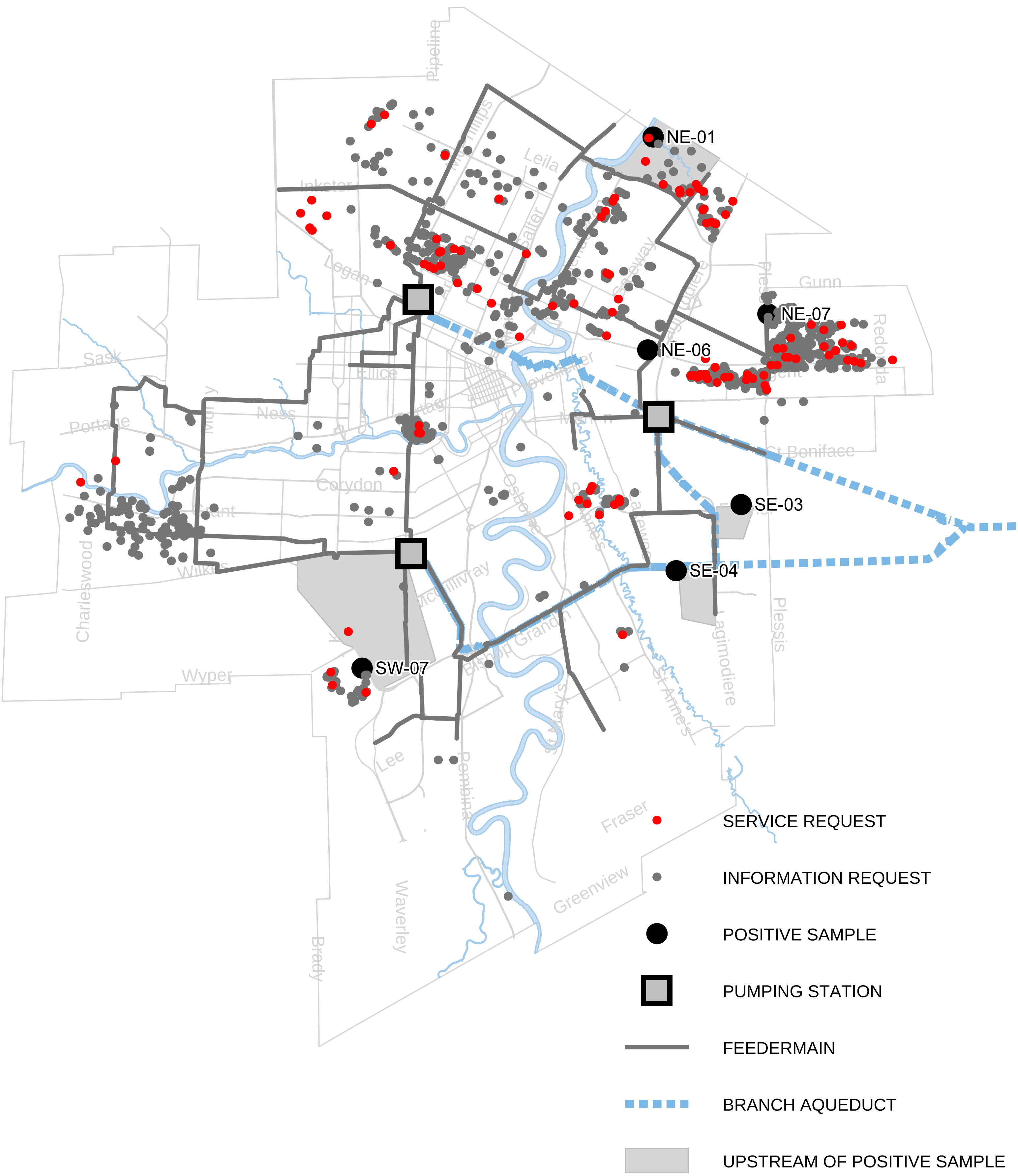
VALVE WORK

SEPTEMEBER 23 - OCTOBER 7, 2013



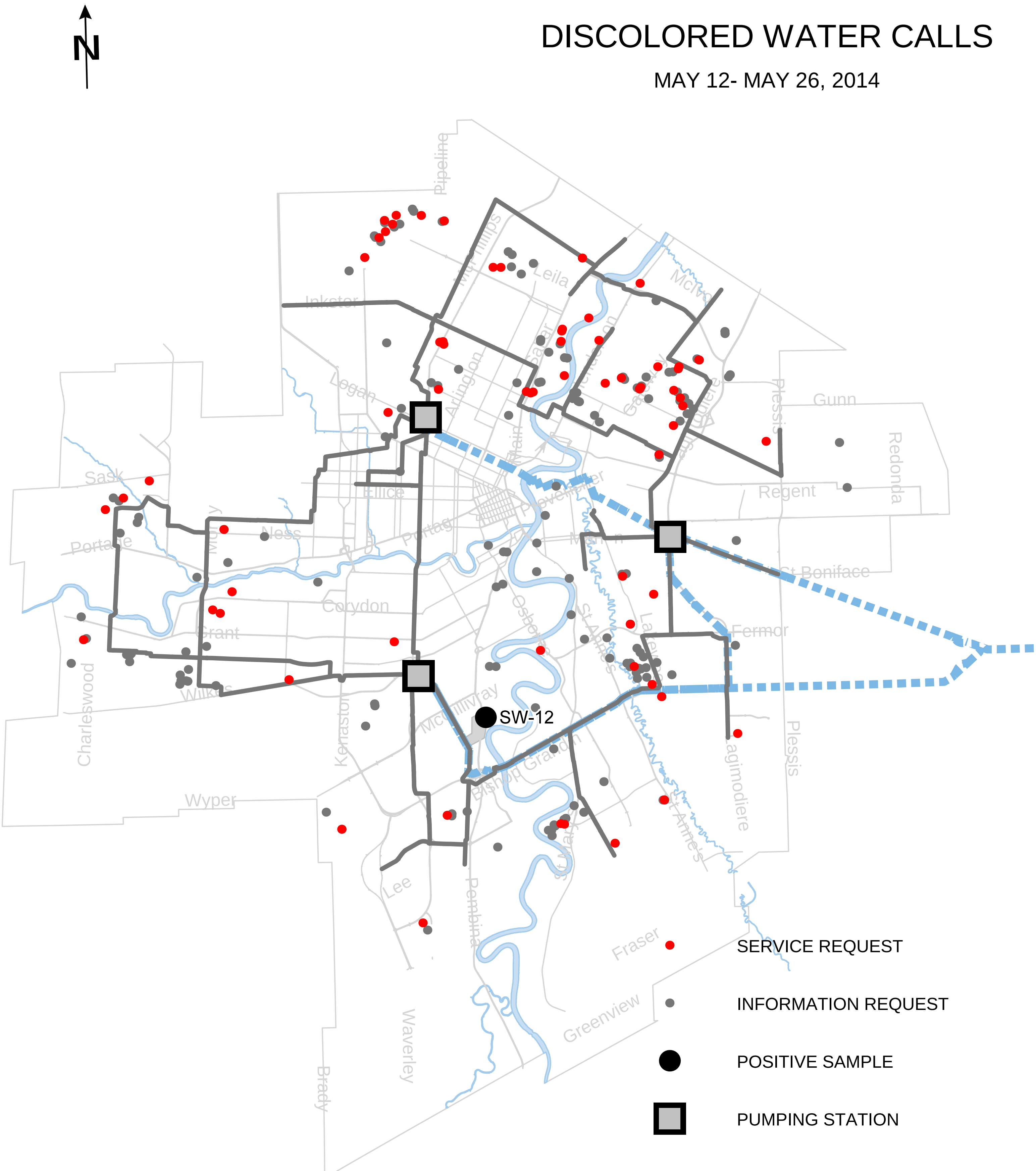
DISCOLORED WATER CALLS

JANUARY 12 - 26, 2015



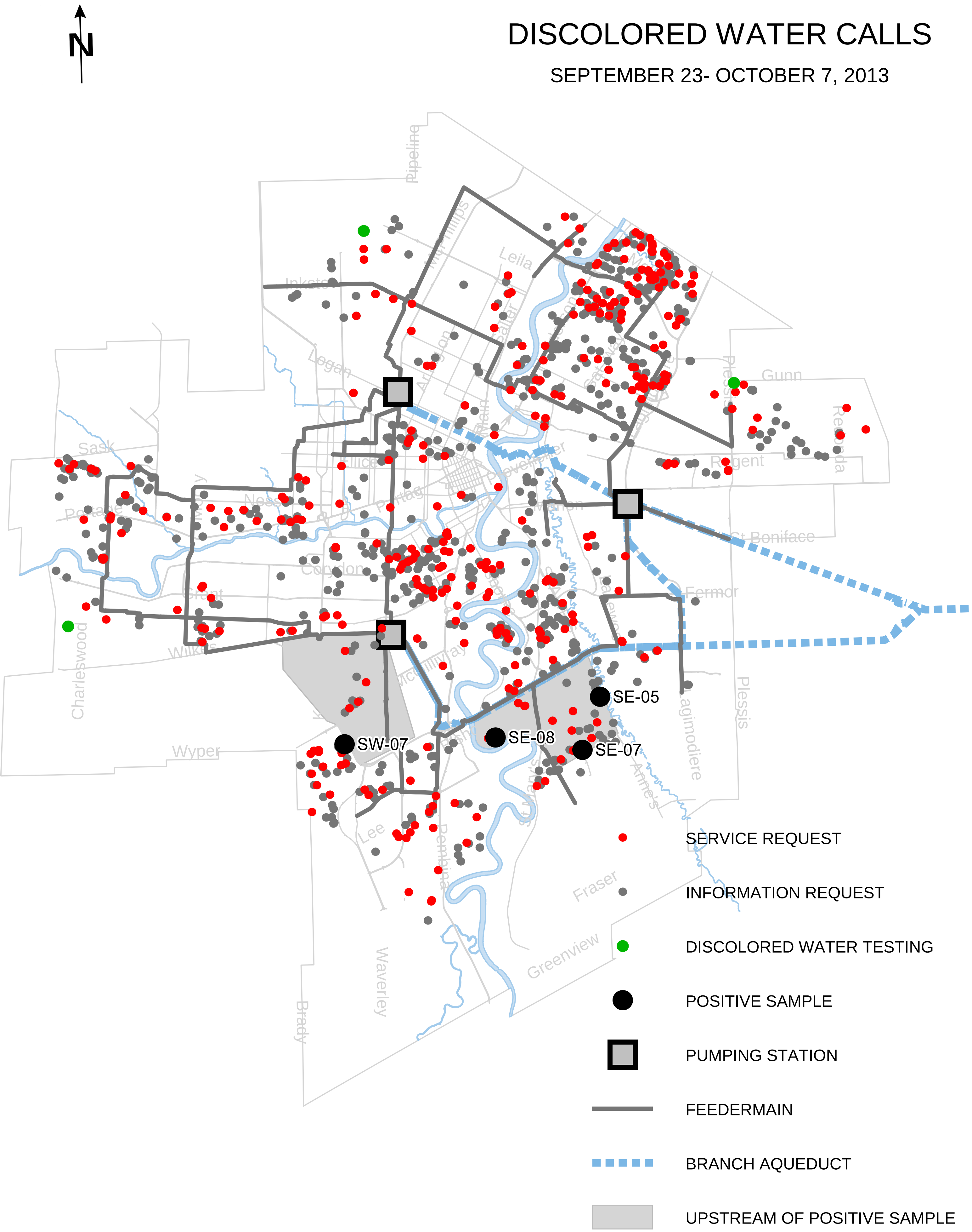
DISCOLORED WATER CALLS

MAY 12- MAY 26, 2014



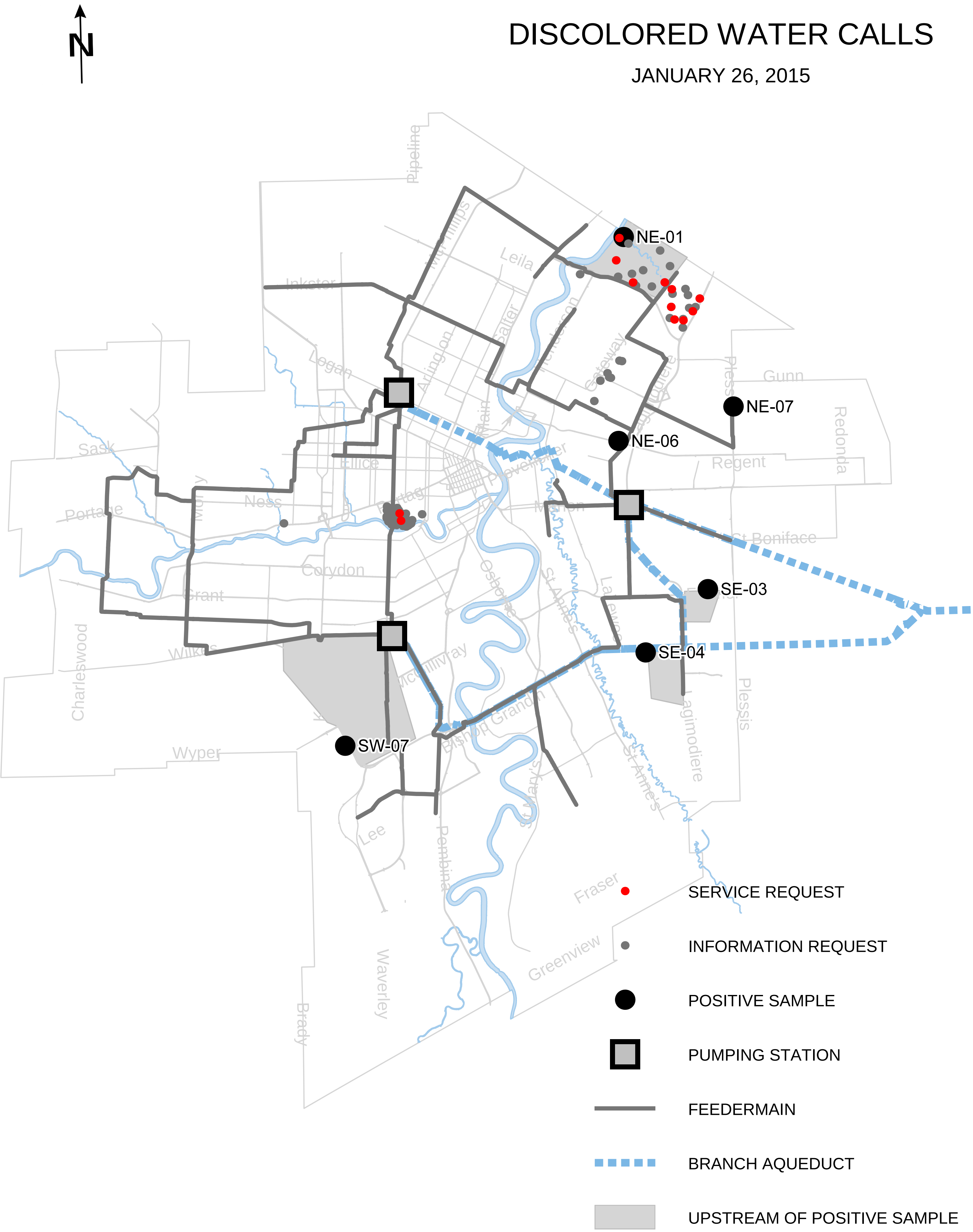
DISCOLORED WATER CALLS

SEPTEMBER 23- OCTOBER 7, 2013



DISCOLORED WATER CALLS

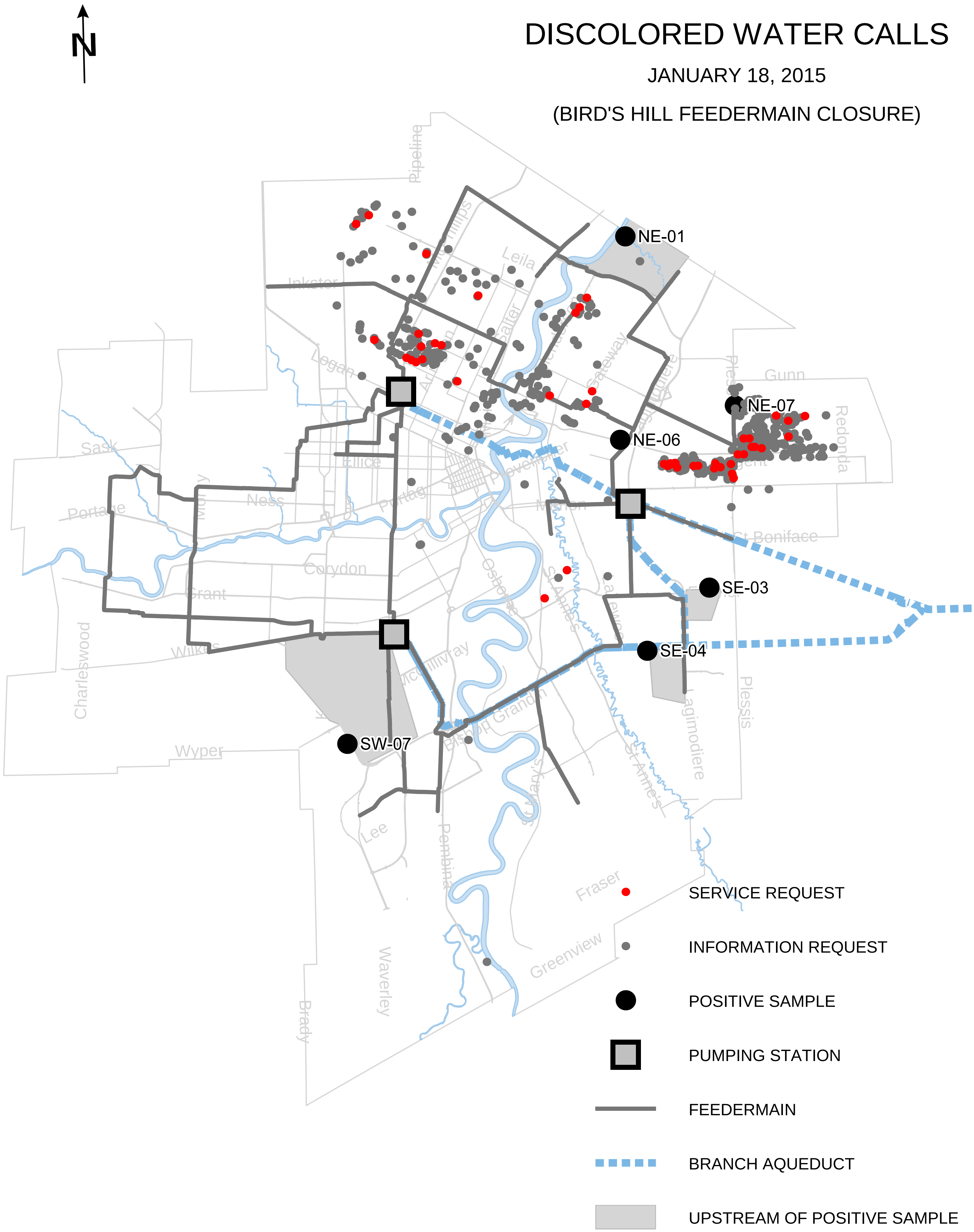
JANUARY 26, 2015



DISCOLORED WATER CALLS

JANUARY 18, 2015

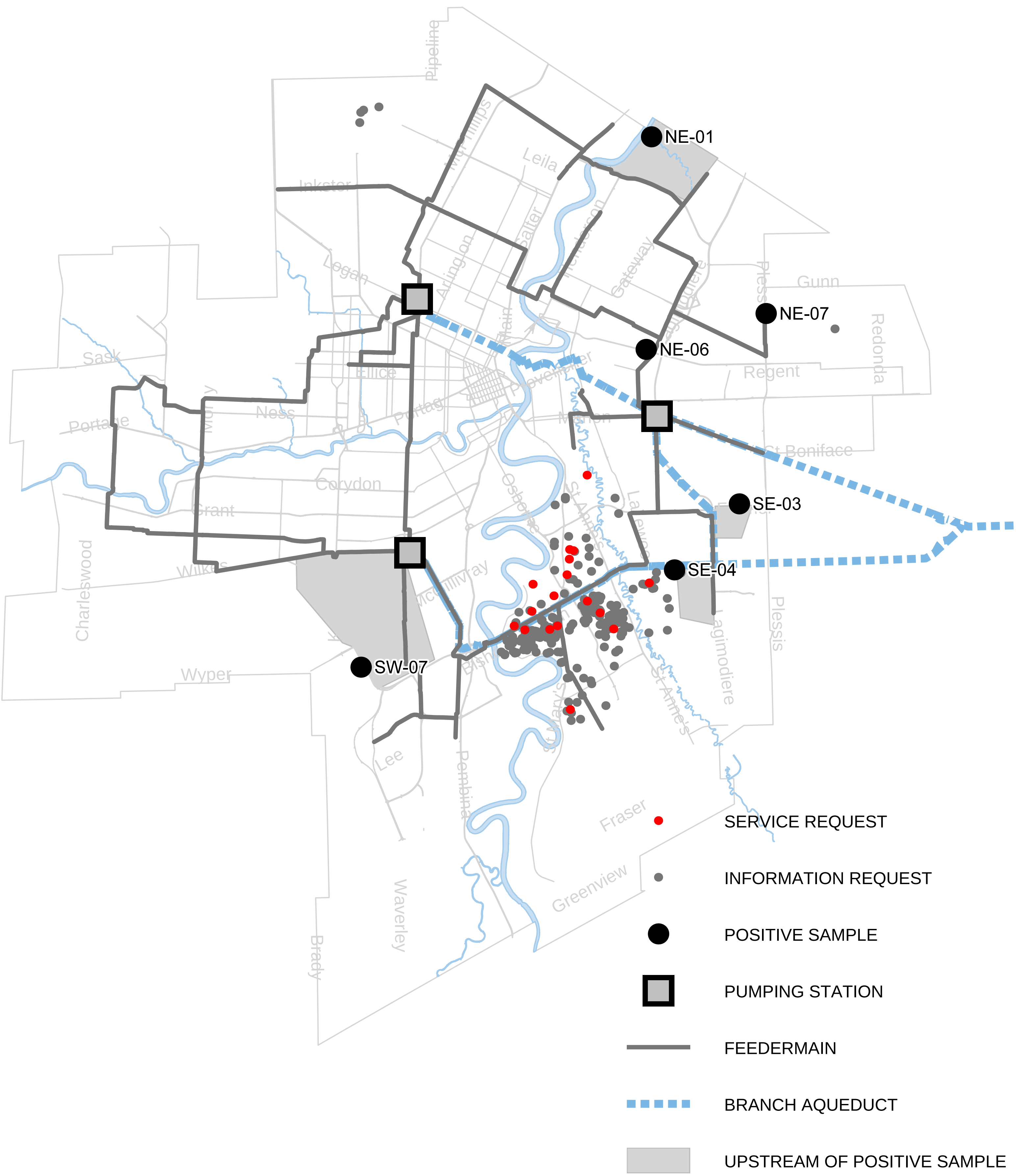
(BIRD'S HILL FEEDERMAIN CLOSURE)



DISCOLORED WATER CALLS

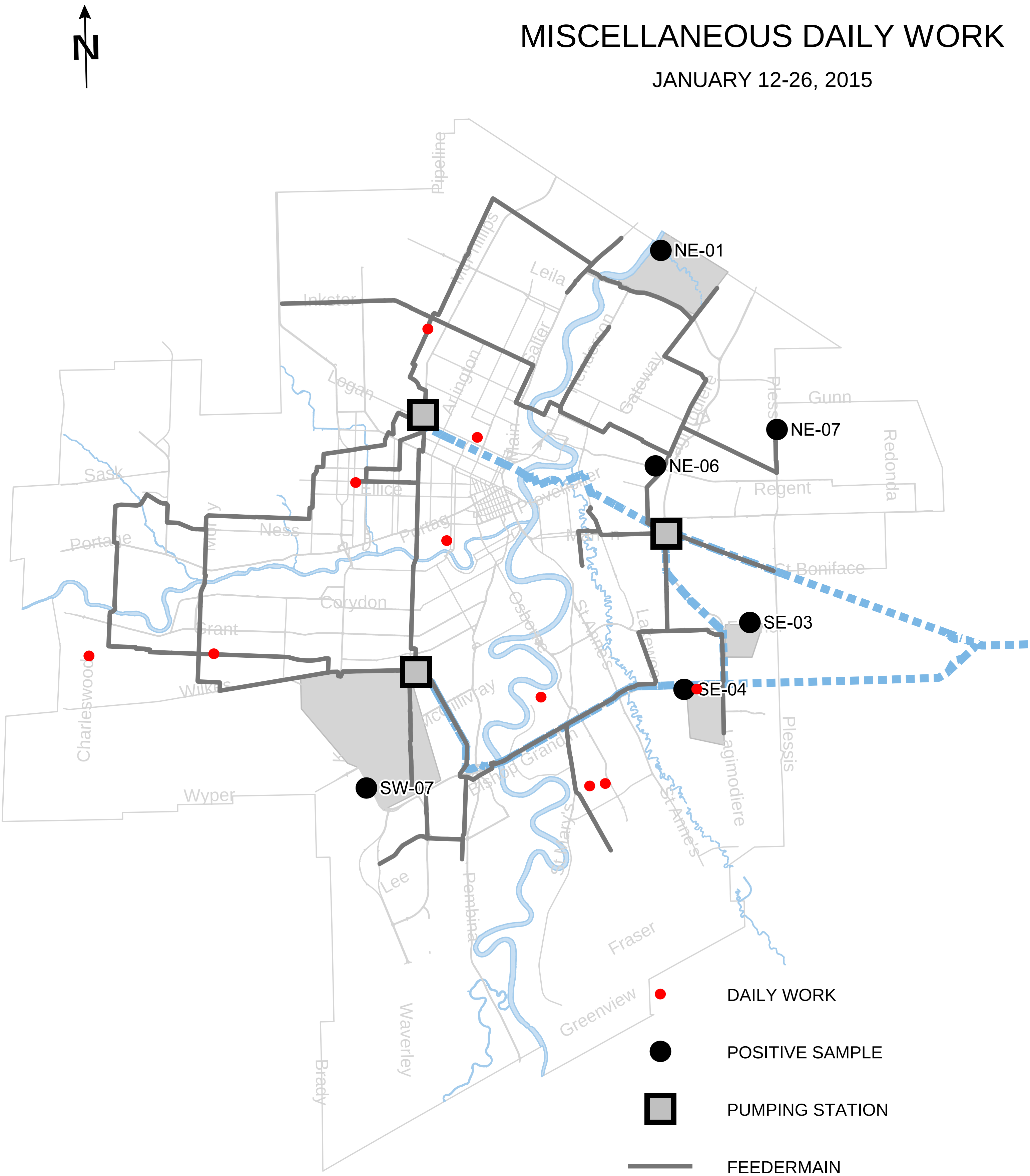
DECEMBER 26, 2014

N



MISCELLANEOUS DAILY WORK

JANUARY 12-26, 2015



DAILY WORK

POSITIVE SAMPLE

PUMPING STATION

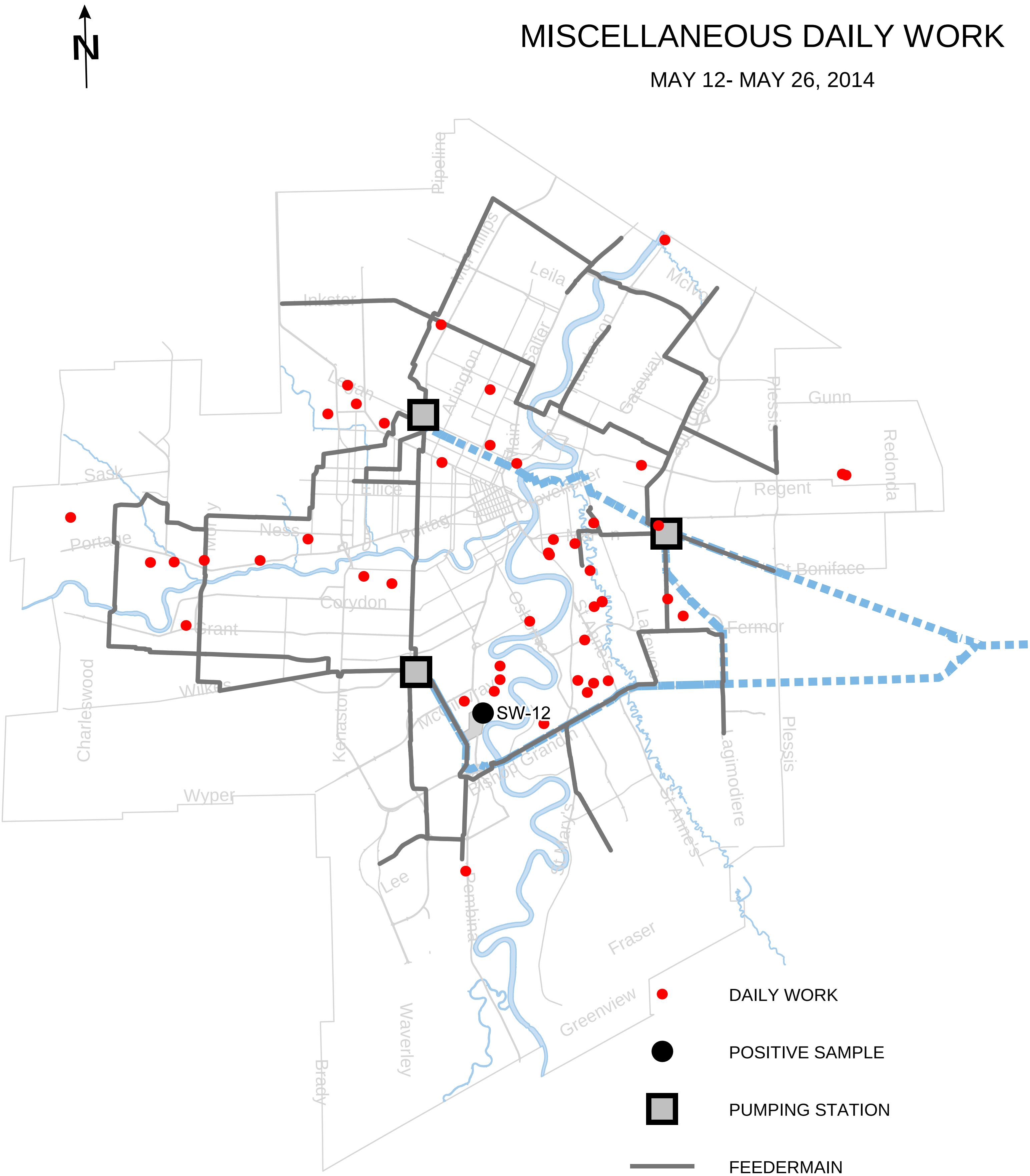
FEEDERMAIN

BRANCH AQUEDUCT

UPSTREAM OF POSITIVE SAMPLE

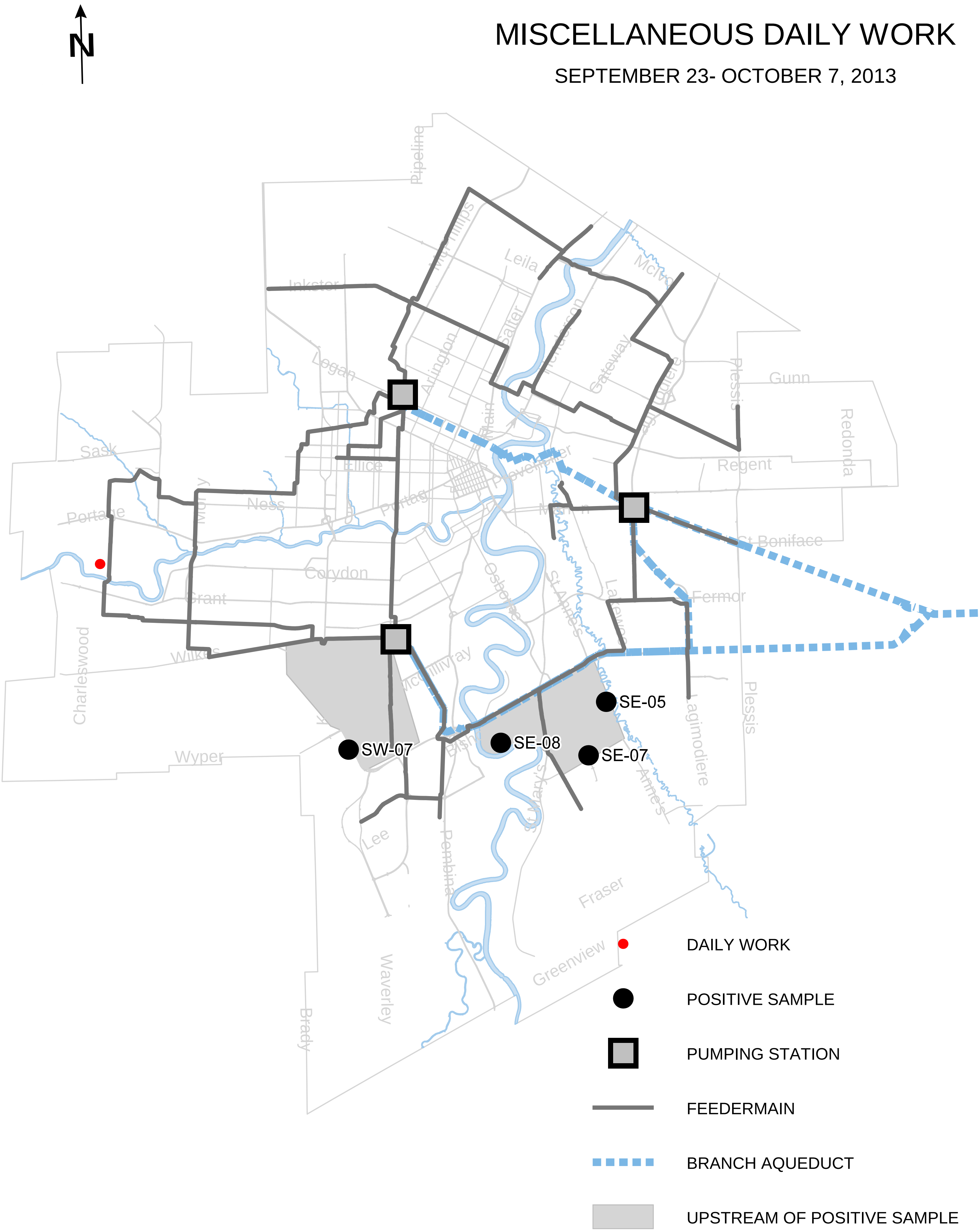
MISCELLANEOUS DAILY WORK

MAY 12- MAY 26, 2014



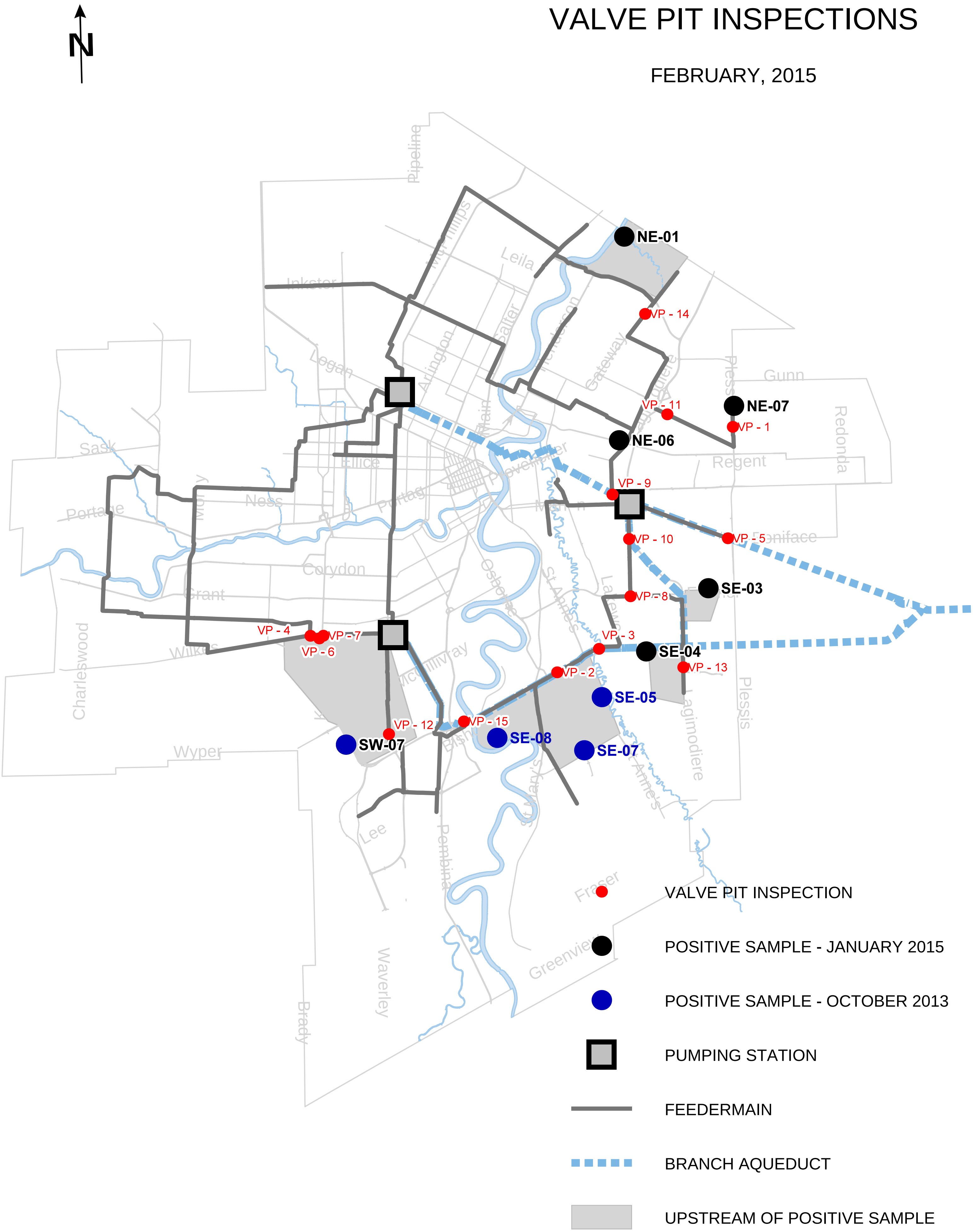
MISCELLANEOUS DAILY WORK

SEPTEMBER 23- OCTOBER 7, 2013

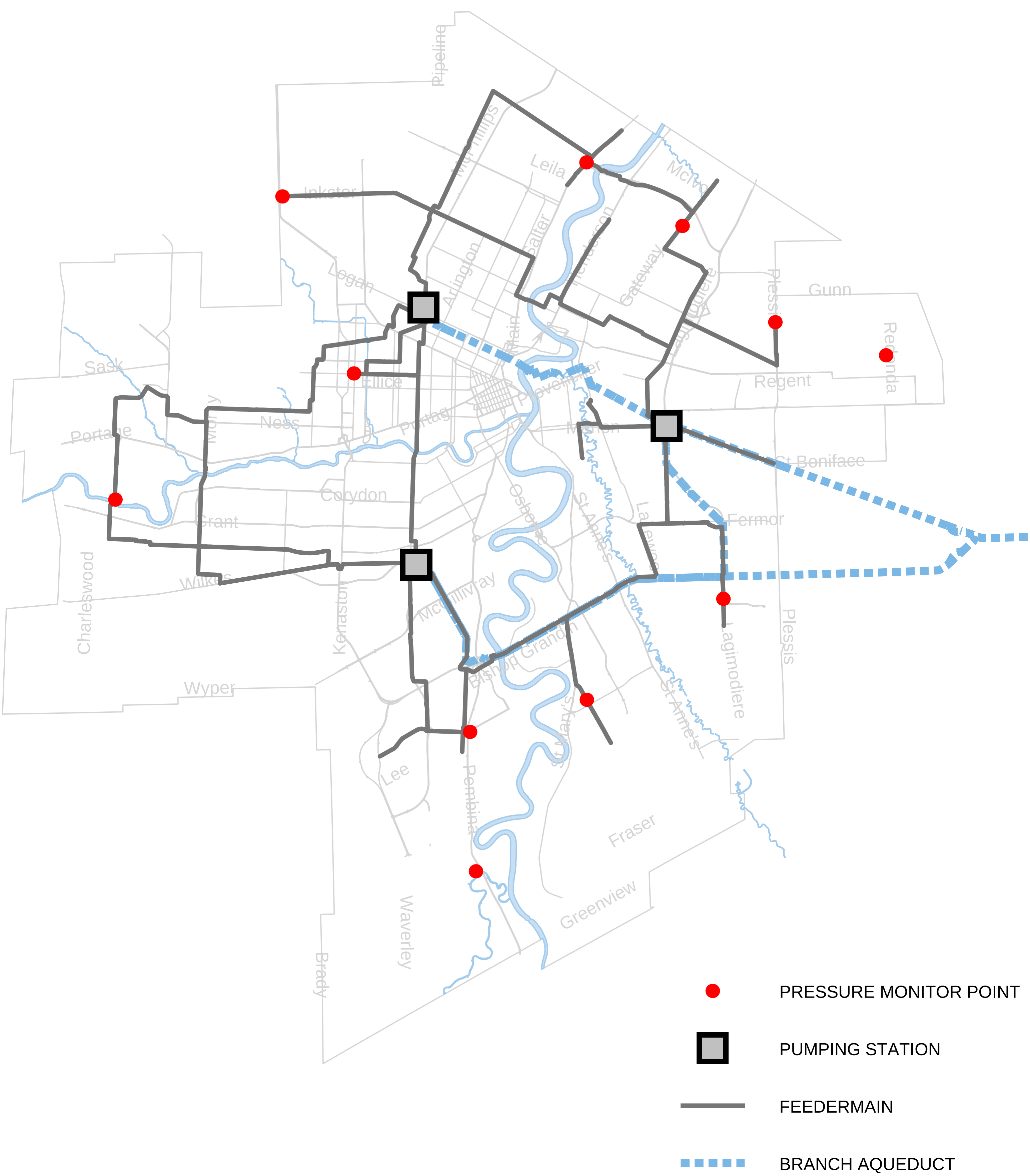


VALVE PIT INSPECTIONS

FEBRUARY, 2015



PRESSURE MONITORING POINTS

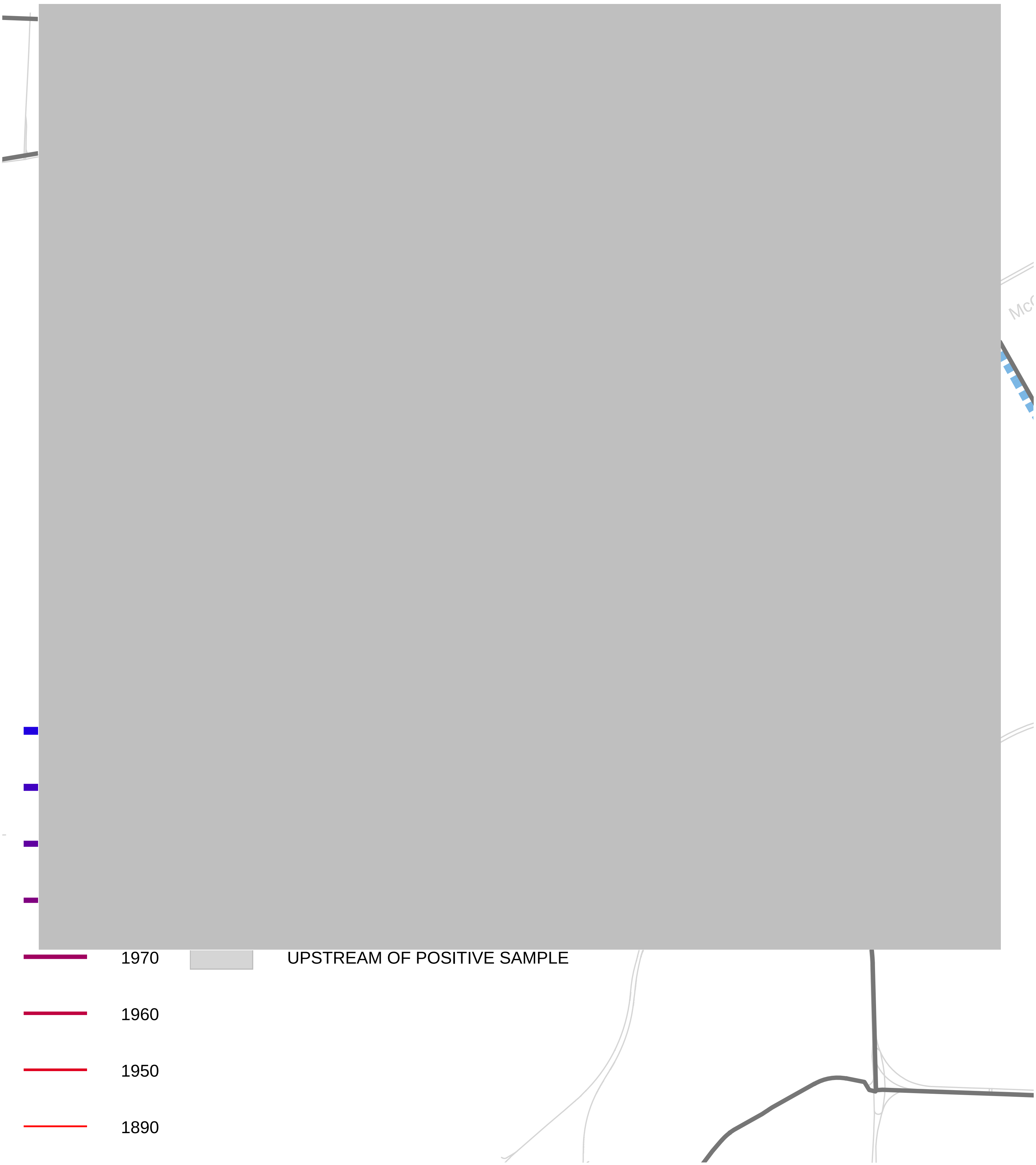


WATERMAIN MATERIAL
UPSTREAM OF POSITIVE SAMPLE

SAMPLE POINT SW-07

WATERMAIN AGE
UPSTREAM OF POSITIVE SAMPLE

SAMPLE POINT SW-07



WATERMAIN MATERIAL
UPSTREAM OF POSITIVE SAMPLE

PVC

PUMPING STATION

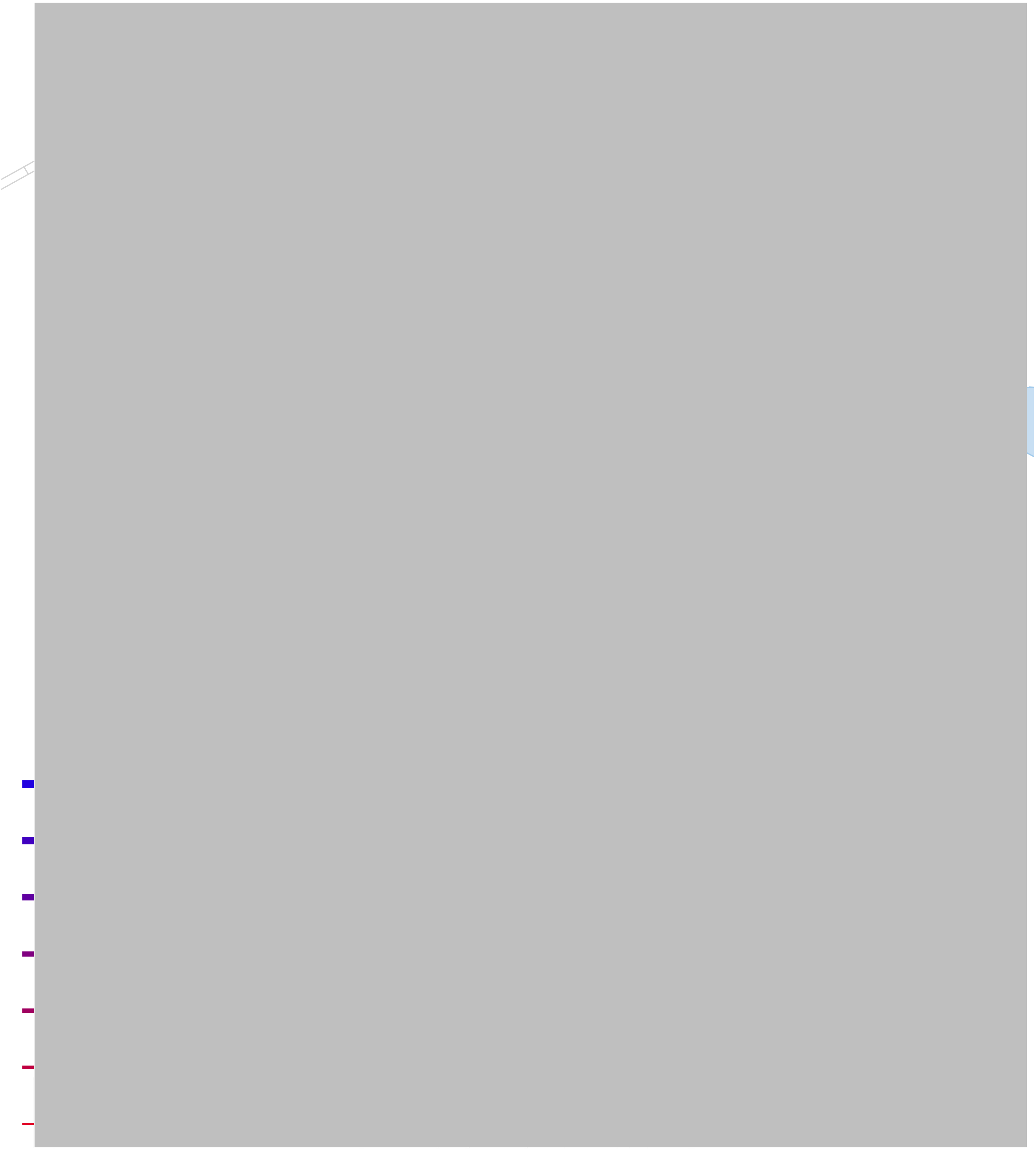
FEEDERMAIN

BRANCH AQUEDUCT

UPSTREAM OF POSITIVE SAMPLE

N

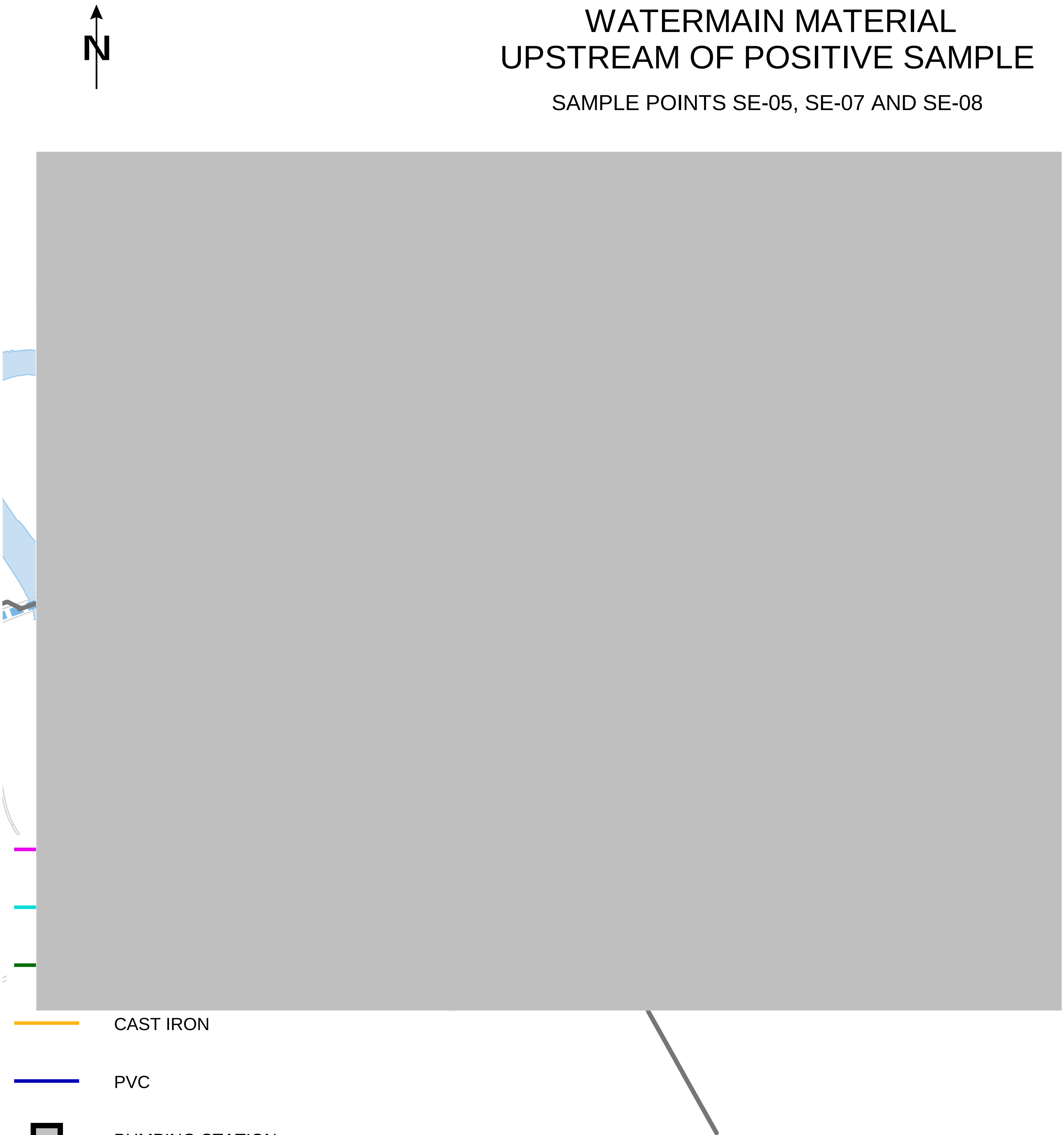
WATERMAIN AGE
UPSTREAM OF POSITIVE SAMPLE



1890

WATERMAIN MATERIAL
UPSTREAM OF POSITIVE SAMPLE

SAMPLE POINTS SE-05, SE-07 AND SE-08



CAST IRON

PVC

PUMPING STATION

FEEDERMAIN

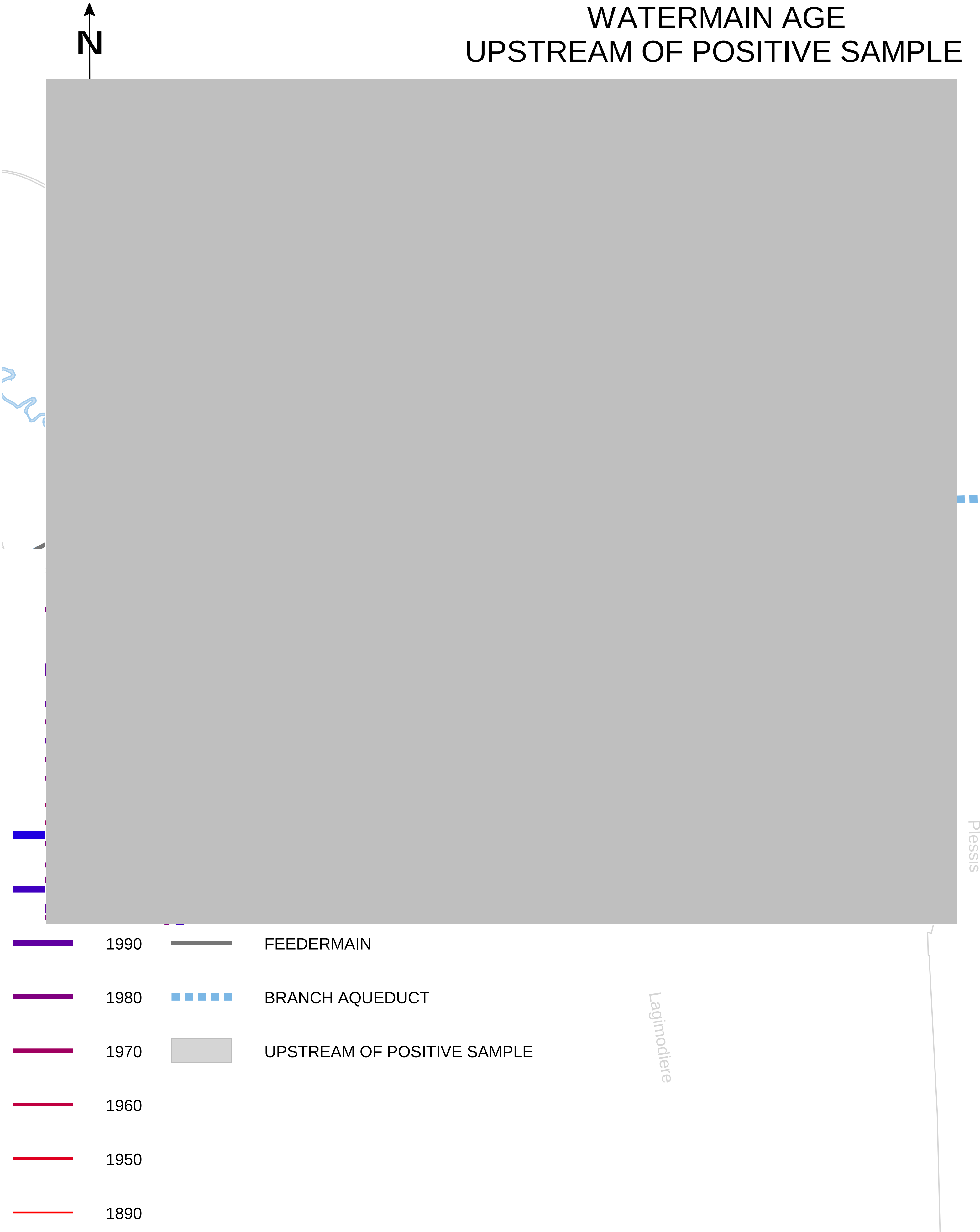
BRANCH AQUEDUCT

UPSTREAM OF POSITIVE SAMPLE


WATERMAIN AGE
N
2000
1990
1980
1970
1960
1950
1890
PUMPING STATION
FEEDERMAIN
BRANCH AQUEDUCT
UPSTREAM OF POSITIVE SAMPLE

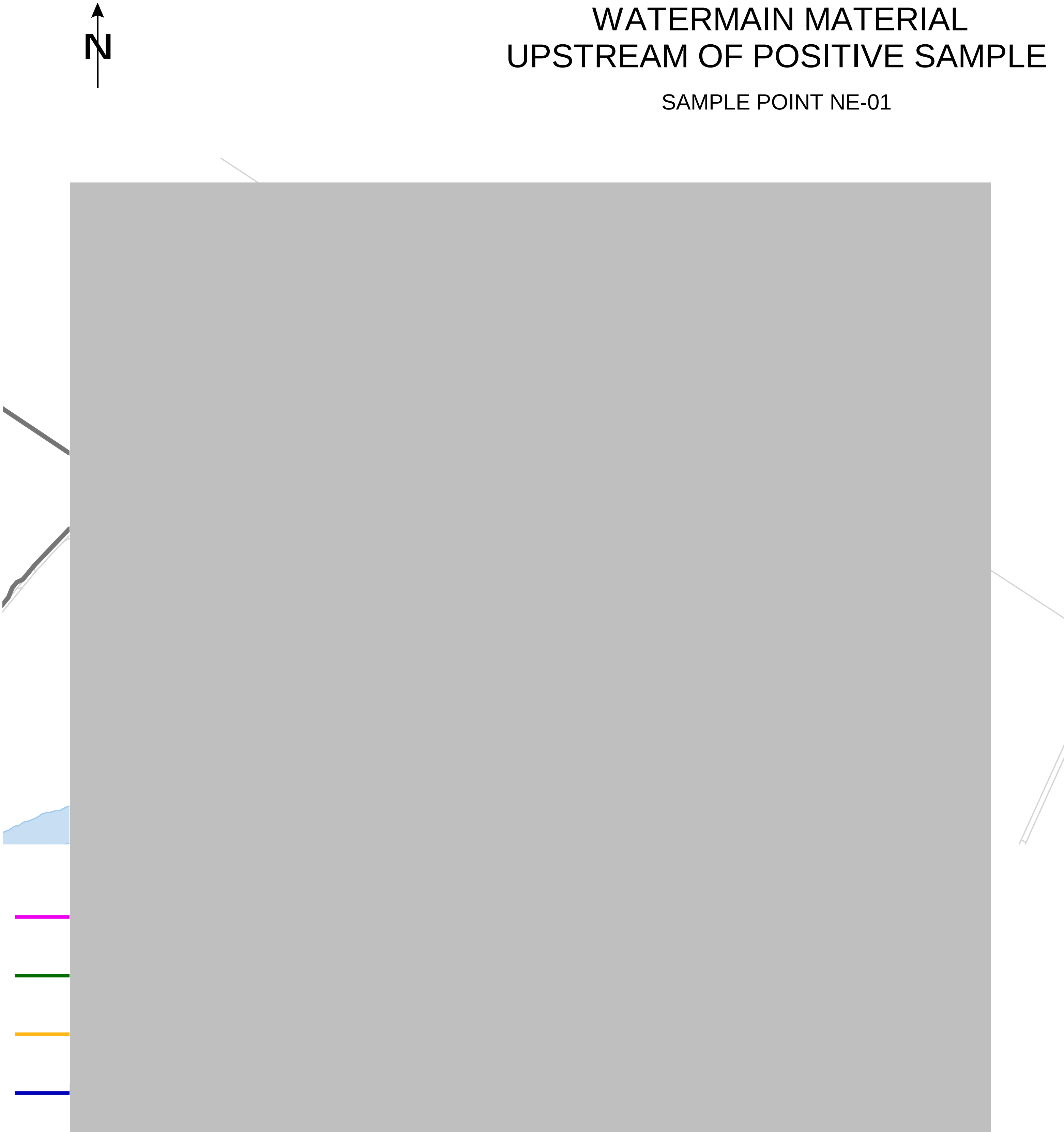
WATERMAIN MATERIAL
UPSTREAM OF POSITIVE SAMPLE

WATERMAIN AGE
UPSTREAM OF POSITIVE SAMPLE



WATERMAIN MATERIAL
UPSTREAM OF POSITIVE SAMPLE

SAMPLE POINT NE-01



PUMPING STATION

FEEDERMAIN

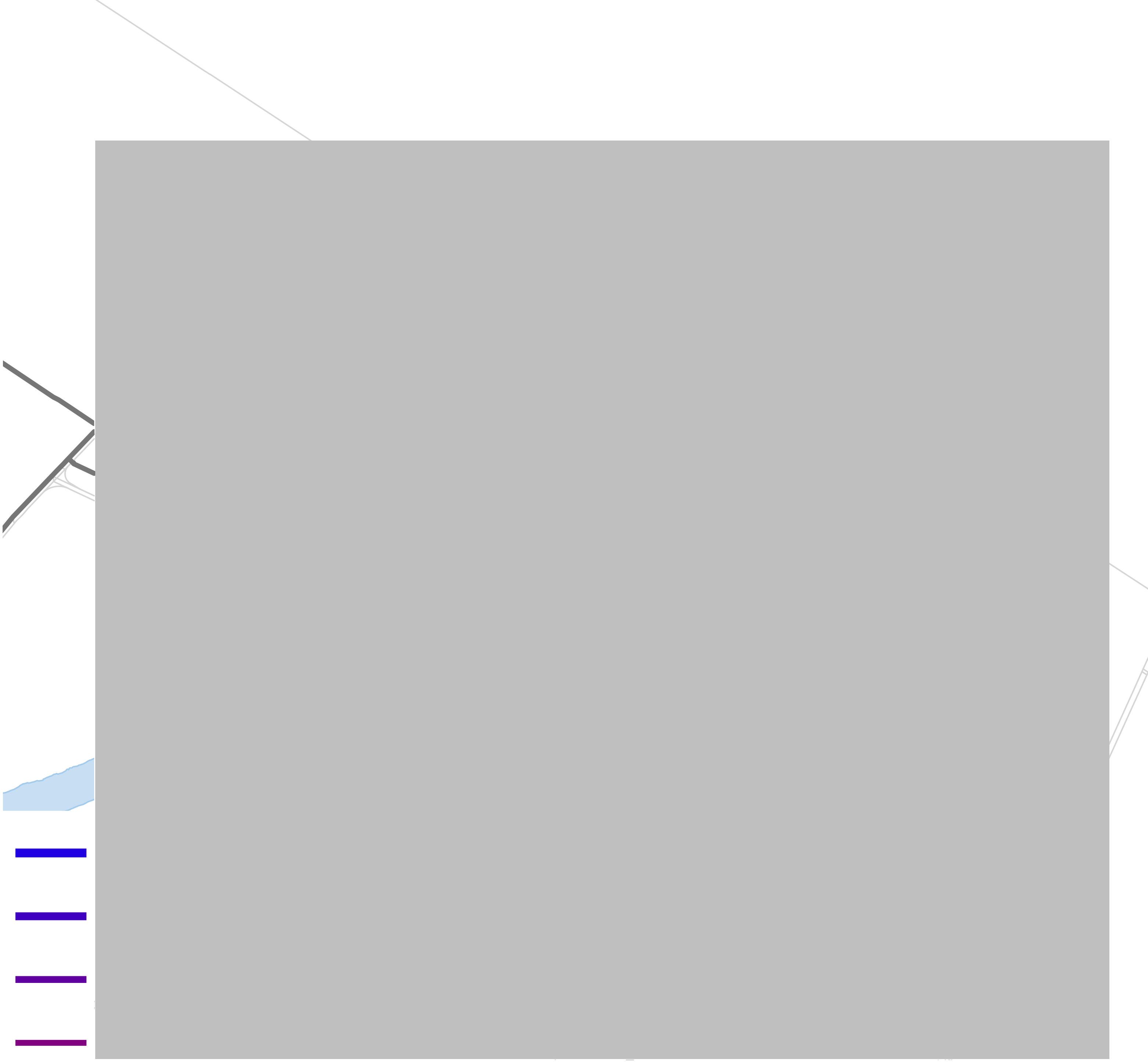
BRANCH AQUEDUCT

UPSTREAM OF POSITIVE SAMPLE

N

WATERMAIN AGE
UPSTREAM OF POSITIVE SAMPLE

SAMPLE POINT NE-01



1970 UPSTREAM OF POSITIVE SAMPLE

1960

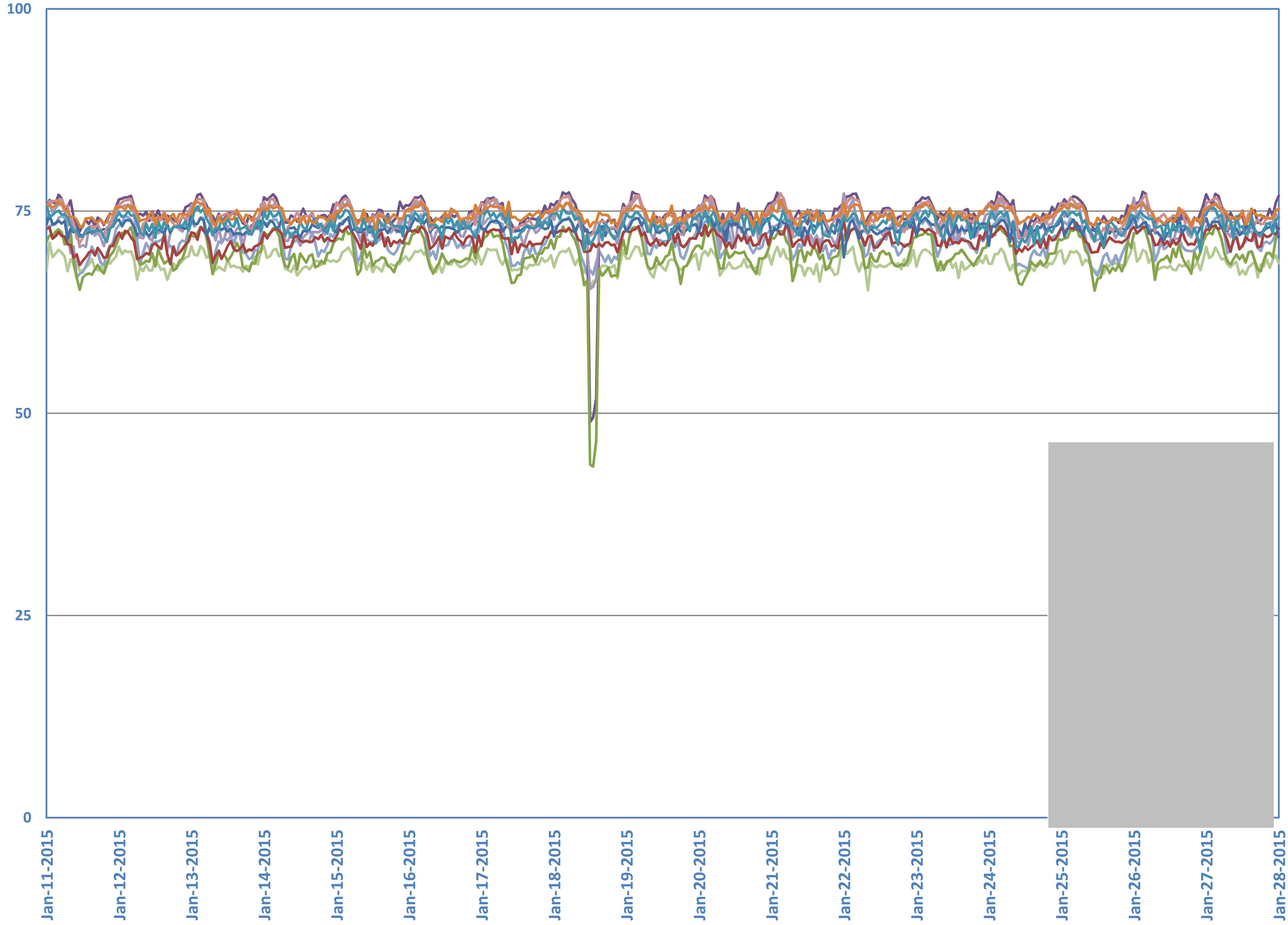
1950

1890

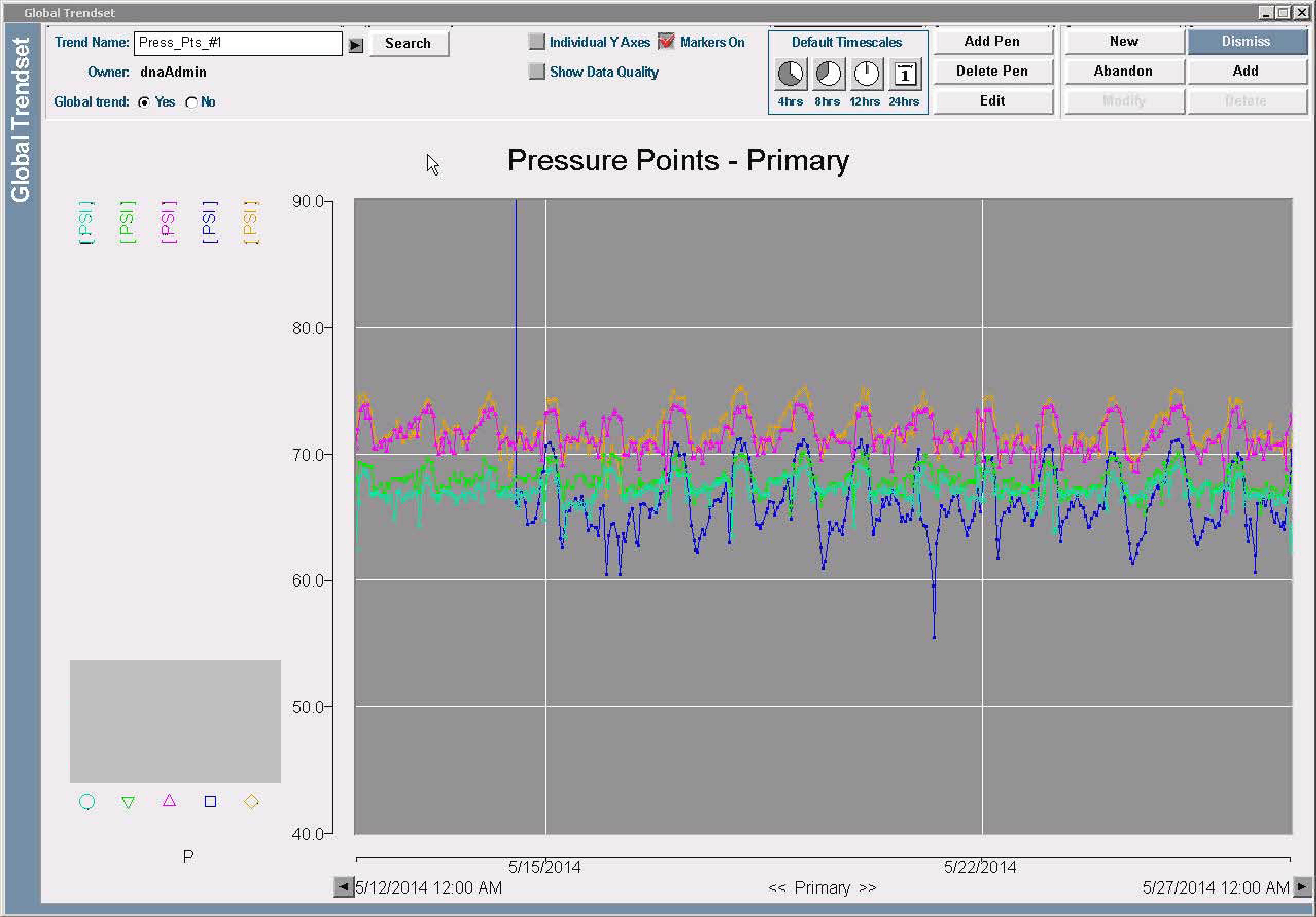
E2 Distribution System Pressures

E2a SCADA Hourly Pressure Values Jan 12-26 2015

Hourly Pressure Values (PSI)

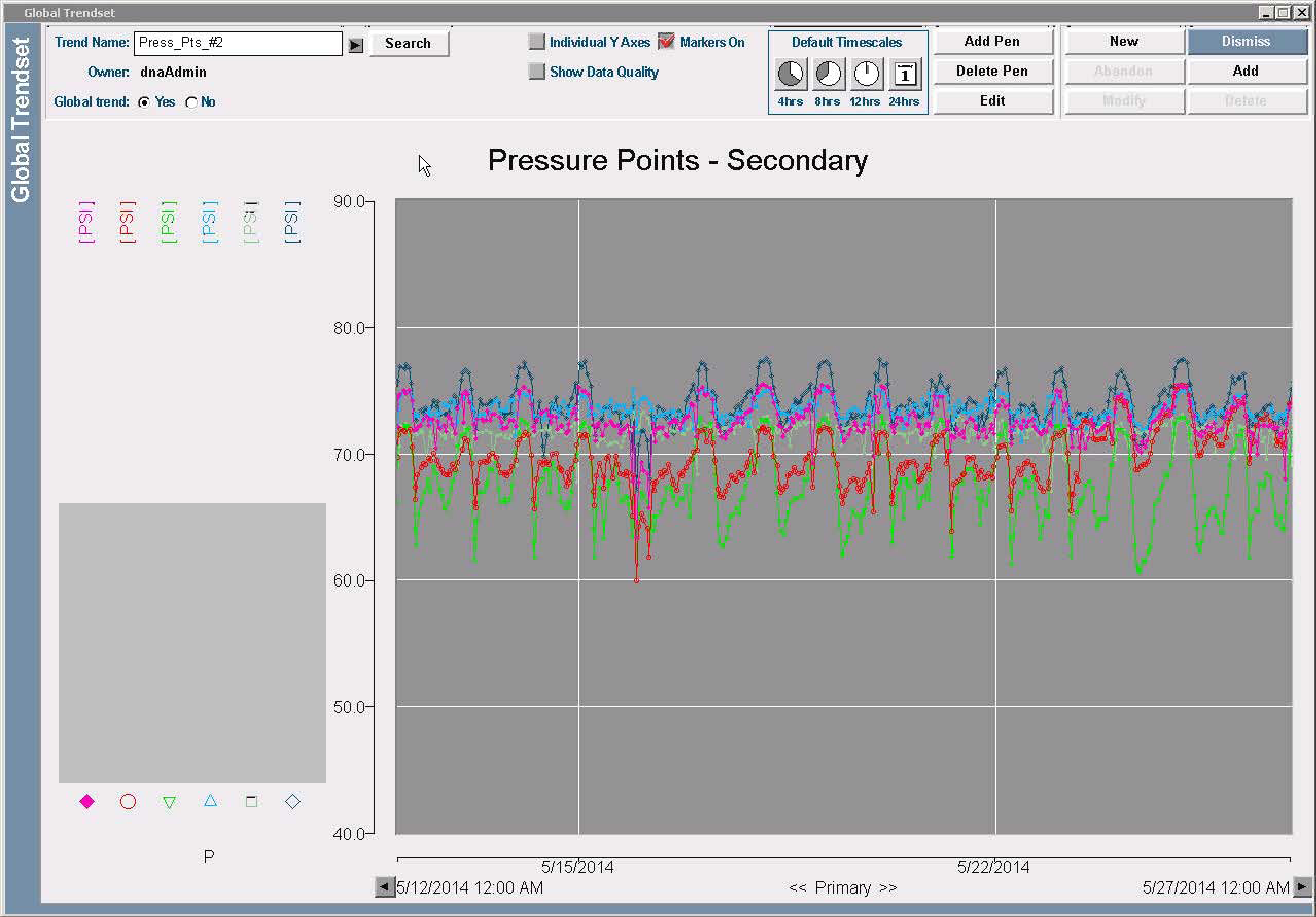


E2b Pressure Points 1 Hourly Min May 12-May 26 2014



Global Trendset
Global Trendset
Trend Name: Press_Pts_#1
Search
Owner: dnaAdmin
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
Pressure Points - Primary
[PSI]
[PSI]
[PSI]
[PSI]
[PSI]
90.0
80.0
70.0
60.0
50.0
40.0
P
5/15/2014
5/22/2014
5/12/2014 12:00 AM
<< Primary >>
5/27/2014 12:00 AM

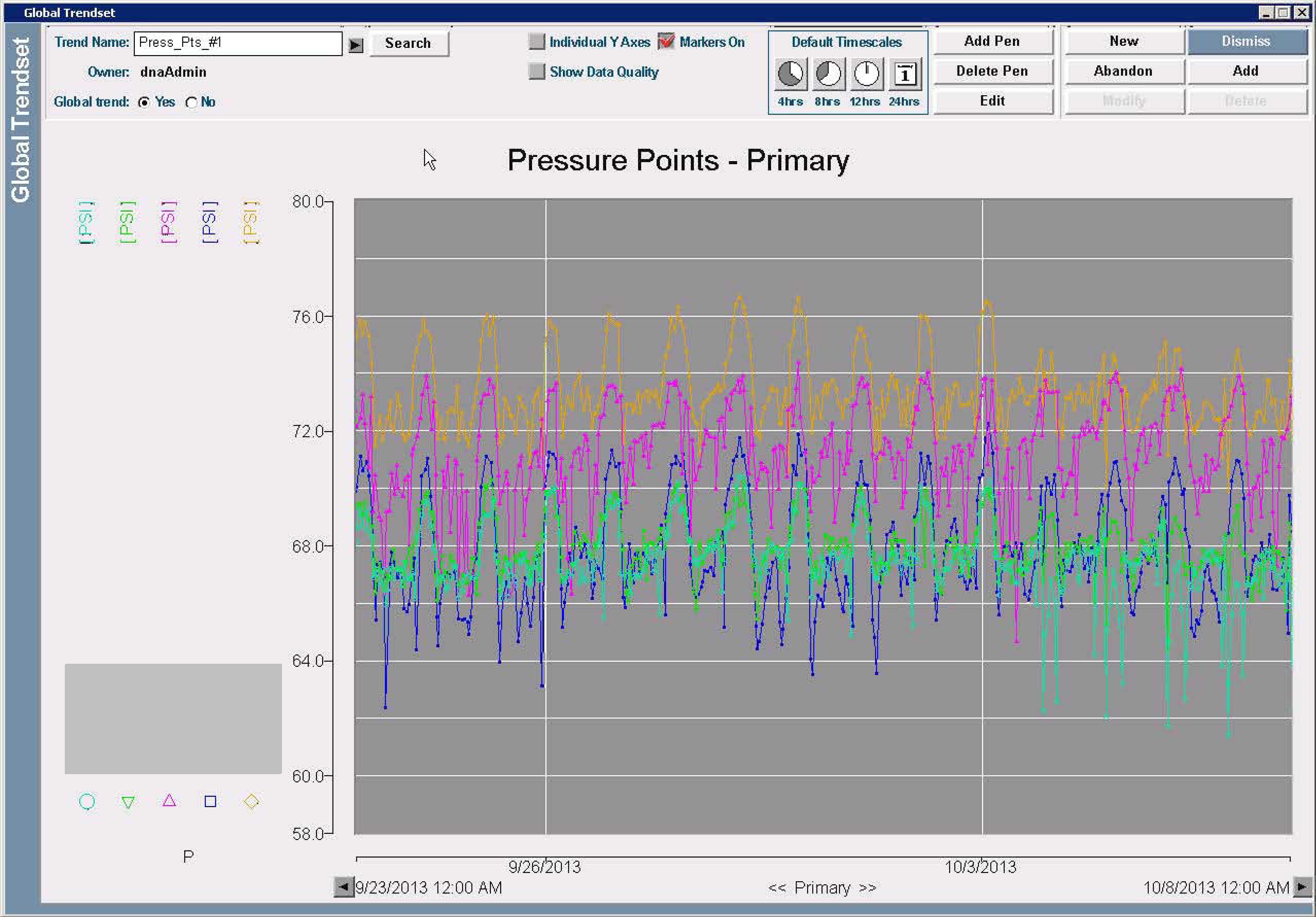
E2c Pressure Points 2 Hourly Min May 12-May 26 2014



Global Trendset
Global Trendset
Trend Name: Press_Pts_#2
Search
Owner: dnaAdmin
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
Pressure Points - Secondary
[PSI]
[PSI]
[PSI]
[PSI]
[PSI]
[PSI]
90.0
80.0
70.0
60.0
50.0
40.0
P
5/15/2014
5/22/2014
5/12/2014 12:00 AM
<< Primary >>
5/27/2014 12:00 AM

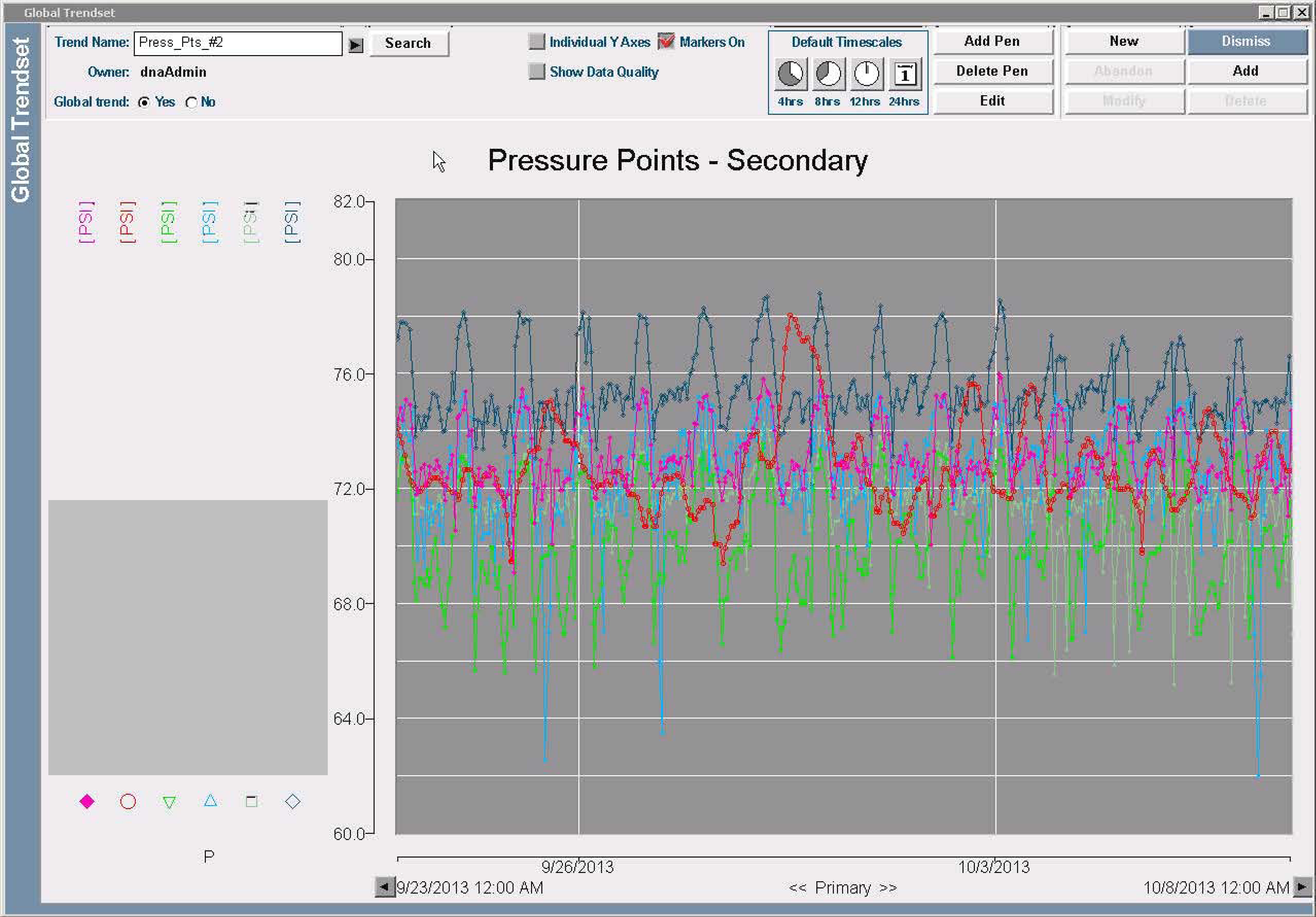
AECOM

E2d Pressure Points 1
Hourly Min Sep 23-Oct 7 2013



Global Trendset
Global Trendset
Trend Name: Press_Pts_#1
Search
Owner: dnaAdmin
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Dismiss
Abandon
Add
Modify
Delete
Pressure Points - Primary
[PSI]
[PSI]
[PSI]
[PSI]
[PSI]
80.0
76.0
72.0
68.0
64.0
60.0
58.0
P
9/26/2013
10/3/2013
9/23/2013 12:00 AM
<< Primary >>
10/8/2013 12:00 AM

E2e Pressure Points 2
Hourly Min Sep 23-Oct 7 2013



Global Trendset
Global Trendset
Trend Name: Press_Pts_#2
Search
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Dismiss
Abandon
Add
Modify
Delete
Owner: dnaAdmin
Global trend: Yes No
Pressure Points - Secondary
[PSI] [PSI] [PSI] [PSI] [PSI] [PSI]
82.0
80.0
76.0
72.0
68.0
64.0
60.0
9/26/2013
10/3/2013
P
9/23/2013 12:00 AM
<< Primary >>
10/8/2013 12:00 AM

E2f Pressure Point Pressure Alarms Jan 12-26 2015

	dbName	ptName	description	message	sevInt
1/14/2015 3:06	analog	QMRR_599_PT		Value = 74.45 psi (HIGH state)	0
1/14/2015 3:06	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/14/2015 3:08	analog	QMRR_599_PT		Value = 72.71 psi (NORMAL state)	0
1/14/2015 3:08	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/14/2015 5:57	analog	QMSA_599_PT		Value = 76.05 psi (HIGH state)	0
1/14/2015 5:57	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/14/2015 5:58	analog	QMSA_599_PT		Value = 74.89 psi (NORMAL state)	0
1/14/2015 5:58	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/15/2015 1:24	analog	QMRR_599_PT		Value = 74.26 psi (HIGH state)	0
1/15/2015 1:24	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/15/2015 1:26	analog	QMRR_599_PT		Value = 71.55 psi (NORMAL state)	0
1/15/2015 1:26	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/15/2015 5:15	analog	QMSA_599_PT		Value = 76.05 psi (HIGH state)	0
1/15/2015 5:16	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/15/2015 5:17	analog	QMRR_599_PT		Value = 76.22 psi (HIGH-HIGH state)	0
1/15/2015 5:17	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/15/2015 5:18	analog	QMSA_599_PT		Value = 74.98 psi (NORMAL state)	0
1/15/2015 5:18	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/15/2015 5:19	analog	QMRR_599_PT		Value = 71.91 psi (NORMAL state)	0
1/15/2015 5:19	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/15/2015 23:42	analog	QMRR_599_PT		Value = 74.26 psi (HIGH state)	0
1/15/2015 23:43	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/15/2015 23:44	analog	QMRR_599_PT		Value = 71.45 psi (NORMAL state)	0
1/15/2015 23:45	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/16/2015 5:38	analog	QMSA_599_PT		Value = 76.14 psi (HIGH state)	0
1/16/2015 5:38	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by M keMastroianni at wwdwsxo	0
1/16/2015 5:39	analog	QMRR_599_PT		Value = 75.97 psi (HIGH-HIGH state)	0
1/16/2015 5:39	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by M keMastroianni at wwdwsxc	0
1/16/2015 5:40	analog	QMSA_599_PT		Value = 74.43 psi (NORMAL state)	0
1/16/2015 5:40	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/16/2015 5:41	analog	QMRR_599_PT		Value = 73.41 psi (NORMAL state)	0
1/16/2015 5:41	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/17/2015 3:40	analog	QMRR_599_PT		Value = 74.2 psi (HIGH state)	0
1/17/2015 3:41	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/17/2015 3:42	analog	QMRR_599_PT		Value = 71.64 psi (NORMAL state)	0
1/17/2015 3:43	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
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1/17/2015 4:36	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by M keMastroianni at wwdwsxc	0
1/17/2015 4:38	analog	QMRR_599_PT		Value = 71.91 psi (NORMAL state)	0
1/17/2015 4:38	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by M keMastroianni at wwdwsxc	0
1/17/2015 4:54	analog	QMRR_599_PT		Value = 74.35 psi (HIGH state)	0
1/17/2015 4:55	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/17/2015 4:56	analog	QMRR_599_PT		Value = 72.64 psi (NORMAL state)	0
1/17/2015 4:57	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/17/2015 7:31	analog	QMSA_599_PT		Value = 76.23 psi (HIGH state)	0
1/17/2015 7:31	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/17/2015 7:31	analog	QMRR_599_PT		Value = 74.93 psi (HIGH state)	0
1/17/2015 7:31	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0

1/17/2015 7:32	analog	QMSA_599_PT		Value = 74.98 psi (NORMAL state)	0
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1/17/2015 7:33	analog	QMRR_599_PT		Value = 70.72 psi (NORMAL state)	0
1/17/2015 7:33	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 7:42	analog	QMRR_599_PT		Value = 74.69 psi (HIGH state)	0
1/18/2015 7:42	analog	QMSA_599_PT		Value = 76.2 psi (HIGH state)	0
1/18/2015 7:42	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 7:43	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 7:44	analog	QMSA_599_PT		Value = 74.92 psi (NORMAL state)	0
1/18/2015 7:44	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 7:44	analog	QMRR_599_PT		Value = 71.27 psi (NORMAL state)	0
1/18/2015 7:44	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 11:23	analog	QMRS_599_PT		Value = 62.71 psi (LOW state)	0
1/18/2015 11:23	analog	QMPR_599_PT		Value = 58.51 psi (LOW state)	0
1/18/2015 11:23	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/18/2015 11:23	analog	QMRS_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRS_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/18/2015 11:25	analog	QMRS_599_PT		Value = 43.24 psi (LOW-LOW state)	0
1/18/2015 11:25	analog	QMRS_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRS_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 11:25	analog	QMPR_599_PT		Value = 48.26 psi (LOW-LOW state)	0
1/18/2015 11:25	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/18/2015 11:43	analog	QMJB_599_PT		Value = 63.91 psi (LOW state)	0
1/18/2015 11:44	analog	QMJB_599_PT		Issued command ACKNOWLEDGE ANALOG.QMJB_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 11:45	analog	QMJB_599_PT		Value = 65.29 psi (NORMAL state)	0
1/18/2015 11:46	analog	QMJB_599_PT		Issued command ACKNOWLEDGE ANALOG.QMJB_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/18/2015 12:31	analog	QMJB_599_PT		Value = 63.82 psi (LOW state)	0
1/18/2015 12:31	analog	QMJB_599_PT		Issued command ACKNOWLEDGE ANALOG.QMJB_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 12:33	analog	QMJB_599_PT		Value = 66.72 psi (NORMAL state)	0
1/18/2015 12:33	analog	QMJB_599_PT		Issued command ACKNOWLEDGE ANALOG.QMJB_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 14:07	analog	QMPR_599_PT		Value = 58.48 psi (LOW state)	0
1/18/2015 14:07	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 14:16	analog	QMPR_599_PT		Value = 63.7 psi (NORMAL state)	0
1/18/2015 14:16	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 14:20	analog	QMRS_599_PT		Value = 63.81 psi (LOW state)	0
1/18/2015 14:20	analog	QMRS_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRS_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/18/2015 14:27	analog	QMRS_599_PT		Value = 68.08 psi (NORMAL state)	0
1/18/2015 14:27	analog	QMRS_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRS_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/19/2015 0:03	analog	QMPR_599_PT		Value = 78.72 psi (HIGH state)	0
1/19/2015 0:03	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/19/2015 0:06	analog	QMPR_599_PT		Value = 74.93 psi (NORMAL state)	0
1/19/2015 0:06	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/19/2015 1:18	analog	QMPR_599_PT		Value = 78.11 psi (HIGH state)	0
1/19/2015 1:18	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/19/2015 1:20	analog	QMPR_599_PT		Value = 76.4 psi (NORMAL state)	0
1/19/2015 1:20	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/19/2015 2:34	analog	QMPR_599_PT		Value = 78.02 psi (HIGH state)	0
1/19/2015 2:34	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/19/2015 3:02	analog	QMPR_599_PT		Value = 76.83 psi (NORMAL state)	0
1/19/2015 3:03	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by MikeMastroianni at wwdwsxo	0
1/19/2015 3:12	analog	QMRR_599_PT		Value = 74.11 psi (HIGH state)	0

1/19/2015 3:12	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/19/2015 3:14	analog	QMRR_599_PT	Value = 71.79 psi (NORMAL state)	0
1/19/2015 3:14	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/20/2015 3:40	analog	QMRR_599_PT	Value = 74.38 psi (HIGH state)	0
1/20/2015 3:40	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/20/2015 3:42	analog	QMRR_599_PT	Value = 72.86 psi (NORMAL state)	0
1/20/2015 3:42	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/20/2015 5:40	analog	QMSA_599_PT	Value = 76.44 psi (HIGH state)	0
1/20/2015 5:40	analog	QMSA_599_PT	Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by M keMastroianni at wwdwsxo	0
1/20/2015 5:41	analog	QMRR_599_PT	Value = 74.66 psi (HIGH state)	0
1/20/2015 5:41	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by M keMastroianni at wwdwsxc	0
1/20/2015 5:42	analog	QMSA_599_PT	Value = 74.86 psi (NORMAL state)	0
1/20/2015 5:42	analog	QMSA_599_PT	Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by M keMastroianni at wwdwsxo	0
1/20/2015 5:43	analog	QMRR_599_PT	Value = 72.83 psi (NORMAL state)	0
1/20/2015 5:43	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by M keMastroianni at wwdwsxc	0
1/20/2015 10:22	analog	QMSA_599_PT	Value = 76.08 psi (HIGH state)	0
1/20/2015 10:22	analog	QMSA_599_PT	Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/20/2015 10:23	analog	QMSA_599_PT	Value = 74.92 psi (NORMAL state)	0
1/20/2015 10:23	analog	QMSA_599_PT	Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/20/2015 23:30	analog	QMPR_599_PT	Value = 78.35 psi (HIGH state)	0
1/20/2015 23:30	analog	QMPR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/20/2015 23:32	analog	QMPR_599_PT	Value = 74.69 psi (NORMAL state)	0
1/20/2015 23:32	analog	QMPR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/21/2015 1:16	analog	QMPR_599_PT	Value = 78.05 psi (HIGH state)	0
1/21/2015 1:16	analog	QMPR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 1:18	analog	QMPR_599_PT	Value = 75 psi (NORMAL state)	0
1/21/2015 1:18	analog	QMPR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 1:23	analog	QMRR_599_PT	Value = 74.02 psi (HIGH state)	0
1/21/2015 1:23	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/21/2015 1:25	analog	QMRR_599_PT	Value = 71.67 psi (NORMAL state)	0
1/21/2015 1:25	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/21/2015 1:46	analog	QMRR_599_PT	Value = 74.17 psi (HIGH state)	0
1/21/2015 1:46	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 1:48	analog	QMRR_599_PT	Value = 72.58 psi (NORMAL state)	0
1/21/2015 1:48	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 2:12	analog	QMRR_599_PT	Value = 74.32 psi (HIGH state)	0
1/21/2015 2:13	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 2:14	analog	QMRR_599_PT	Value = 71.76 psi (NORMAL state)	0
1/21/2015 2:15	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 2:45	analog	QMRR_599_PT	Value = 74.08 psi (HIGH state)	0
1/21/2015 2:46	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 2:47	analog	QMRR_599_PT	Value = 72.1 psi (NORMAL state)	0
1/21/2015 2:48	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 3:01	analog	QMPR_599_PT	Value = 78.44 psi (HIGH state)	0
1/21/2015 3:01	analog	QMPR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 3:03	analog	QMPR_599_PT	Value = 76.15 psi (NORMAL state)	0
1/21/2015 3:03	analog	QMPR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0
1/21/2015 4:16	analog	QMRR_599_PT	Value = 74.02 psi (HIGH state)	0
1/21/2015 4:16	analog	QMRR_599_PT	Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos(	0

1/21/2015 4:18	analog	QMRR_599_PT		Value = 72.28 psi (NORMAL state)	0
1/21/2015 4:18	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/21/2015 4:20	analog	QMRR_599_PT		Value = 74.26 psi (HIGH state)	0
1/21/2015 4:20	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/21/2015 4:22	analog	QMRR_599_PT		Value = 71.61 psi (NORMAL state)	0
1/21/2015 4:22	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/21/2015 5:54	analog	QMSA_599_PT		Value = 76.14 psi (HIGH state)	0
1/21/2015 5:54	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/21/2015 5:55	analog	QMSA_599_PT		Value = 74.7 psi (NORMAL state)	0
1/21/2015 5:55	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/22/2015 2:30	analog	QMPR_599_PT		Value = 78.05 psi (HIGH state)	0
1/22/2015 2:30	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/22/2015 2:32	analog	QMPR_599_PT		Value = 76.86 psi (NORMAL state)	0
1/22/2015 2:32	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/22/2015 5:44	analog	QMSA_599_PT		Value = 76.23 psi (HIGH state)	0
1/22/2015 5:44	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/22/2015 5:46	analog	QMSA_599_PT		Value = 74.73 psi (NORMAL state)	0
1/22/2015 5:46	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/23/2015 5:25	analog	QMSA_599_PT		Value = 76.26 psi (HIGH state)	0
1/23/2015 5:25	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/23/2015 5:27	analog	QMSA_599_PT		Value = 74.95 psi (NORMAL state)	0
1/23/2015 5:27	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/23/2015 5:28	analog	QMSA_599_PT		Value = 76.05 psi (HIGH state)	0
1/23/2015 5:28	analog	QMSA_599_PT		Value = 74.89 psi (NORMAL state)	0
1/23/2015 5:28	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/23/2015 5:34	analog	QMRR_599_PT		Value = 74.6 psi (HIGH state)	0
1/23/2015 5:35	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/23/2015 5:37	analog	QMRR_599_PT		Value = 71.52 psi (NORMAL state)	0
1/23/2015 5:37	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/24/2015 7:26	analog	QMSA_599_PT		Value = 76.02 psi (HIGH state)	0
1/24/2015 7:26	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/24/2015 7:27	analog	QMSA_599_PT		Value = 74.95 psi (NORMAL state)	0
1/24/2015 7:27	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/25/2015 7:40	analog	QMRR_599_PT		Value = 75.03 psi (HIGH-HIGH state)	0
1/25/2015 7:40	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/25/2015 7:42	analog	QMRR_599_PT		Value = 71.76 psi (NORMAL state)	0
1/25/2015 7:43	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/26/2015 0:49	analog	QMPR_599_PT		Value = 78.6 psi (HIGH state)	0
1/26/2015 0:50	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by CarsonIkonen at wwdwsxos0	0
1/26/2015 0:52	analog	QMPR_599_PT		Value = 75.48 psi (NORMAL state)	0
1/26/2015 0:52	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:34	analog	QMSA_599_PT		Value = 76.02 psi (HIGH state)	0
1/26/2015 5:35	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:36	analog	QMPR_599_PT		Value = 78.32 psi (HIGH state)	0
1/26/2015 5:36	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:36	analog	QMRR_599_PT		Value = 74.11 psi (HIGH state)	0
1/26/2015 5:36	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:37	analog	QMSA_599_PT		Value = 74.95 psi (NORMAL state)	0
1/26/2015 5:37	analog	QMSA_599_PT		Issued command ACKNOWLEDGE ANALOG.QMSA_599_PT.:HILO by JohnPenner at wwdwsxos01	0

1/26/2015 5:38	analog	QMRR_599_PT		Value = 72.43 psi (NORMAL state)	0
1/26/2015 5:38	analog	QMRR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMRR_599_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:38	analog	QMPR_599_PT		Value = 74.78 psi (NORMAL state)	0
1/26/2015 5:38	analog	QMPR_599_PT		Issued command ACKNOWLEDGE ANALOG.QMPR_599_PT.:HILO by JohnPenner at wwdwsxos01	0

E2g Pressure Point Hourly Minimum Pressures Dec 2014 through Feb 2015

Timestamp							
12/1/2014 0 47	72.5200025	12/1/2014 0 52	70.92000066	12/1/2014 0 44	73.1799977	12/1/2014 0 00	69.47
12/1/2014 1 37	73.35000253	12/1/2014 1 03	70.89000066	12/1/2014 1 42	73.2999977	12/1/2014 1 42	70.75
12/1/2014 2 24	74.57000257	12/1/2014 2 24	71.78000067	12/1/2014 2 06	74.14999767	12/1/2014 2 25	71.15
12/1/2014 3 28	74.75000257	12/1/2014 3 32	71.72000067	12/1/2014 3 28	73.3299977	12/1/2014 3 27	71.61
12/1/2014 4 55	75.00000258	12/1/2014 4 47	70.98000066	12/1/2014 4 46	73.81999768	12/1/2014 4 54	71.64
12/1/2014 5 22	72.77000251	12/1/2014 5 50	68.24000063	12/1/2014 5 39	73.0599977	12/1/2014 5 27	70.48
12/1/2014 6 35	71.73000247	12/1/2014 6 50	66.95000062	12/1/2014 6 36	71.43999775	12/1/2014 6 36	69.81
12/1/2014 7 58	70.51000243	12/1/2014 7 33	66.10000061	12/1/2014 7 36	70.51999778	12/1/2014 7 24	69.16
12/1/2014 8 00	70.51000243	12/1/2014 8 00	67.29000062	12/1/2014 8 05	70.70999778	12/1/2014 8 52	69.81
12/1/2014 9 00	72.10000248	12/1/2014 9 06	68.15000063	12/1/2014 9 15	70.85999777	12/1/2014 9 28	70.26
12/1/2014 10 14	71.73000247	12/1/2014 10 48	67.66000063	12/1/2014 10 41	70.66999778	12/1/2014 10 18	69.53
12/1/2014 11 41	71.18000245	12/1/2014 11 21	67.81000063	12/1/2014 11 29	71.52999775	12/1/2014 11 00	70.05
12/1/2014 12 45	71.21000246	12/1/2014 12 14	68.15000063	12/1/2014 12 16	71.18999776	12/1/2014 12 23	69.96
12/1/2014 13 16	72.10000248	12/1/2014 13 07	68.02000063	12/1/2014 13 21	72.37999773	12/1/2014 13 17	70.23
12/1/2014 14 51	72.5200025	12/1/2014 14 52	68.36000063	12/1/2014 14 23	72.13999773	12/1/2014 14 56	70.39
12/1/2014 15 35	72.4900025	12/1/2014 15 43	68.36000063	12/1/2014 15 03	72.68999772	12/1/2014 15 00	70.42
12/1/2014 16 42	72.31000249	12/1/2014 16 19	68.05000063	12/1/2014 16 16	71.46999775	12/1/2014 16 12	70.05
12/1/2014 17 35	71.85000248	12/1/2014 17 13	67.35000063	12/1/2014 17 21	71.98999774	12/1/2014 17 20	70.29
12/1/2014 18 48	71.03000245	12/1/2014 18 31	66.44000062	12/1/2014 18 53	71.64999775	12/1/2014 18 09	69.87
12/1/2014 19 37	71.36000246	12/1/2014 19 01	67.20000062	12/1/2014 19 12	71.18999776	12/1/2014 19 25	69.84
12/1/2014 20 20	72.6800025	12/1/2014 20 00	67.35000063	12/1/2014 20 28	70.45999778	12/1/2014 20 01	70.36
12/1/2014 21 33	73.01000252	12/1/2014 21 02	67.32000062	12/1/2014 21 32	71.64999775	12/1/2014 21 58	69.78
12/1/2014 22 06	72.37000249	12/1/2014 22 49	68.18000063	12/1/2014 22 02	72.25999773	12/1/2014 22 00	69.78
12/1/2014 23 57	70.36000243	12/1/2014 23 08	69.24000064	12/1/2014 23 05	72.68999772	12/1/2014 23 57	67.82
12/2/2014 0 03	73.56000253	12/2/2014 0 00	69.52000065	12/2/2014 0 02	72.86999771	12/2/2014 0 03	70.94
12/2/2014 1 12	74.14000255	12/2/2014 1 08	71.29000066	12/2/2014 1 12	73.47999769	12/2/2014 1 12	71.67
12/2/2014 2 10	75.33000259	12/2/2014 2 18	71.41000066	12/2/2014 2 50	74.11999767	12/2/2014 2 47	72.1
12/2/2014 3 23	73.90000254	12/2/2014 3 53	71.59000067	12/2/2014 3 27	73.75999768	12/2/2014 3 23	71
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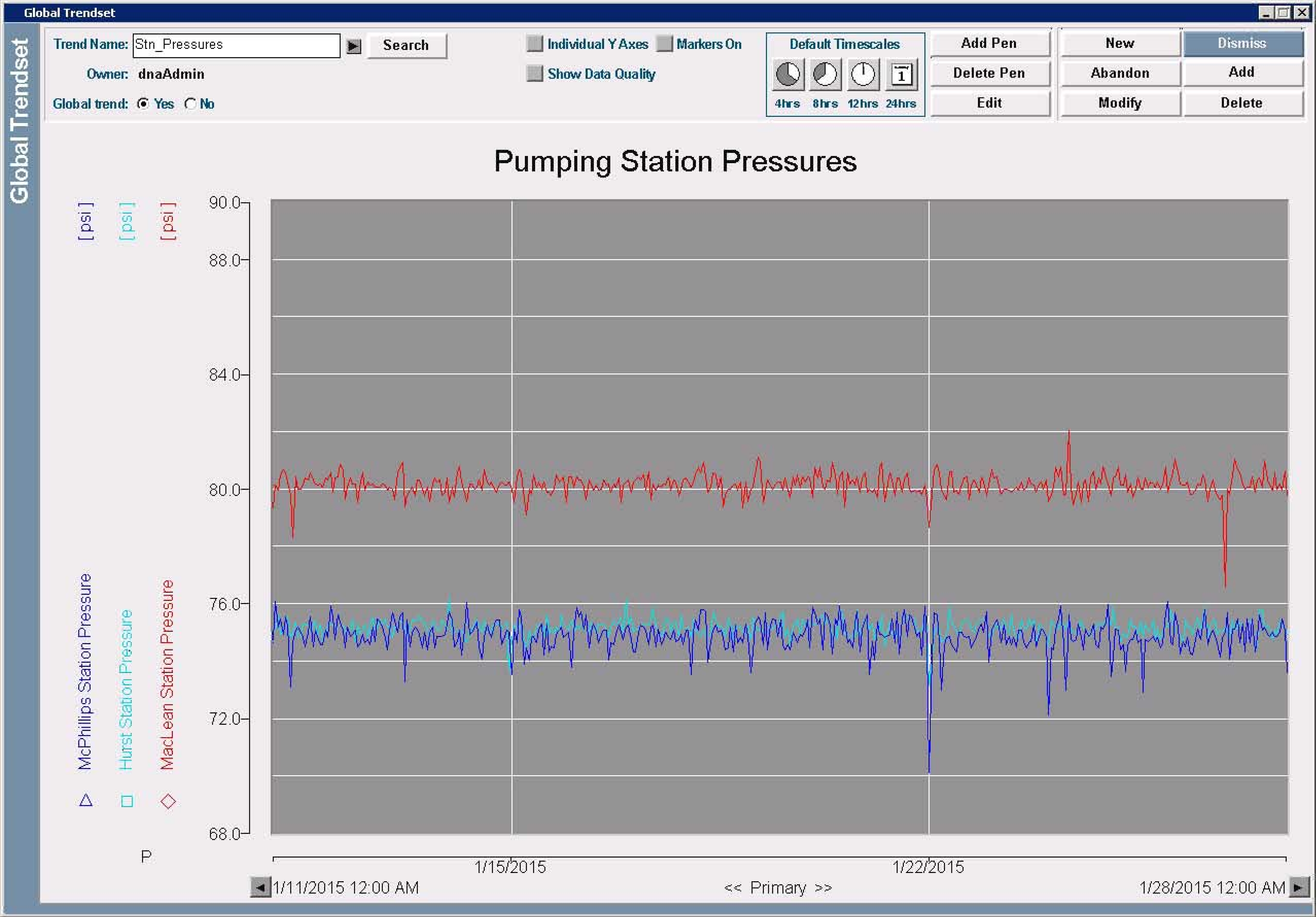
2/16/2015 20 12	71.21000246	2/16/2015 20 12	67.32000062	2/16/2015 19 48	71.15999776	2/16/2015 19 35	69.96	2/16/2015 19 00	67.61000248	2/16/2015 20 12	74.7000014	2/16/2015 20 29	71.92999818	2/16/2015 20 29	73.87000207	2/16/2015 20 29	68.82999914	2/16/2015 20 00	72.73000272	2/16/2015 19 50	73.1
2/16/2015 21 57	71.30000246	2/16/2015 21 57	66.86000062	2/16/2015 20 48	71.95999774	2/16/2015 20 45	69.53	2/16/2015 20 45	67.37000247	2/16/2015 21 41	75.22000141	2/16/2015 21 42	70.51999822	2/16/2015 21 41	73.26000205	2/16/2015 21 42	68.45999914	2/16/2015 21 02	72.67000272	2/16/2015 20 13	73.59
2/16/2015 22 01	72.34000249	2/16/2015 22 01	68.91000064	2/16/2015 21 41	71.82999774	2/16/2015 21 05	69.74	2/16/2015 21 57	67.15000246	2/16/2015 22 16	74.89000141	2/16/2015 22 01	71.89999818	2/16/2015 22 15	73.87000207	2/16/2015 22 16	68.30999914	2/16/2015 22 15	72.64000272	2/16/2015 21 57	73.22
2/16/2015 23 42	67.91000234	2/16/2015 23 02	70.74000066	2/16/2015 22 15	71.89999774	2/16/2015 22 34	70.29	2/16/2015 22 16	67.85000249	2/16/2015 23 42	76.38000143	2/16/2015 23 42	68.28999827	2/16/2015 23 42	74.42000208	2/16/2015 23 43	70.96999911	2/16/2015 23 06	74.62000279	2/16/2015 22 01	73.84
2/17/2015 0 15	73.47000253	2/17/2015 0 21	71.05000066	2/16/2015 23 43	72.47999772	2/16/2015 23 42	68.58	2/16/2015 23 42	64.22000235	2/17/2015 0 02	77.45000145	2/17/2015 0 14	71.89999818	2/17/2015 0 15	74.72000209	2/17/2015 0 02	72.61999909	2/17/2015 0 08	75.35000282	2/16/2015 23 42	75.06
2/17/2015 1 25	74.42000256	2/17/2015 1 25	71.44000066	2/17/2015 0 15	73.50999769	2/17/2015 0 23	71.45	2/17/2015 0 15	68.2500025	2/17/2015 1 02	78.06000146	2/17/2015 1 24	72.07999818	2/17/2015 1 28	75.0600021	2/17/2015 1 00	72.82999909	2/17/2015 1 12	75.54000283	2/17/2015 0 02	75.18
2/17/2015 2 25	74.54000257	2/17/2015 2 13	72.11000067	2/17/2015 1 28	73.81999768	2/17/2015 1 25	71.48	2/17/2015 1 25	68.89000253	2/17/2015 2 00	78.40000147	2/17/2015 2 38	72.37999817	2/17/2015 2 45	75.33000211	2/17/2015 2 40	73.19999908	2/17/2015 2 21	75.99000284	2/17/2015 1 20	75.85
2/17/2015 3 28	74.45000256	2/17/2015 3 14	71.66000067	2/17/2015 2 45	74.14999767	2/17/2015 2 39	71.61	2/17/2015 2 25	69.50000255	2/17/2015 3 15	78.31000147	2/17/2015 3 23	72.25999817	2/17/2015 3 24	74.9000021	2/17/2015 3 01	72.85999909	2/17/2015 3 47	75.72000283	2/17/2015 2 13	76.28
2/17/2015 4 34	73.77000254	2/17/2015 4 14	68.79000064	2/17/2015 3 42	73.72999768	2/17/2015 3 24	71.15	2/17/2015 3 47	68.40000251	2/17/2015 4 48	77.88000146	2/17/2015 4 14	72.37999817	2/17/2015 4 14	74.23000208	2/17/2015 4 13	70.80999911	2/17/2015 4 14	74.56000279	2/17/2015 3 33	75.82
2/17/2015 5 34	72.4900025	2/17/2015 5 58	69.55000065	2/17/2015 4 14	73.0899977	2/17/2015 4 55	71.91	2/17/2015 4 14	68.89000253	2/17/2015 5 58	76.51000144	2/17/2015 5 33	71.0099982	2/17/2015 5 58	74.32000208	2/17/2015 5 53	70.65999911	2/17/2015 5 57	73.92000277	2/17/2015 4 14	74.45
2/17/2015 6 48	71.27000246	2/17/2015 6 16	67.47000063	2/17/2015 5 01	73.35999769	2/17/2015 5 57	70.66	2/17/2015 5 32	67.18000246	2/17/2015 6 42	74.4900014	2/17/2015 6 48	71.1899982	2/17/2015 6 02	73.53000206	2/17/2015 6 51	67.90999915	2/17/2015 6 54	72.1200027	2/17/2015 5 58	74.69
2/17/2015 7 33	70.78000244	2/17/2015 7 11	66.19000061	2/17/2015 6 01	71.55999775	2/17/2015 6 38	69.47	2/17/2015 6 48	67.18000246	2/17/2015 7 17	73.54000138	2/17/2015 7 47	70.60999821	2/17/2015 7 52	72.74000203	2/17/2015 7 12	66.59999916	2/17/2015 7 03	71.14000266	2/17/2015 6 07	73.13
2/17/2015 8 54	68.59000237	2/17/2015 8 09	67.78000063	2/17/2015 7 52	70.97999777	2/17/2015 7 39	69.04	2/17/2015 7 48	66.24000243	2/17/2015 8 54	74.2500014	2/17/2015 8 53	68.47999826	2/17/2015 8 17	73.68000206	2/17/2015 8 02	68.48999914	2/17/2015 8 05	73.12000274	2/17/2015 7 12	72.46
2/17/2015 9 10	70.66000244	2/17/2015 9 11	67.08000062	2/17/2015 8 16	72.10999773	2/17/2015 8 54	68.52	2/17/2015 8 54	64.22000235	2/17/2015 9 39	74.80000141	2/17/2015 9 10	70.54999821	2/17/2015 9 05	73.53000206	2/17/2015 9 06	69.06999913	2/17/2015 9 13	73.25000274	2/17/2015 8 21	73.56
2/17/2015 10 02	71.55000247	2/17/2015 10 18	68.45000064	2/17/2015 9 05	71.46999775	2/17/2015 9 02	69.04	2/17/2015 9 10	66.54000244	2/17/2015 10 24	75.10000141	2/17/2015 10 10	70.9799982	2/17/2015 10 02	72.98000204	2/17/2015 10 26	69.49999913	2/17/2015 10 55	73.22000274	2/17/2015 9 45	73.35
2/17/2015 11 22	70.29000242	2/17/2015 11 00	68.76000064	2/17/2015 10 44	71.98999774	2/17/2015 10 47	62.14 A	2/17/2015 10 55	67.27000247	2/17/2015 11 27	74.7300014	2/17/2015 11 03	71.1599982	2/17/2015 11 29	72.83000204	2/17/2015 11 09	69.46999913	2/17/2015 11 02	73.49000275	2/17/2015 10 30	73.44
2/17/2015 12 44	70.91000245	2/17/2015 12 56	68.82000064	2/17/2015 11 29	70.85999777	2/17/2015 11 22	63.46	2/17/2015 11 26	66.79000245	2/17/2015 12 32	75.25000141	2/17/2015 12 00	70.66999821	2/17/2015 12 32	73.71000206	2/17/2015 12 56	69.86999912	2/17/2015 12 00	73.80000276	2/17/2015 11 22	73.59
2/17/2015 13 07	71.67000247	2/17/2015 13 14	67.96000063	2/17/2015 12 23	72.01999774	2/17/2015 12 38	63.85	2/17/2015 12 01	67.12000246	2/17/2015 13 28	75.35000142	2/17/2015 13 02	70.9499982	2/17/2015 13 06	73.74000206	2/17/2015 13 13	69.58999913	2/17/2015 13 00	73.95000277	2/17/2015 12 47	73.19
2/17/2015 14 46	70.69000244	2/17/2015 14 16	69.12000064	2/17/2015 13 05	71.92999774	2/17/2015 13 01	62.85	2/17/2015 13 11	67.09000246	2/17/2015 14 05	75.47000142	2/17/2015 14 58	71.1599982	2/17/2015 14 34	73.77000206	2/17/2015 14 59	70.50999912	2/17/2015 14 59	73.77000276	2/17/2015 13 03	73.68
2/17/2015 15 54	70.91000245	2/17/2015 15 55	68.82000064	2/17/2015 14 28	72.01999774	2/17/2015 14 43	62.42 A	2/17/2015 14 58	66.85000245	2/17/2015 15 50	75.41000142	2/17/2015 15 49	70.9499982	2/17/2015 15 41	73.47000206	2/17/2015 15 46	69.92999912	2/17/2015 15 00	73.77000276	2/17/2015 14 06	73.99
2/17/2015 16 12	71.09000245	2/17/2015 16 36	68.24000063	2/17/2015 15 40	71.46999775	2/17/2015 15 02	63	2/17/2015 15 00	66.85000245	2/17/2015 16 51	75.16000141	2/17/2015 16 11	71.40999819	2/17/2015 16 23	73.74000206	2/17/2015 16 47	70.04999912	2/17/2015 16 55	73.77000276	2/17/2015 15 22	73.77
2/17/2015 17 57	71.09000245	2/17/2015 17 30	66.44000062	2/17/2015 16 32	71.76999774	2/17/2015 16 33	62.69	2/17/2015 16 37	67.03000246	2/17/2015 17 31	74.3700014	2/17/2015 17 46	71.2499982	2/17/2015 17 44	73.71000206	2/17/2015 17 27	68.67999914	2/17/2015 17 37	73.34000274	2/17/2015 16 36	73.29
2/17/2015 18 01	70.84000244	2/17/2015 18 57	66.41000062	2/17/2015 17 17	71.58999775	2/17/2015 17 47	59.67 A	2/17/2015 17 43	66.79000245	2/17/2015 18 30	74.2800014	2/17/2015 18 38	71.0399982	2/17/2015 18 04	73.62000206	2/17/2015 18 18	68.73999914	2/17/2015 18 59	72.58000272	2/17/2015 17 12	73.13
2/17/2015 19 13	70.39000243	2/17/2015 19 00	66.41000062	2/17/2015 18 28	71.34999776	2/17/2015 18 44	60.77 A	2/17/2015 18 01	67.12000246	2/17/2015 19 00	74.3100014	2/17/2015 19 13	71.1899982	2/17/2015 19 13	73.47000206	2/17/2015 19 00	68.73999914	2/17/2015 19 00	72.58000272	2/17/2015 18 58	72.61
2/17/2015 20 03	70.69000244	2/17/2015 20 19	67.60000063	2/17/2015 19 16	71.24999776	2/17/2015 19 03	61.17 A	2/17/2015 19 22	66.63000244	2/17/2015 20 06	74.7300014	2/17/2015 20 14	71.49999819	2/17/2015 20 26	73.71000206	2/17/2015 20 01	69.19999913	2/17/2015 20 00	73.16000274	2/17/2015 19 00	72.61
2/17/2015 21 11	71.45000246	2/17/2015 21 03	68.08000063	2/17/2015 20 04	72.10999773	2/17/2015 20 03	63.21	2/17/2015 20 03	67.21000246	2/17/2015 21 11	75.50000142	2/17/2015 21 00	71.92999818	2/17/2015 21 14	73.87000207	2/17/2015 21 12	69.52999913	2/17/2015 21 14	73.43000275	2/17/2015 20 00	73.26
2/17/2015 22 31	71.18000245	2/17/2015 22 10	68.24000063	2/17/2015 21 30	71.95999774	2/17/2015 21 06	63.58	2/17/2015 21 00	67.95000249	2/17/2015 22 02	75.59000142	2/17/2015 22 30	70.69999821	2/17/2015 22 31	72.55000203	2/17/2015 22 02	69.31999913	2/17/2015 22 03	73.34000274	2/17/2015 21 06	73.29
2/17/2015 23 43	70.36000243	2/17/2015 23 00	70.07000065	2/17/2015 22 25	72.07999773	2/17/2015 22 31	64.1	2/17/2015 22 31	66.72000245	2/17/2015 23 41	76.08000143	2/17/2015 23 42	66.67999831	2/17/2015 23 52	74.45000208	2/17/2015 23 42	70.93999911	2/17/2015 23 42	74.16000278	2/17/2015 22 04	73.93
				2/17/2015 23 42	71.34999776	2/17/2015 23 43	62.24 A	2/17/2015 23 43	64.37000236											2/17/2015 23 00	74.42
																				2/18/2015 0 00	75.06

E3 Pumping Station Pressures

E3a Pumping Station Pressures Jan 2015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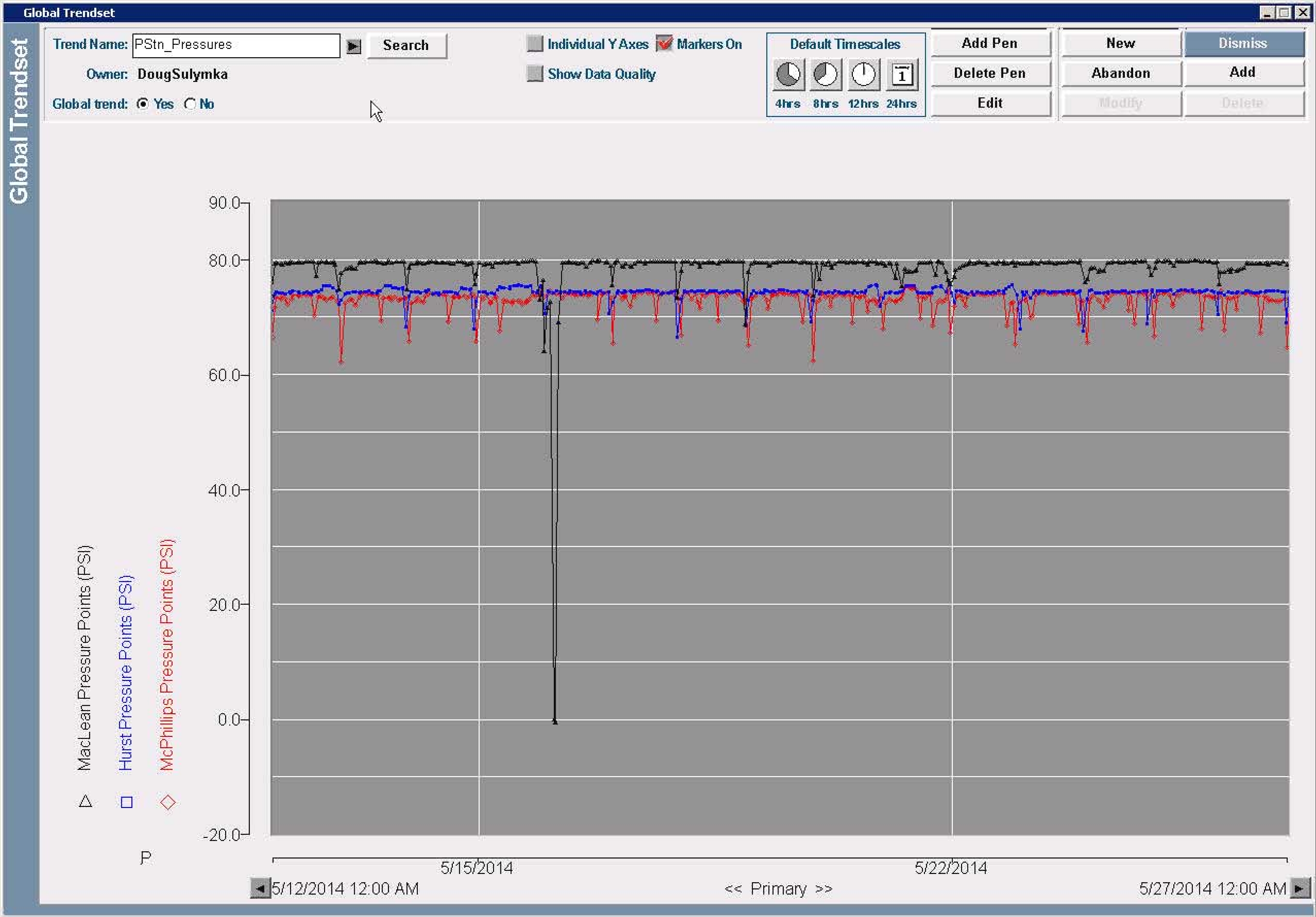
Trend Name: Stn_Pressures
Search
Owner: dnaAdmin
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
Pumping Station Pressures
[psi]
[psi]
[psi]
McPhillips Station Pressure
Hurst Station Pressure
MacLean Station Pressure
90.0
88.0
84.0
80.0
76.0
72.0
68.0
P
1/15/2015
1/22/2015
1/11/2015 12:00 AM
<< Primary >>
1/28/2015 12:00 AM

AECOM

E3b Pumping Station Hourly Min Pressures May 12-May 26 2014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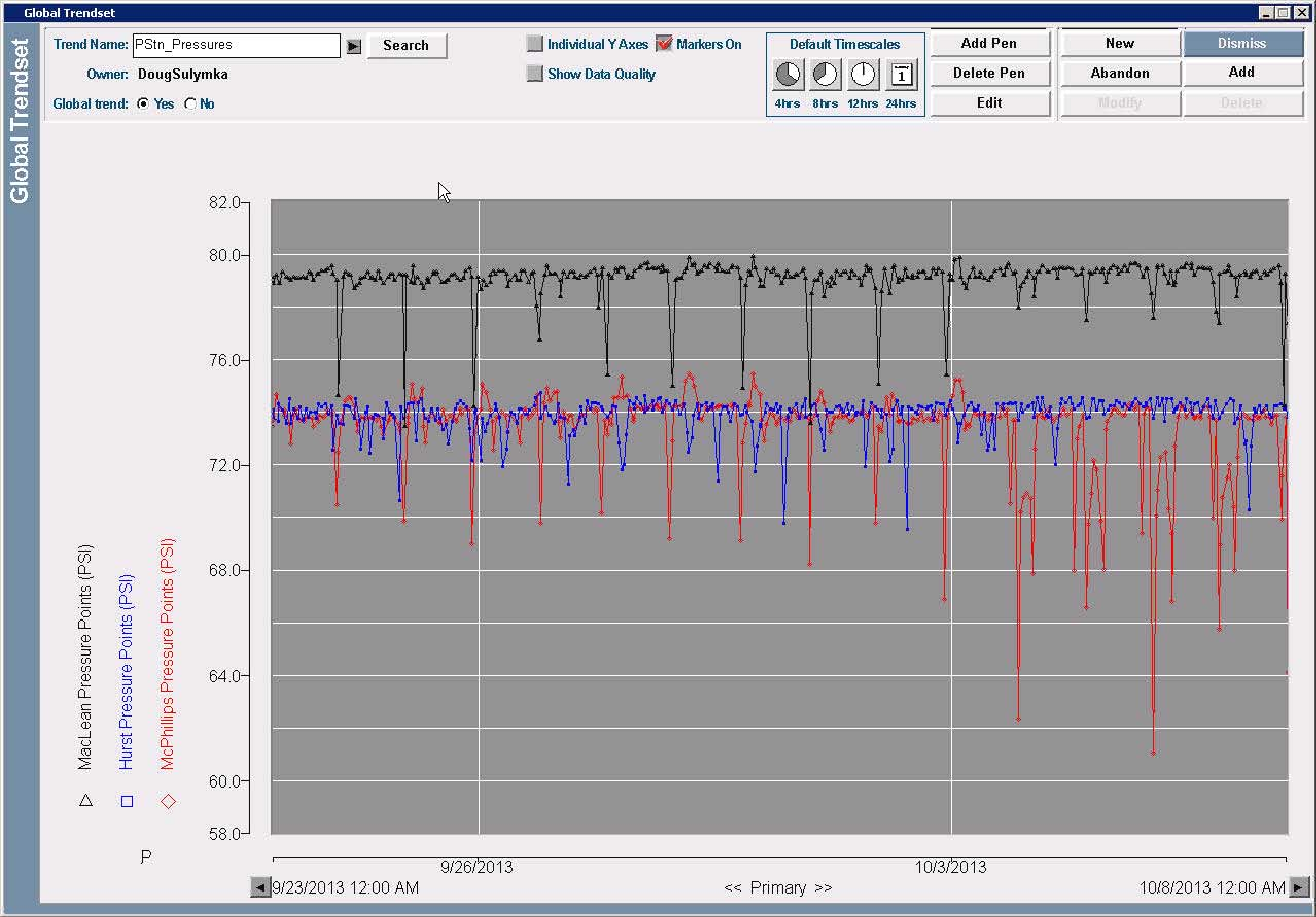
Global Trendset
Trend Name: PStn_Pressures
Search
Owner: DougSulymka
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs
8hrs
12hrs
24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
90.0
80.0
60.0
40.0
20.0
0.0
-20.0
MacLean Pressure Points (PSI)
Hurst Pressure Points (PSI)
McPhillips Pressure Points (PSI)
P
5/15/2014
5/22/2014
5/12/2014 12:00 AM
<< Primary >>
5/27/2014 12:00 AM

E3c Pumping Station Hourly Min Pressures Sep 23-Oct 7 2013


Global Trendset
Global Trendset
Trend Name: PStn_Pressures
Search
Owner: DougSulymka
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
82.0
80.0
76.0
72.0
68.0
64.0
60.0
58.0
MacLean Pressure Points (PSI)
Hurst Pressure Points (PSI)
McPhillips Pressure Points (PSI)
P
9/26/2013
10/3/2013
9/23/2013 12:00 AM
<< Primary >>
10/8/2013 12:00 AM

E3d Pumping Station Pressure Alarms Jan 12-26 2015

	dbName	ptName	description	message	sevInt
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.9344 psig (NORMAL state)	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.9344 psig (NORMAL state)	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2153 psig (LOW state)	0
1/12/2015 0:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2153 psig (LOW state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.4137 psig (NORMAL state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.4137 psig (NORMAL state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8198 psig (LOW state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8198 psig (LOW state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.9374 psig (NORMAL state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.9374 psig (NORMAL state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3985 psig (LOW state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3985 psig (LOW state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1573 psig (NORMAL state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1573 psig (NORMAL state)	0
1/12/2015 0:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/12/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.4092 psig (LOW state)	0
1/12/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.4092 psig (LOW state)	0
1/12/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/12/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.4321 psig (NORMAL state)	0
1/12/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.4321 psig (NORMAL state)	0
1/12/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/13/2015 0:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.0611 psig (LOW state)	0
1/13/2015 0:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.0611 psig (LOW state)	0
1/13/2015 0:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/13/2015 0:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 73.3008 psig (NORMAL state)	0
1/13/2015 0:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 73.3008 psig (NORMAL state)	0
1/13/2015 0:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/14/2015 0:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 66.4122 psig (LOW-LOW state)	0
1/14/2015 0:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 66.4122 psig (LOW-LOW state)	0
1/14/2015 0:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 73.0443 psig (NORMAL state)	0
1/14/2015 0:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 73.0443 psig (NORMAL state)	0
1/14/2015 0:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos01	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4595 psig (NORMAL state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4595 psig (NORMAL state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0

1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/14/2015 5:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos01	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 76.9649 psig (NORMAL state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 76.9649 psig (NORMAL state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos01	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos01	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 76.0489 psig (NORMAL state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 76.0489 psig (NORMAL state)	0
1/14/2015 5:58	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos01	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by CarsonIkonen at wwdwsxos03	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by CarsonIkonen at wwdwsxos03	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.8992 psig (LOW-LOW state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.8992 psig (LOW-LOW state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8748 psig (LOW state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8748 psig (LOW state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4427 psig (NORMAL state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4427 psig (NORMAL state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2153 psig (LOW state)	0
1/14/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2153 psig (LOW state)	0
1/14/2015 23:47	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 71.4321 psig (LOW state)	0
1/14/2015 23:47	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 71.4321 psig (LOW state)	0
1/14/2015 23:47	analog	HMD_050_PT		Issued command ACKNOWLEDGE ANALOG.HMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/14/2015 23:47	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 70.9008 psig (LOW-LOW state)	0
1/14/2015 23:47	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 70.9008 psig (LOW-LOW state)	0
1/14/2015 23:47	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.HMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.4748 psig (LOW-LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.4748 psig (LOW-LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.1527 psig (LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.1527 psig (LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.9511 psig (LOW-LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.9511 psig (LOW-LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.1893 psig (LOW state)	0
1/14/2015 23:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.1893 psig (LOW state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.1817 psig (LOW-LOW state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.1817 psig (LOW-LOW state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.9405 psig (LOW state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.9405 psig (LOW state)	0
1/14/2015 23:48	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 71.2855 psig (LOW state)	0
1/14/2015 23:48	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 71.2855 psig (LOW state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.5893 psig (NORMAL state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.5893 psig (NORMAL state)	0
1/14/2015 23:48	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.HMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.6183 psig (LOW state)	0
1/14/2015 23:48	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.6183 psig (LOW state)	0

1/14/2015 23:49	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.6992 psig (NORMAL state)	0
1/14/2015 23:49	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.6992 psig (NORMAL state)	0
1/14/2015 23:49	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 72.1466 psig (NORMAL state)	0
1/14/2015 23:49	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 72.1466 psig (NORMAL state)	0
1/14/2015 23:49	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.HMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/15/2015 5:15	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/15/2015 5:15	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.3099 psig (HIGH-HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.3099 psig (HIGH-HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7969 psig (HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7969 psig (HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.5298 psig (HIGH-HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.5298 psig (HIGH-HIGH state)	0
1/15/2015 5:16	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 78.1557 psig (HIGH state)	0
1/15/2015 5:16	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 78.1557 psig (HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.9802 psig (HIGH state)	0
1/15/2015 5:16	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.9802 psig (HIGH state)	0
1/15/2015 5:16	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.HMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/15/2015 5:17	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 77.8443 psig (NORMAL state)	0
1/15/2015 5:17	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Value = 77.8443 psig (NORMAL state)	0
1/15/2015 5:17	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.9328 psig (HIGH-HIGH state)	0
1/15/2015 5:17	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.9328 psig (HIGH-HIGH state)	0
1/15/2015 5:17	analog	HMD_050_PT	(H) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.HMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/15/2015 5:17	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1374 psig (HIGH state)	0
1/15/2015 5:17	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1374 psig (HIGH state)	0
1/15/2015 5:18	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/15/2015 5:18	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/15/2015 5:18	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/15/2015 5:18	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/15/2015 5:18	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.0198 psig (NORMAL state)	0
1/15/2015 5:18	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.0198 psig (NORMAL state)	0
1/15/2015 23:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.5374 psig (LOW state)	0
1/15/2015 23:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.5374 psig (LOW state)	0
1/15/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.7985 psig (NORMAL state)	0
1/15/2015 23:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.7985 psig (NORMAL state)	0
1/16/2015 5:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/16/2015 5:37	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.1267 psig (HIGH-HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.1267 psig (HIGH-HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7969 psig (HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7969 psig (HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.0168 psig (HIGH-HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.0168 psig (HIGH-HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.8885 psig (HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.8885 psig (HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.0351 psig (HIGH-HIGH state)	0
1/16/2015 5:38	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.0351 psig (HIGH-HIGH state)	0
1/16/2015 5:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.9802 psig (HIGH state)	0
1/16/2015 5:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.9802 psig (HIGH state)	0
1/16/2015 5:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.2366 psig (HIGH-HIGH state)	0

1/16/2015 5:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.2366 psig (HIGH-HIGH state)	0
1/16/2015 5:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.742 psig (HIGH state)	0
1/16/2015 5:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.742 psig (HIGH state)	0
1/16/2015 5:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/16/2015 5:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/16/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/16/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.7527 psig (LOW-LOW state)	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.7527 psig (LOW-LOW state)	0
1/16/2015 23:42	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.7908 psig (NORMAL state)	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.7908 psig (NORMAL state)	0
1/16/2015 23:42	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8748 psig (LOW state)	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8748 psig (LOW state)	0
1/16/2015 23:42	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.9374 psig (NORMAL state)	0
1/16/2015 23:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.9374 psig (NORMAL state)	0
1/16/2015 23:42	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3985 psig (LOW state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3985 psig (LOW state)	0
1/16/2015 23:43	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2229 psig (NORMAL state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2229 psig (NORMAL state)	0
1/16/2015 23:43	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8931 psig (LOW state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8931 psig (LOW state)	0
1/16/2015 23:43	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.7176 psig (NORMAL state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.7176 psig (NORMAL state)	0
1/16/2015 23:43	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.9115 psig (LOW state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.9115 psig (LOW state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by MikeMastroianni at wwdwsxos01	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by MikeMastroianni at wwdwsxos01	0
1/16/2015 23:43	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1206 psig (NORMAL state)	0
1/16/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1206 psig (NORMAL state)	0
1/17/2015 5:13	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/17/2015 5:13	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/17/2015 7:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/17/2015 7:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/17/2015 7:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/17/2015 7:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6977 psig (NORMAL state)	0
1/17/2015 7:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6977 psig (NORMAL state)	0
1/17/2015 7:31	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/17/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3206 psig (HIGH state)	0
1/17/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3206 psig (HIGH state)	0
1/17/2015 11:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 11:21	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5145 psig (NORMAL state)	0

1/17/2015 11:21	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5145 psig (NORMAL state)	0
1/17/2015 11:21	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/17/2015 11:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.2809 psig (LOW state)	0
1/17/2015 11:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.2809 psig (LOW state)	0
1/17/2015 11:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.9008 psig (NORMAL state)	0
1/17/2015 11:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.9008 psig (NORMAL state)	0
1/17/2015 11:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 23:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/17/2015 23:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/17/2015 23:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.8641 psig (NORMAL state)	0
1/17/2015 23:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.8641 psig (NORMAL state)	0
1/17/2015 23:40	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 23:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.7466 psig (LOW state)	0
1/17/2015 23:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.7466 psig (LOW state)	0
1/17/2015 23:41	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.058 psig (NORMAL state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.058 psig (NORMAL state)	0
1/17/2015 23:41	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3618 psig (LOW state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3618 psig (LOW state)	0
1/17/2015 23:41	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.626 psig (NORMAL state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.626 psig (NORMAL state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by MikeMastroianni at wwdwsxos01	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by MikeMastroianni at wwdwsxos01	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by MikeMastroianni at wwdwsxos01	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by MikeMastroianni at wwdwsxos01	0
1/17/2015 23:41	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.9298 psig (LOW state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.9298 psig (LOW state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0947 psig (NORMAL state)	0
1/17/2015 23:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0947 psig (NORMAL state)	0
1/18/2015 5:05	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/18/2015 5:05	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1008 psig (HIGH state)	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1008 psig (HIGH state)	0
1/18/2015 7:42	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8626 psig (NORMAL state)	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8626 psig (NORMAL state)	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0824 psig (HIGH state)	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0824 psig (HIGH state)	0
1/18/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2107 psig (HIGH state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2107 psig (HIGH state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0

1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3206 psig (HIGH state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3206 psig (HIGH state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/18/2015 7:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 10:11	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3023 psig (HIGH state)	0
1/18/2015 10:11	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3023 psig (HIGH state)	0
1/18/2015 10:11	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 10:12	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8443 psig (NORMAL state)	0
1/18/2015 10:12	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8443 psig (NORMAL state)	0
1/18/2015 10:12	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 11:22	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 83.0107 psig (HIGH state)	0
1/18/2015 11:22	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 83.0107 psig (HIGH state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 84.5863 psig (HIGH-HIGH state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 84.5863 psig (HIGH-HIGH state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.LMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 83.7985 psig (HIGH state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 83.7985 psig (HIGH state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.LMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 82.626 psig (NORMAL state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Value = 82.626 psig (NORMAL state)	0
1/18/2015 11:23	analog	LMD_050_PT	(L) Discharge Header Pressure (60-90 psig)	Issued command ACKNOWLEDGE ANALOG.LMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/18/2015 14:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.3176 psig (LOW state)	0
1/18/2015 14:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.3176 psig (LOW state)	0
1/18/2015 14:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 14:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.1099 psig (NORMAL state)	0
1/18/2015 14:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.1099 psig (NORMAL state)	0
1/18/2015 14:28	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/18/2015 23:29	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by MikeMastroianni at wwdwsxos01	0
1/18/2015 23:29	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by MikeMastroianni at wwdwsxos01	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.6977 psig (LOW-LOW state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.6977 psig (LOW-LOW state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.945 psig (NORMAL state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.945 psig (NORMAL state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.4458 psig (LOW state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.4458 psig (LOW state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0397 psig (NORMAL state)	0
1/18/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0397 psig (NORMAL state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8015 psig (LOW state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8015 psig (LOW state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4611 psig (NORMAL state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4611 psig (NORMAL state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2336 psig (LOW state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2336 psig (LOW state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0031 psig (NORMAL state)	0
1/18/2015 23:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0031 psig (NORMAL state)	0
1/19/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/19/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0

1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7603 psig (HIGH state)	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7603 psig (HIGH state)	0
1/19/2015 5:47	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/19/2015 5:47	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1924 psig (HIGH state)	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1924 psig (HIGH state)	0
1/19/2015 5:47	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4229 psig (NORMAL state)	0
1/19/2015 5:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4229 psig (NORMAL state)	0
1/19/2015 5:48	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0092 psig (HIGH state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0092 psig (HIGH state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4229 psig (NORMAL state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4229 psig (NORMAL state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0641 psig (HIGH state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0641 psig (HIGH state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.3863 psig (NORMAL state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.3863 psig (NORMAL state)	0
1/19/2015 5:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/19/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by MikeMastroianni at wwdwsxos01	0
1/19/2015 23:33	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by MikeMastroianni at wwdwsxos01	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 64.5252 psig (LOW-LOW state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 64.5252 psig (LOW-LOW state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4061 psig (NORMAL state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4061 psig (NORMAL state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.5267 psig (LOW state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.5267 psig (LOW state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2595 psig (NORMAL state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2595 psig (NORMAL state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.7832 psig (LOW state)	0
1/19/2015 23:43	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.7832 psig (LOW state)	0
1/19/2015 23:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0397 psig (NORMAL state)	0
1/19/2015 23:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0397 psig (NORMAL state)	0
1/19/2015 23:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8382 psig (LOW state)	0
1/19/2015 23:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8382 psig (LOW state)	0
1/19/2015 23:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0947 psig (NORMAL state)	0
1/19/2015 23:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0947 psig (NORMAL state)	0
1/20/2015 4:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/20/2015 4:50	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/20/2015 5:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3023 psig (HIGH state)	0
1/20/2015 5:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3023 psig (HIGH state)	0
1/20/2015 5:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6611 psig (NORMAL state)	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6611 psig (NORMAL state)	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1557 psig (HIGH state)	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1557 psig (HIGH state)	0

1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.826 psig (NORMAL state)	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.826 psig (NORMAL state)	0
1/20/2015 5:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 5:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1374 psig (HIGH state)	0
1/20/2015 5:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1374 psig (HIGH state)	0
1/20/2015 5:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5695 psig (NORMAL state)	0
1/20/2015 5:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5695 psig (NORMAL state)	0
1/20/2015 5:42	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4672 psig (HIGH state)	0
1/20/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4672 psig (HIGH state)	0
1/20/2015 5:44	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5145 psig (NORMAL state)	0
1/20/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5145 psig (NORMAL state)	0
1/20/2015 5:44	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by MikeMastroianni at wwdwsxos0	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4122 psig (HIGH state)	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4122 psig (HIGH state)	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2656 psig (HIGH state)	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2656 psig (HIGH state)	0
1/20/2015 10:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/20/2015 10:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/20/2015 10:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/20/2015 10:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/20/2015 10:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8565 psig (LOW state)	0
1/20/2015 10:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8565 psig (LOW state)	0
1/20/2015 10:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/20/2015 10:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.1649 psig (NORMAL state)	0
1/20/2015 10:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.1649 psig (NORMAL state)	0
1/20/2015 10:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/20/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by JohnPenner at wwdwsxos01	0
1/20/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by JohnPenner at wwdwsxos01	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.255 psig (LOW-LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.255 psig (LOW-LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.3771 psig (NORMAL state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.3771 psig (NORMAL state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.655 psig (LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.655 psig (LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1573 psig (NORMAL state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1573 psig (NORMAL state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.4824 psig (LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.4824 psig (LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.113 psig (NORMAL state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.113 psig (NORMAL state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.6916 psig (LOW state)	0
1/20/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.6916 psig (LOW state)	0
1/20/2015 23:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2229 psig (NORMAL state)	0

1/20/2015 23:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2229 psig (NORMAL state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3023 psig (HIGH state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3023 psig (HIGH state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8992 psig (NORMAL state)	0
1/21/2015 5:53	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8992 psig (NORMAL state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2107 psig (HIGH state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2107 psig (HIGH state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.284 psig (HIGH state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.284 psig (HIGH state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/21/2015 5:54	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/21/2015 5:55	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/21/2015 7:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1557 psig (HIGH state)	0
1/21/2015 7:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1557 psig (HIGH state)	0
1/21/2015 7:27	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/21/2015 7:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8443 psig (NORMAL state)	0
1/21/2015 7:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8443 psig (NORMAL state)	0
1/21/2015 7:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/21/2015 8:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.7206 psig (LOW state)	0
1/21/2015 8:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.7206 psig (LOW state)	0
1/21/2015 8:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.084 psig (NORMAL state)	0
1/21/2015 8:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.084 psig (NORMAL state)	0
1/21/2015 8:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/21/2015 23:59	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by JohnPenner at wwdwsxos01	0
1/21/2015 23:59	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by JohnPenner at wwdwsxos01	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 66.3573 psig (LOW-LOW state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 66.3573 psig (LOW-LOW state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.9298 psig (LOW state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.9298 psig (LOW state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.1679 psig (NORMAL state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.1679 psig (NORMAL state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.5084 psig (LOW state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.5084 psig (LOW state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.8824 psig (NORMAL state)	0
1/22/2015 0:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.8824 psig (NORMAL state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4122 psig (HIGH state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4122 psig (HIGH state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0

1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.174 psig (HIGH state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.174 psig (HIGH state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.174 psig (HIGH state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.174 psig (HIGH state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/22/2015 5:44	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0641 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0641 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8626 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8626 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4855 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.4855 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7344 psig (NORMAL state)	0
1/22/2015 5:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7344 psig (NORMAL state)	0
1/22/2015 5:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0824 psig (HIGH state)	0
1/22/2015 5:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0824 psig (HIGH state)	0
1/22/2015 5:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5695 psig (NORMAL state)	0
1/22/2015 5:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5695 psig (NORMAL state)	0
1/22/2015 6:56	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by JohnPenner at wwdwsxos01	0
1/22/2015 6:56	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by JohnPenner at wwdwsxos01	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6611 psig (NORMAL state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6611 psig (NORMAL state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1924 psig (HIGH state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1924 psig (HIGH state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6427 psig (NORMAL state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6427 psig (NORMAL state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2656 psig (HIGH state)	0
1/22/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2656 psig (HIGH state)	0
1/22/2015 7:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/22/2015 7:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/22/2015 7:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/22/2015 7:41	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/22/2015 7:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1969 psig (LOW state)	0
1/22/2015 7:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1969 psig (LOW state)	0

1/22/2015 7:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.6626 psig (NORMAL state)	0
1/22/2015 7:57	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.6626 psig (NORMAL state)	0
1/22/2015 7:57	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.4015 psig (LOW-LOW state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.4015 psig (LOW-LOW state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.2672 psig (NORMAL state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.2672 psig (NORMAL state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by CarsonIkonen at wwdwsxos03	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by CarsonIkonen at wwdwsxos03	0
1/22/2015 23:26	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2336 psig (LOW state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2336 psig (LOW state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.6992 psig (NORMAL state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.6992 psig (NORMAL state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.116 psig (LOW state)	0
1/22/2015 23:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.116 psig (LOW state)	0
1/22/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.3695 psig (NORMAL state)	0
1/22/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.3695 psig (NORMAL state)	0
1/22/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/22/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/22/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4244 psig (NORMAL state)	0
1/22/2015 23:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.4244 psig (NORMAL state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7603 psig (HIGH state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.7603 psig (HIGH state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.2031 psig (NORMAL state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.2031 psig (NORMAL state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.8885 psig (HIGH state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.8885 psig (HIGH state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.5588 psig (HIGH state)	0
1/23/2015 5:25	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.5588 psig (HIGH state)	0
1/23/2015 5:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7893 psig (NORMAL state)	0
1/23/2015 5:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7893 psig (NORMAL state)	0
1/23/2015 5:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1374 psig (HIGH state)	0
1/23/2015 5:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1374 psig (HIGH state)	0
1/23/2015 5:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 76.7634 psig (NORMAL state)	0
1/23/2015 5:26	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 76.7634 psig (NORMAL state)	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.229 psig (HIGH state)	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/23/2015 5:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9725 psig (NORMAL state)	0
1/23/2015 5:28	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/23/2015 23:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by CarsonIkonen at wwdwsxos03	0
1/23/2015 23:20	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by CarsonIkonen at wwdwsxos03	0

1/23/2015 23:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1969 psig (LOW state)	0
1/23/2015 23:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1969 psig (LOW state)	0
1/23/2015 23:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1573 psig (NORMAL state)	0
1/23/2015 23:22	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.1573 psig (NORMAL state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.1603 psig (LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.255 psig (LOW-LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.255 psig (LOW-LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.7389 psig (LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.7389 psig (LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.8229 psig (LOW-LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 67.8229 psig (LOW-LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2885 psig (LOW state)	0
1/23/2015 23:23	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.2885 psig (LOW state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0031 psig (NORMAL state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.0031 psig (NORMAL state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3802 psig (LOW state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3802 psig (LOW state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2412 psig (NORMAL state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2412 psig (NORMAL state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.7466 psig (LOW state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.7466 psig (LOW state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.8458 psig (NORMAL state)	0
1/23/2015 23:24	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.8458 psig (NORMAL state)	0
1/24/2015 7:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/24/2015 7:27	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/24/2015 10:01	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9542 psig (NORMAL state)	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by CarsonIkonen at wwdwsxos03	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by CarsonIkonen at wwdwsxos03	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/24/2015 10:01	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1191 psig (HIGH state)	0
1/24/2015 10:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8626 psig (NORMAL state)	0
1/24/2015 10:02	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.8626 psig (NORMAL state)	0
1/24/2015 18:21	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by JohnPenner at wwdwsxos01	0
1/24/2015 18:21	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by JohnPenner at wwdwsxos01	0
1/25/2015 0:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.3313 psig (LOW-LOW state)	0
1/25/2015 0:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 65.3313 psig (LOW-LOW state)	0
1/25/2015 0:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 73.6855 psig (NORMAL state)	0
1/25/2015 0:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 73.6855 psig (NORMAL state)	0
1/25/2015 0:45	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT ALARMS by CarsonIkonen at wwdwsxos03	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command INHIBIT RTN by CarsonIkonen at wwdwsxos03	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3985 psig (LOW state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.3985 psig (LOW state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.3511 psig (NORMAL state)	0

1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.3511 psig (NORMAL state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.5634 psig (LOW state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.5634 psig (LOW state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2046 psig (NORMAL state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 70.2046 psig (NORMAL state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8565 psig (LOW state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.8565 psig (LOW state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.3221 psig (NORMAL state)	0
1/25/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.3221 psig (NORMAL state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.716 psig (NORMAL state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.716 psig (NORMAL state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2107 psig (HIGH state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2107 psig (HIGH state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5695 psig (NORMAL state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.5695 psig (NORMAL state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0458 psig (HIGH state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6794 psig (NORMAL state)	0
1/25/2015 7:40	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.6794 psig (NORMAL state)	0
1/25/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE ALARMS by CarsonIkonen at wwdwsxos03	0
1/25/2015 7:42	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ENABLE RTN by CarsonIkonen at wwdwsxos03	0
1/25/2015 9:51	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/25/2015 9:51	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0275 psig (HIGH state)	0
1/25/2015 9:51	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4962 psig (NORMAL state)	0
1/25/2015 9:51	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4962 psig (NORMAL state)	0
1/25/2015 9:51	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2473 psig (HIGH state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.2473 psig (HIGH state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9359 psig (NORMAL state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3206 psig (HIGH state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.3206 psig (HIGH state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.771 psig (NORMAL state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.771 psig (NORMAL state)	0
1/25/2015 9:52	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/25/2015 14:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.0061 psig (LOW state)	0
1/25/2015 14:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.0061 psig (LOW state)	0
1/25/2015 14:00	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/25/2015 14:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.2672 psig (NORMAL state)	0
1/25/2015 14:00	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.2672 psig (NORMAL state)	0
1/25/2015 14:00	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 66.1374 psig (LOW-LOW state)	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 66.1374 psig (LOW-LOW state)	0
1/26/2015 0:46	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.087 psig (LOW state)	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.087 psig (LOW state)	0

1/26/2015 0:46	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.5863 psig (NORMAL state)	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 72.5863 psig (NORMAL state)	0
1/26/2015 0:46	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.684 psig (LOW state)	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.684 psig (LOW state)	0
1/26/2015 0:46	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.0656 psig (NORMAL state)	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.0656 psig (NORMAL state)	0
1/26/2015 0:46	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/26/2015 0:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.655 psig (LOW state)	0
1/26/2015 0:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 69.655 psig (LOW state)	0
1/26/2015 0:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.4687 psig (NORMAL state)	0
1/26/2015 0:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.4687 psig (NORMAL state)	0
1/26/2015 0:47	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos02	0
1/26/2015 5:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1008 psig (HIGH state)	0
1/26/2015 5:34	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1008 psig (HIGH state)	0
1/26/2015 5:34	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.1634 psig (HIGH-HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.1634 psig (HIGH-HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.687 psig (HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.687 psig (HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.2366 psig (HIGH-HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.2366 psig (HIGH-HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.9435 psig (HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.9435 psig (HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.2 psig (HIGH-HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.2 psig (HIGH-HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.8153 psig (HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.8153 psig (HIGH state)	0
1/26/2015 5:35	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:36	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.0168 psig (HIGH-HIGH state)	0
1/26/2015 5:36	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 79.0168 psig (HIGH-HIGH state)	0
1/26/2015 5:36	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:36	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.742 psig (HIGH state)	0
1/26/2015 5:36	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.742 psig (HIGH state)	0
1/26/2015 5:36	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 5:36	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/26/2015 5:36	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.9176 psig (NORMAL state)	0
1/26/2015 5:36	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by JohnPenner at wwdwsxos01	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0641 psig (HIGH state)	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.0641 psig (HIGH state)	0
1/26/2015 7:39	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.716 psig (NORMAL state)	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.716 psig (NORMAL state)	0
1/26/2015 7:39	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0

1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1924 psig (HIGH state)	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1924 psig (HIGH state)	0
1/26/2015 7:39	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.7527 psig (NORMAL state)	0
1/26/2015 7:39	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1008 psig (HIGH state)	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 78.1008 psig (HIGH state)	0
1/26/2015 7:39	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4779 psig (NORMAL state)	0
1/26/2015 7:39	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 77.4779 psig (NORMAL state)	0
1/26/2015 7:39	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 8:04	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.9588 psig (LOW state)	0
1/26/2015 8:04	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 68.9588 psig (LOW state)	0
1/26/2015 8:04	analog	PMD_050_PT		Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0
1/26/2015 8:04	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.542 psig (NORMAL state)	0
1/26/2015 8:04	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Value = 71.542 psig (NORMAL state)	0
1/26/2015 8:04	analog	PMD_050_PT	(P) Discharge Header Pressure (60-90 PSIG)	Issued command ACKNOWLEDGE ANALOG.PMD_050_PT.:HILO by CarsonIkonen at wwdwsxos03	0

E3e Pumping Station Power Failure Events

Pump Station Power Failure Events

Event Data	MacLean PS	McPhillips PS	Hurst PS
16-Jan-15		x	
3-Jan-15	x		
13-Dec-14	X		
13-Dec-14	x		
30-Sep-14	x	x	x
21-Sep-14	x		
24-Jul-14			x
28-Jun-14	x	x	x
9-Jun-14	x	x	x
16-Mar-14	x		
2-Jan-14	x		
18-Aug-13	x		
16-Aug-13	x	x	
17-Jul-13	x		
2-Jun-13	x		
29-May-13	x		
11-May-13		x	
23-Apr-13		x	
15-Apr-13	x		
11-Jan-13			x

E3f Pumping Station
Hourly Pressures Jan 2015

	McPhillips				MacLean				Hurst		
Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum
2015-01-10 18:00:00	75 02115	75.81069	74.08855	2015-01-10 18:00:00	79.97407	80.46412	79 56641	2015-01-10 18:00:00	75.00326	75.44427	74.58321
2015-01-10 19:00:00	75 03259	75.93893	73.8687	2015-01-10 19:00:00	79.97249	80.42748	79.49313	2015-01-10 19:00:00	74.93725	75 57252	73.50229
2015-01-10 20:00:00	75 00843	75.81069	74.21679	2015-01-10 20:00:00	79.97955	80.39084	79 52977	2015-01-10 20:00:00	75.00123	75.49924	74.50992
2015-01-10 21:00:00	74 98666	76.15878	73.90534	2015-01-10 21:00:00	79.97923	80.46412	79 58473	2015-01-10 21:00:00	75.01396	75.4626	74.45496
2015-01-10 22:00:00	75.0309	75.82901	73.97863	2015-01-10 22:00:00	79.96359	80.48244	79.43817	2015-01-10 22:00:00	75.01236	75.60916	74.4916
2015-01-10 23:00:00	75 05639	76.10382	73.97863	2015-01-10 23:00:00	79.9719	80.42748	79.2	2015-01-10 23:00:00	75.01816	75 84733	74.32672
2015-01-11 00:00:00	75 36671	77.80763	73.28244	2015-01-11 00:00:00	79.22243	80.70229	78.4855	2015-01-11 00:00:00	75.02898	75.68244	74.12519
2015-01-11 01:00:00	74 97976	77.00153	65.77099	2015-01-11 01:00:00	79.99326	81.56336	77.9542	2015-01-11 01:00:00	74.97972	76 21374	73 3374
2015-01-11 02:00:00	75.12678	75.92061	74.12519	2015-01-11 02:00:00	80.0979	80.50076	79 52977	2015-01-11 02:00:00	75.00794	75.44427	74.65649
2015-01-11 03:00:00	75.4222	76.39695	74.27176	2015-01-11 03:00:00	80.37847	80.81221	79 89618	2015-01-11 03:00:00	75.0152	75.5542	74.67481
2015-01-11 04:00:00	75.46955	76.36031	74.38168	2015-01-11 04:00:00	80.4594	80.73893	79 89618	2015-01-11 04:00:00	74.99366	75 29771	74.72977
2015-01-11 05:00:00	75.17732	76.19542	74.08855	2015-01-11 05:00:00	80.1177	80.70229	79 32824	2015-01-11 05:00:00	74.98918	75 38931	74.61985
2015-01-11 06:00:00	74 50005	75.62748	73.08092	2015-01-11 06:00:00	79.90479	80.31756	79 38321	2015-01-11 06:00:00	74.96904	75.4626	74.50992
2015-01-11 07:00:00	73 33034	78.17405	71.02901	2015-01-11 07:00:00	79.8983	82.24122	78.46718	2015-01-11 07:00:00	74.99956	77.11145	74.45496
2015-01-11 08:00:00	74 98657	77.11145	73.96031	2015-01-11 08:00:00	79.95332	82.77252	78 21069	2015-01-11 08:00:00	74.95393	75 81069	74.4
2015-01-11 09:00:00	75 04021	77.84427	73.90534	2015-01-11 09:00:00	79.92392	80.55573	79 52977	2015-01-11 09:00:00	75.07464	76 87328	74.54656
2015-01-11 10:00:00	74 98814	75.86565	74.23511	2015-01-11 10:00:00	79.94552	80.3542	79.40153	2015-01-11 10:00:00	74.98	75.42595	74.34504
2015-01-11 11:00:00	74 99481	75.93893	74.3084	2015-01-11 11:00:00	79.97093	80.51908	79.40153	2015-01-11 11:00:00	75.01469	75 33435	74.71145
2015-01-11 12:00:00	75 00567	76.04885	74.3084	2015-01-11 12:00:00	79.97239	80.46412	79.40153	2015-01-11 12:00:00	75.00555	75 33435	74.71145
2015-01-11 13:00:00	75 00604	75.84733	74.21679	2015-01-11 13:00:00	79.98004	80.40916	79.47481	2015-01-11 13:00:00	75.00848	75 35267	74.58321
2015-01-11 14:00:00	74 85658	75.93893	68.77557	2015-01-11 14:00:00	79.98208	80.51908	79 32824	2015-01-11 14:00:00	75.0032	75.5542	74.41832
2015-01-11 15:00:00	75 00614	75.92061	74.12519	2015-01-11 15:00:00	79.96629	80.5374	79 27328	2015-01-11 15:00:00	74.99822	75 29771	74.58321
2015-01-11 16:00:00	74 99144	76.03053	73.97863	2015-01-11 16:00:00	79.96441	80.46412	79 54809	2015-01-11 16:00:00	75.00063	75 38931	74.67481
2015-01-11 17:00:00	74 99017	75.86565	74.18015	2015-01-11 17:00:00	79.95644	80.48244	79 51145	2015-01-11 17:00:00	74.99776	75 33435	74.65649
2015-01-11 18:00:00	74.9749	76.03053	74.12519	2015-01-11 18:00:00	79.95605	80.51908	79.47481	2015-01-11 18:00:00	74.9946	75 33435	74.67481
2015-01-11 19:00:00	75.0684	76.12214	74.10687	2015-01-11 19:00:00	79.99486	80.3542	79 56641	2015-01-11 19:00:00	75.00694	75.4626	74.71145
2015-01-11 20:00:00	75.0498	76.14046	73.88702	2015-01-11 20:00:00	79.97926	80.46412	79 23664	2015-01-11 20:00:00	75.00623	75.4626	74.61985
2015-01-11 21:00:00	75 06374	75.88397	73.81374	2015-01-11 21:00:00	79.97953	80.37252	79 54809	2015-01-11 21:00:00	74.94135	75.5542	73.6855
2015-01-11 22:00:00	75.10413	76.15878	73.63053	2015-01-11 22:00:00	79.98606	80.42748	79 38321	2015-01-11 22:00:00	75.0303	75.70076	74.01527
2015-01-11 23:00:00	75 85127	77.47786	73.50229	2015-01-11 23:00:00	79.93846	81.08702	77.49618	2015-01-11 23:00:00	75.02141	75 92061	73.7771
2015-01-12 00:00:00	75 31376	77.20305	69.16031	2015-01-12 00:00:00	80.03566	81.92977	77.69771	2015-01-12 00:00:00	75.00623	76 32366	73.17252
2015-01-12 01:00:00	75 20032	76.56183	73.48397	2015-01-12 01:00:00	80.25777	81.32519	79.62137	2015-01-12 01:00:00	75.0178	75.5542	74.21679
2015-01-12 02:00:00	75 52054	76.83664	74.01527	2015-01-12 02:00:00	80.57824	81.27023	79.8229	2015-01-12 02:00:00	75.00679	75.60916	74.36336
2015-01-12 03:00:00	75.62518	76.98321	74.63817	2015-01-12 03:00:00	80.63531	81.32519	80 02443	2015-01-12 03:00:00	74.99975	75 51756	74.65649
2015-01-12 04:00:00	75.18883	76.28702	73.02595	2015-01-12 04:00:00	80.2728	80.79389	79.2916	2015-01-12 04:00:00	74.98035	75.4626	74.47328
2015-01-12 05:00:00	73.41893	75.66412	70.7542	2015-01-12 05:00:00	79.78123	80.61069	78 50382	2015-01-12 05:00:00	74.92402	75 57252	74.23511
2015-01-12 06:00:00	75 07191	77.05649	73.81374	2015-01-12 06:00:00	79.99618	82.46107	78.63206	2015-01-12 06:00:00	74.97484	76 23206	74.32672
2015-01-12 07:00:00	74 94858	75.95725	73.70382	2015-01-12 07:00:00	79.97795	80.5374	79 51145	2015-01-12 07:00:00	75.08961	76 81832	74.58321
2015-01-12 08:00:00	75 05725	76.25038	73.8687	2015-01-12 08:00:00	79.98045	80.48244	79.43817	2015-01-12 08:00:00	75.01184	75.4626	74.60153
2015-01-12 09:00:00	74 96668	76.28702	73.50229	2015-01-12 09:00:00	79.96461	80.57405	79.40153	2015-01-12 09:00:00	75.0001	75.48092	74.47328
2015-01-12 10:00:00	75.1228	77.78931	73.96031	2015-01-12 10:00:00	79.9693	80.48244	79 51145	2015-01-12 10:00:00	75.00838	75.60916	74.25344
2015-01-12 11:00:00	74 86172	76.39695	68.40916	2015-01-12 11:00:00	79.96015	80.64733	79 51145	2015-01-12 11:00:00	75.00099	75.5542	74.45496
2015-01-12 12:00:00	75 00363	76.04885	73.81374	2015-01-12 12:00:00	79.97291	80.50076	79.49313	2015-01-12 12:00:00	75.00849	75.49924	74.4
2015-01-12 13:00:00	75 03003	76.1771	73.44733	2015-01-12 13:00:00	79.96343	80.5374	79 54809	2015-01-12 13:00:00	74.93433	75 53588	73.37405
2015-01-12 14:00:00	75 01078	76.10382	73.00763	2015-01-12 14:00:00	79.9698	80.55573	79 54809	2015-01-12 14:00:00	74.99811	75.6458	74.45496
2015-01-12 15:00:00	74 98713	76.48855	73.42901	2015-01-12 15:00:00	79.95047	80.48244	79.47481	2015-01-12 15:00:00	74.97649	75 51756	74.23511
2015-01-12 16:00:00	74 98644	76.06718	73.85038	2015-01-12 16:00:00	79.96441	80.46412	79.47481	2015-01-12 16:00:00	75.0032	75.79237	74.36336
2015-01-12 17:00:00	75 007	75.93893	73.96031	2015-01-12 17:00:00	79.95826	80.50076	79 52977	2015-01-12 17:00:00	75.00597	75 53588	74.4916
2015-01-12 18:00:00	74 99411	76.01221	73.96031	2015-01-12 18:00:00	79.96316	80.55573	79 51145	2015-01-12 18:00:00	74.98282	75 84733	74.4
2015-01-12 19:00:00	75 02619	76.19542	73.90534	2015-01-12 19:00:00	79.97778	80.50076	79 52977	2015-01-12 19:00:00	75.01679	75 84733	74.43664
2015-01-12 20:00:00	75 03377	76.25038	73.41069	2015-01-12 20:00:00	79.98227	80.39084	79.49313	2015-01-12 20:00:00	75.00988	75.79237	74.34504
2015-01-12 21:00:00	75 03182	76.43359	73.85038	2015-01-12 21:00:00	79.96818	80.4458	79 52977	2015-01-12 21:00:00	75.00301	75.79237	74.27176
2015-01-12 22:00:00	75.10019	76.06718	73.97863	2015-01-12 22:00:00	79.99152	80.37252	79.60305	2015-01-12 22:00:00	75.02468	75.6458	74.34504
2015-01-12 23:00:00	75.74644	76.69008	74.4916	2015-01-12 23:00:00	79.97996	80.2626	79.71298	2015-01-12 23:00:00	75.03829	75.62748	74.54656
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2015-01-13 01:00:00	75 05199	76.19542	73.46565	2015-01-13 01:00:00	80.13109	80.8855	79 21832	2015-01-13 01:00:00	75.01232	75 59084	74.43664
2015-01-13 02:00:00	75.42341	76.65344	73.46565	2015-01-13 02:00:00	80.48523	81.03206	79 38321	2015-01-13 02:00:00	75.0144	75 51756	74.45496
2015-01-13 03:00:00	75.47655	76.52519	73.72214	2015-01-13 03:00:00	80.46859	81.10534	79.65802	2015-01-13 03:00:00	74.99704	75.44427	74.50992
2015-01-13 04:00:00	75.1095	76.23206	73.30076	2015-01-13 04:00:00	80.15091	80.95878	79.12672	2015-01-13 04:00:00	74.97233	75.40763	74.45496
2015-01-13 05:00:00	74.11485	77.84427	70.73588	2015-01-13 05:00:00	79.83531	81.28855	78 98015	2015-01-13 05:00:00	74.98919	76.61679	74.18015
2015-01-13 06:00:00	74 86419	75.81069	73.79542	2015-01-13 06:00:00	79.91466	82.71756	78.63206	2015-01-13 06:00:00	75.01031	76.8916	74.45496
2015-01-13 07:00:00	74 94004	76.06718	73.88702	2015-01-13 07:00:00	79.96196	80.5374	79.40153	2015-01-13 07:00:00	75.00099	75.49924	74.54656
2015-01-13 08:00:00	75 06338	75.88397	74.08855	2015-01-13 08:00:00	79.98764	80.64733	79.43817	2015-01-13 08:00:00	75.01145	75 38931	74.43664
2015-01-13 09:00:00	74 99012	76.23206	73.66718	2015-01-13 09:00:00	79.95349	80.61069	79.45649	2015-01-13 09:00:00	74.99604	75.48092	74.41832
2015-01-13 10:00:00	75 00905	76.19542	73.88702	2015-01-13 10:00:00	79.9689	80.39084	79.47481	2015-01-13 10:00:00	75.00215	75.48092	74.34504
2015-01-13 11:00:00	74 99956	76.39695	73.44733	2015-01-13 11:00:00	79.96309	80.66565	79 54809	2015-01-13 11:00:00	74.99758	75.5542	74.41832
2015-01-13 12:00:00	74 99873	76.19542	73.66718	2015-01-13 12:00:00	79.96455	80.4458	79 52977	2015-01-13 12:00:00	75.00447	75 57252	74.56489
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2015-01-13 16:00:00	74 97704	75.92061	73.75878	2015-01-13 16:00:00	79.95608	80.4458	79.43817	2015-01-13 16:00:00	74.99694	75.42595	74.52824
2015-01-13 17:00:00	74 97908	76.15878	73.88702	2015-01-13 17:00:00	79.95665	80.37252	79 38321	2015-01-13 17:00:00	75.00188	75.48092	74.60153

	McPhillips				MacLean				Hurst		
Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum
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2015-01-13 19:00:00	75 00707	75.82901	74.03359	2015-01-13 19:00:00	79.9788	80.5374	79.43817	2015-01-13 19:00:00	74.99739	75 37099	74.63817
2015-01-13 20:00:00	75 03223	76.34198	73.57557	2015-01-13 20:00:00	79.97902	80.46412	79 32824	2015-01-13 20:00:00	75.00638	75.68244	74.43664
2015-01-13 21:00:00	75 03669	76.61679	73.55725	2015-01-13 21:00:00	79.96921	80.50076	79 36489	2015-01-13 21:00:00	74.93254	75.68244	73.44733
2015-01-13 22:00:00	75 07689	76.28702	73.72214	2015-01-13 22:00:00	79.98644	80.48244	79.45649	2015-01-13 22:00:00	75.01601	75 97557	74.07023
2015-01-13 23:00:00	75.70742	76.90992	73.85038	2015-01-13 23:00:00	79.96577	80.64733	77 99084	2015-01-13 23:00:00	75.04536	75 90229	74.07023
2015-01-14 00:00:00	75 58734	77.01985	66.41221	2015-01-14 00:00:00	79.99142	81.10534	78.61374	2015-01-14 00:00:00	74.98503	76 39695	73.61221
2015-01-14 01:00:00	75 29092	76.81832	73.61221	2015-01-14 01:00:00	80.12845	81.23359	79 25496	2015-01-14 01:00:00	75.01083	75 88397	74.54656
2015-01-14 02:00:00	75 57757	76.52519	74.54656	2015-01-14 02:00:00	80.44885	81.03206	79.67634	2015-01-14 02:00:00	75.01359	75 51756	74.61985
2015-01-14 03:00:00	75.64376	76.83664	73.97863	2015-01-14 03:00:00	80.54282	81.10534	79.69466	2015-01-14 03:00:00	74.99508	75.42595	74.21679
2015-01-14 04:00:00	75 32106	76.65344	73.57557	2015-01-14 04:00:00	80.13674	80.75725	79 32824	2015-01-14 04:00:00	74.98596	75.60916	74.29008
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2015-01-14 06:00:00	74 90391	76.21374	73.72214	2015-01-14 06:00:00	79.91332	82.9374	78.68702	2015-01-14 06:00:00	75.00502	76 90992	74.01527
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2015-01-14 08:00:00	75 04723	76.28702	73.83206	2015-01-14 08:00:00	79.98623	80.51908	79.45649	2015-01-14 08:00:00	75.01066	75.44427	74.58321
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2015-01-14 10:00:00	74 98594	76.19542	73.79542	2015-01-14 10:00:00	79.95325	80.4458	79 51145	2015-01-14 10:00:00	75.00056	75.68244	74.58321
2015-01-14 11:00:00	75.0063	76.2687	73.6855	2015-01-14 11:00:00	79.96803	80.48244	79 51145	2015-01-14 11:00:00	75.00653	75.60916	74.38168
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2015-01-14 13:00:00	75 01168	76.43359	73.75878	2015-01-14 13:00:00	79.96702	80.42748	79.49313	2015-01-14 13:00:00	74.99805	75 53588	74.47328
2015-01-14 14:00:00	75 02699	76.81832	73.37405	2015-01-14 14:00:00	79.97246	80.51908	79 38321	2015-01-14 14:00:00	75.00339	75.70076	74.21679
2015-01-14 15:00:00	75 00327	76.39695	73.55725	2015-01-14 15:00:00	79.96152	80.57405	79.45649	2015-01-14 15:00:00	74.99409	75.44427	74.50992
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2015-01-14 17:00:00	74.9725	76.23206	73.3374	2015-01-14 17:00:00	79.95531	80.48244	79.45649	2015-01-14 17:00:00	74.99919	75.48092	74.41832
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2015-01-14 22:00:00	74 97286	76.04885	73.20916	2015-01-14 22:00:00	79.98807	80.50076	79.43817	2015-01-14 22:00:00	74.27098	75 35267	72.36641
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2015-01-15 00:00:00	74.49331	76.0855	71.85344	2015-01-15 00:00:00	79.94115	80.2626	79 25496	2015-01-15 00:00:00	74.83044	75 95725	73.35573
2015-01-15 01:00:00	75 21505	76.52519	72.69618	2015-01-15 01:00:00	80.00352	81.05038	78 85191	2015-01-15 01:00:00	75.03274	75 99389	74.05191
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2015-01-15 07:00:00	74.9084	75.88397	73.74046	2015-01-15 07:00:00	79.97477	80.59237	79.40153	2015-01-15 07:00:00	74.99723	75 51756	74.60153
2015-01-15 08:00:00	75.10078	76.25038	73.6855	2015-01-15 08:00:00	79.98627	80.42748	79.49313	2015-01-15 08:00:00	75.01278	75.75573	74.4
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2015-01-15 10:00:00	74 98292	75.97557	73.92366	2015-01-15 10:00:00	79.9548	80.50076	79.47481	2015-01-15 10:00:00	74.99819	75.4626	74.67481
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2015-01-15 19:00:00	75 02923	76.37863	73.61221	2015-01-15 19:00:00	79.97739	80.5374	79.45649	2015-01-15 19:00:00	75.00662	75 57252	74.56489
2015-01-15 20:00:00	75 03503	75.93893	73.70382	2015-01-15 20:00:00	79.9815	80.5374	79.49313	2015-01-15 20:00:00	75.00681	75.60916	74.38168
2015-01-15 21:00:00	75 03245	76.15878	73.90534	2015-01-15 21:00:00	79.97607	80.55573	79.14504	2015-01-15 21:00:00	74.99871	75.5542	74.45496
2015-01-15 22:00:00	75 09292	76.10382	73.6855	2015-01-15 22:00:00	79.98886	80.39084	79 09008	2015-01-15 22:00:00	74.95901	75.40763	73.42901
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2015-01-16 01:00:00	75.2387	76.50687	73.42901	2015-01-16 01:00:00	80.02462	80.51908	79.67634	2015-01-16 01:00:00	75.00946	75.6458	74.36336
2015-01-16 02:00:00	75 58137	76.72672	73.55725	2015-01-16 02:00:00	80.44236	81.0687	79.43817	2015-01-16 02:00:00	75.00521	75.7374	74.4916
2015-01-16 03:00:00	75.70417	76.81832	74.61985	2015-01-16 03:00:00	80.52795	81.03206	79 87786	2015-01-16 03:00:00	75.00127	75 29771	74.60153
2015-01-16 04:00:00	75 38922	76.54351	73.35573	2015-01-16 04:00:00	80.17484	81.16031	79.2916	2015-01-16 04:00:00	74.97933	75 51756	74.56489
2015-01-16 05:00:00	75 04519	79.23664	72.6229	2015-01-16 05:00:00	79.83451	81.65496	79 05344	2015-01-16 05:00:00	74.97192	76 83664	74.05191
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2015-01-16 07:00:00	74 91967	75.7374	73.70382	2015-01-16 07:00:00	79.95283	80.39084	79.47481	2015-01-16 07:00:00	74.99456	75.4626	74.41832
2015-01-16 08:00:00	75 05411	76.04885	73.46565	2015-01-16 08:00:00	79.97472	80.64733	79.47481	2015-01-16 08:00:00	74.99993	75.44427	74.43664
2015-01-16 09:00:00	75 00962	76.06718	73.81374	2015-01-16 09:00:00	79.96587	80.55573	79 51145	2015-01-16 09:00:00	75.01027	75.5542	74.4916
2015-01-16 10:00:00	74 96674	75.93893	73.75878	2015-01-16 10:00:00	79.95737	80.55573	79.43817	2015-01-16 10:00:00	74.99149	75.4626	74.34504
2015-01-16 11:00:00	75 02198	76.23206	74.10687	2015-01-16 11:00:00	79.97173	80.46412	79.40153	2015-01-16 11:00:00	75.00443	75.70076	74.34504
2015-01-16 12:00:00	74 99674	76.12214	73.52061	2015-01-16 12:00:00	79.96219	80.39084	79.49313	2015-01-16 12:00:00	75.00198	75.49924	74.56489
2015-01-16 13:00:00	75 02295	76.15878	73.83206	2015-01-16 13:00:00	79.97406	80.46412	79 52977	2015-01-16 13:00:00	75.00653	75 53588	74.4916
2015-01-16 14:00:00	75 01791	76.25038	73.75878	2015-01-16 14:00:00	79.95675	80.40916	79 51145	2015-01-16 14:00:00	75.00268	75 53588	74.58321
2015-01-16 15:00:00	74 99989	76.04885	73.50229	2015-01-16 15:00:00	79.96204	80.40916	79.62137	2015-01-16 15:00:00	74.99754	75.42595	74.47328
2015-01-16 16:00:00	74 99327	75.99389	73.20916	2015-01-16 16:00:00	79.96409	80.46412	79 34656	2015-01-16 16:00:00	74.99423	75.6458	74.4
2015-01-16 17:00:00	74 98491	76.23206	73.96031	2015-01-16 17:00:00	79.94869	80.40916	79.41985	2015-01-16 17:00:00	74.99941	75 38931	74.52824

	McPhillips				MacLean				Hurst		
Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum
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2015-01-16 19:00:00	75 04883	76.03053	74.08855	2015-01-16 19:00:00	79.98208	80.39084	79.60305	2015-01-16 19:00:00	75.00496	75 29771	74.71145
2015-01-16 20:00:00	75 01702	76.1771	73.8687	2015-01-16 20:00:00	79.96694	80.37252	79 56641	2015-01-16 20:00:00	75.00352	75 51756	74.54656
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2015-01-16 22:00:00	75.15472	76.30534	73.35573	2015-01-16 22:00:00	79.98344	80.59237	79 23664	2015-01-16 22:00:00	75.02977	75 97557	74.10687
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2015-01-19 08:00:00	75 04781	76.36031	73.39237	2015-01-19 08:00:00	79.98398	80.5374	79.40153	2015-01-19 08:00:00	75.00783	75 53588	74.38168
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	McPhillips				MacLean				Hurst		
Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum
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2015-01-19 19:00:00	75.0301	76.28702	73.52061	2015-01-19 19:00:00	79.98662	80.68397	79 30992	2015-01-19 19:00:00	75.00493	75.66412	74.38168
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2015-01-19 21:00:00	75 03156	76.65344	73.70382	2015-01-19 21:00:00	79.97889	80.3542	79 36489	2015-01-19 21:00:00	75.00434	75.60916	74.34504
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2015-01-22 08:00:00	75 00601	76.65344	73.53893	2015-01-22 08:00:00	79.99993	80.8855	79.43817	2015-01-22 08:00:00	75.02077	75 81069	74 3084
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	McPhillips				MacLean				Hurst		
Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum
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2015-01-22 20:00:00	75 02263	76.15878	73.74046	2015-01-22 20:00:00	79.97535	80.51908	79.41985	2015-01-22 20:00:00	74.9996	75 51756	74.38168
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2015-01-25 08:00:00	74.8976	76.04885	73.81374	2015-01-25 08:00:00	79.98955	82.86412	79 09008	2015-01-25 08:00:00	74.95753	75.4626	74.08855
2015-01-25 09:00:00	75 04836	78.32061	73.20916	2015-01-25 09:00:00	79.93102	80.70229	79 30992	2015-01-25 09:00:00	75.0773	76 81832	74.52824
2015-01-25 10:00:00	75 00127	75.95725	74.23511	2015-01-25 10:00:00	79.95642	80.37252	79 51145	2015-01-25 10:00:00	74.98711	75.48092	74.56489
2015-01-25 11:00:00	74 99297	75.66412	74.07023	2015-01-25 11:00:00	79.96331	80.50076	79.47481	2015-01-25 11:00:00	75.00461	75.4626	74.54656
2015-01-25 12:00:00	75 00191	75.92061	74.14351	2015-01-25 12:00:00	79.97087	80.39084	79 56641	2015-01-25 12:00:00	74.99951	75.44427	74.63817
2015-01-25 13:00:00	75 00524	75.77405	72.89771	2015-01-25 13:00:00	79.98817	80.40916	79.45649	2015-01-25 13:00:00	75.00233	75 38931	74.65649
2015-01-25 14:00:00	74 88489	76.14046	68.00611	2015-01-25 14:00:00	79.96998	80.42748	79.2	2015-01-25 14:00:00	75.01135	75.77405	74.23511
2015-01-25 15:00:00	75 02036	75.79237	73.92366	2015-01-25 15:00:00	79.9584	80.50076	79 51145	2015-01-25 15:00:00	75.00261	75.40763	74.47328
2015-01-25 16:00:00	75.0002	75.84733	74.10687	2015-01-25 16:00:00	79.96897	80.4458	79 58473	2015-01-25 16:00:00	75.00141	75 38931	74.54656
2015-01-25 17:00:00	74 97785	75.79237	74.05191	2015-01-25 17:00:00	79.95137	80.5374	79.41985	2015-01-25 17:00:00	74.99634	75 37099	74.50992

	McPhillips				MacLean				Hurst		
Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum	Date	Average	Maximum	Minimum
2015-01-25 18:00:00	75 01109	75.77405	73.92366	2015-01-25 18:00:00	79.97321	80.42748	79.40153	2015-01-25 18:00:00	75.00076	75.40763	74.63817
2015-01-25 19:00:00	75 02388	75.92061	74.14351	2015-01-25 19:00:00	79.97188	80.4458	79 30992	2015-01-25 19:00:00	75.00561	75.44427	74.63817
2015-01-25 20:00:00	75 05394	76.1771	74.01527	2015-01-25 20:00:00	79.98761	80.42748	79 54809	2015-01-25 20:00:00	75.00298	75.4626	74.58321
2015-01-25 21:00:00	75 04819	75.82901	73.88702	2015-01-25 21:00:00	79.99087	80.39084	79.60305	2015-01-25 21:00:00	74.94364	75.42595	73.39237
2015-01-25 22:00:00	75.10626	76.1771	73.8687	2015-01-25 22:00:00	79.98515	80.4458	79 21832	2015-01-25 22:00:00	75.02541	75.48092	74 3084
2015-01-25 23:00:00	75.9457	77.23969	74.41832	2015-01-25 23:00:00	79.99152	80.39084	79.62137	2015-01-25 23:00:00	75.02917	75.62748	74.03359
2015-01-26 00:00:00	75 97479	77.22137	66.1374	2015-01-26 00:00:00	80.00526	82.07634	77.3313	2015-01-26 00:00:00	74.98331	75 93893	73.52061
2015-01-26 01:00:00	74 98567	76.25038	73.26412	2015-01-26 01:00:00	80.23413	80.90382	79.41985	2015-01-26 01:00:00	75.0157	75 59084	74.58321
2015-01-26 02:00:00	75 36302	76.21374	74.41832	2015-01-26 02:00:00	80.55871	80.92214	79 87786	2015-01-26 02:00:00	75.00948	75.48092	74.60153
2015-01-26 03:00:00	75.49093	76.34198	74.18015	2015-01-26 03:00:00	80.64016	81.08702	80.18931	2015-01-26 03:00:00	74.99913	75 35267	74.58321
2015-01-26 04:00:00	75 01299	76.0855	73.17252	2015-01-26 04:00:00	80.20535	80.81221	79.2916	2015-01-26 04:00:00	74.9705	75.5542	74.4916
2015-01-26 05:00:00	74.6869	79.23664	72.54962	2015-01-26 05:00:00	79.83605	81.91145	78 87023	2015-01-26 05:00:00	74.97568	76 90992	74.29008
2015-01-26 06:00:00	74 86744	75.93893	73.00763	2015-01-26 06:00:00	79.99479	82.3145	78.17405	2015-01-26 06:00:00	75.02775	76.8916	74.18015
2015-01-26 07:00:00	75 07836	78.19237	73.79542	2015-01-26 07:00:00	79.97121	80.42748	79.47481	2015-01-26 07:00:00	74.99875	75 57252	74.45496
2015-01-26 08:00:00	74.8792	76.2687	68.95878	2015-01-26 08:00:00	79.98898	80.62901	79 51145	2015-01-26 08:00:00	75.00711	75.79237	73.83206
2015-01-26 09:00:00	74 97362	76.7084	73.61221	2015-01-26 09:00:00	79.95511	82.16794	76 98321	2015-01-26 09:00:00	74.99781	75.4626	74.47328
2015-01-26 10:00:00	74 98376	76.28702	73.8687	2015-01-26 10:00:00	79.97003	80.72061	78 98015	2015-01-26 10:00:00	74.99745	75 53588	74.52824
2015-01-26 11:00:00	74 98561	75.86565	73.99695	2015-01-26 11:00:00	79.95483	80.57405	79.47481	2015-01-26 11:00:00	74.99461	75.49924	74.56489
2015-01-26 12:00:00	75 01667	76.48855	73.61221	2015-01-26 12:00:00	79.97887	80.92214	79 21832	2015-01-26 12:00:00	74.99835	75.68244	74.41832
2015-01-26 13:00:00	75.0298	76.04885	74.14351	2015-01-26 13:00:00	79.97692	80.39084	79.41985	2015-01-26 13:00:00	75.00499	75.4626	74.50992
2015-01-26 14:00:00	75 00008	76.94656	73.30076	2015-01-26 14:00:00	79.96864	81.10534	78 98015	2015-01-26 14:00:00	74.93507	75.68244	73.39237
2015-01-26 15:00:00	74 99276	76.30534	73.26412	2015-01-26 15:00:00	79.95646	80.68397	79 25496	2015-01-26 15:00:00	74.99005	76 06718	73.99695
2015-01-26 16:00:00	75 01783	76.30534	73.19084	2015-01-26 16:00:00	79.95481	80.95878	79.12672	2015-01-26 16:00:00	74.98731	75 92061	74.14351
2015-01-26 17:00:00	74.9415	76.2687	73.83206	2015-01-26 17:00:00	79.95236	80.4458	79.47481	2015-01-26 17:00:00	75.08078	76 52519	74.34504
2015-01-26 18:00:00	75 02431	75.88397	73.85038	2015-01-26 18:00:00	79.96141	80.40916	79 56641	2015-01-26 18:00:00	74.9925	75 38931	74.45496
2015-01-26 19:00:00	75 05176	76.45191	73.70382	2015-01-26 19:00:00	79.98191	80.5374	79 52977	2015-01-26 19:00:00	75.00699	75 53588	74.45496
2015-01-26 20:00:00	75 02475	75.93893	73.61221	2015-01-26 20:00:00	79.97771	80.55573	79.45649	2015-01-26 20:00:00	74.99593	75.5542	74.54656
2015-01-26 21:00:00	75 03113	76.10382	73.83206	2015-01-26 21:00:00	79.98016	80.61069	79 25496	2015-01-26 21:00:00	74.97323	75 53588	73.30076
2015-01-26 22:00:00	75 08917	76.14046	73.6855	2015-01-26 22:00:00	79.99355	80.59237	77 31298	2015-01-26 22:00:00	74.99263	75.6458	73.50229
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2015-01-27 00:00:00	74 20868	76.92824	68.75725	2015-01-27 00:00:00	79.99551	81.17863	78 52214	2015-01-27 00:00:00	74.99641	76 03053	73.48397
2015-01-27 01:00:00	74 85086	75.92061	72.87939	2015-01-27 01:00:00	80.07581	80.95878	78 81527	2015-01-27 01:00:00	75.01177	75.6458	74.32672
2015-01-27 02:00:00	75 24268	76.36031	73.64885	2015-01-27 02:00:00	80.34051	80.8855	79.7313	2015-01-27 02:00:00	75.01132	75 37099	74.54656
2015-01-27 03:00:00	75 35697	76.61679	73.48397	2015-01-27 03:00:00	80.47702	81.49008	79.47481	2015-01-27 03:00:00	74.9965	75 82901	74.18015
2015-01-27 04:00:00	74 97954	76.14046	72.47634	2015-01-27 04:00:00	80.15441	80.79389	79.12672	2015-01-27 04:00:00	74.98038	75 59084	74.4916
2015-01-27 05:00:00	73.79119	78.85191	71.08397	2015-01-27 05:00:00	79.83918	82.24122	78 52214	2015-01-27 05:00:00	74.97536	77 22137	74.14351
2015-01-27 06:00:00	74 87337	76.39695	73.52061	2015-01-27 06:00:00	79.9959	83.02901	78 55878	2015-01-27 06:00:00	75.02613	76.65344	74.07023
2015-01-27 07:00:00	75.10522	78.43053	73.64885	2015-01-27 07:00:00	79.95916	80.40916	79.41985	2015-01-27 07:00:00	74.99763	75 59084	74.47328
2015-01-27 08:00:00	74 88371	76.15878	68.37252	2015-01-27 08:00:00	79.98816	80.70229	79.41985	2015-01-27 08:00:00	75.00819	75.60916	74.18015
2015-01-27 09:00:00	74 97887	76.43359	73.50229	2015-01-27 09:00:00	79.96777	80.70229	79 32824	2015-01-27 09:00:00	75.00256	75.6458	74.4
2015-01-27 10:00:00	74 99202	76.56183	73.3374	2015-01-27 10:00:00	79.97023	80.62901	79.40153	2015-01-27 10:00:00	74.98825	75.66412	74.25344
2015-01-27 11:00:00	75 03295	76.30534	73.17252	2015-01-27 11:00:00	79.96741	80.59237	79 21832	2015-01-27 11:00:00	75.00677	75.70076	74.25344
2015-01-27 12:00:00	74 99134	76.12214	73.57557	2015-01-27 12:00:00	79.95829	80.57405	79.2916	2015-01-27 12:00:00	74.9991	75.49924	74.47328
2015-01-27 13:00:00	75 00489	76.67176	73.00763	2015-01-27 13:00:00	79.98153	81.05038	79 01679	2015-01-27 13:00:00	74.92169	75.7374	73.39237
2015-01-27 14:00:00	75 04793	76.65344	73.22748	2015-01-27 14:00:00	79.96259	80.70229	79.2	2015-01-27 14:00:00	75.01002	75 82901	74.10687
2015-01-27 15:00:00	74 99823	76.59847	73.00763	2015-01-27 15:00:00	79.95855	80.92214	79.1084	2015-01-27 15:00:00	74.99596	76 36031	74.16183
2015-01-27 16:00:00	74 98003	76.12214	73.17252	2015-01-27 16:00:00	79.94774	80.3542	79 36489	2015-01-27 16:00:00	74.97868	75.71908	74 3084
2015-01-27 17:00:00	74.9646	76.56183	73.81374	2015-01-27 17:00:00	79.95328	80.4458	79.49313	2015-01-27 17:00:00	75.06601	76.65344	74.32672
2015-01-27 18:00:00	75 03266	76.32366	73.57557	2015-01-27 18:00:00	79.9717	80.57405	79 38321	2015-01-27 18:00:00	75.00221	75 57252	74.52824
2015-01-27 19:00:00	75 04708	76.1771	73.70382	2015-01-27 19:00:00	80.00005	80.86718	78 96183	2015-01-27 19:00:00	75.00538	75.68244	74.54656
2015-01-27 20:00:00	75 00897	76.01221	74.19847	2015-01-27 20:00:00	79.97291	80.4458	79.18168	2015-01-27 20:00:00	75.00614	75.44427	74.52824
2015-01-27 21:00:00	75 03131	76.37863	73.94198	2015-01-27 21:00:00	79.98184	80.37252	79.49313	2015-01-27 21:00:00	74.93445	75.49924	73.64885
2015-01-27 22:00:00	75.12522	76.81832	73.63053	2015-01-27 22:00:00	79.89615	80.72061	75.5542	2015-01-27 22:00:00	75.03109	76 37863	73.97863
2015-01-27 23:00:00	75 56935	76.7084	67.89618	2015-01-27 23:00:00	80.02447	81.43511	78 50382	2015-01-27 23:00:00	75.00641	76.15878	73.31908
2015-01-28 00:00:00	74 30063	75.27939	72.69618	2015-01-28 00:00:00	80.00028	80.50076	79 32824	2015-01-28 00:00:00	75.01015	75 37099	74.41832
2015-01-28 01:00:00	75 00006	76.15878	73.72214	2015-01-28 01:00:00	80.14899	80.61069	79.45649	2015-01-28 01:00:00	75.02529	75.42595	74.71145
2015-01-28 02:00:00	75 30459	76.2687	74.23511	2015-01-28 02:00:00	80.44027	80.9771	79 87786	2015-01-28 02:00:00	75.00189	75.44427	74.4
2015-01-28 03:00:00	75.40449	76.25038	74.4916	2015-01-28 03:00:00	80.52846	81.03206	80 04275	2015-01-28 03:00:00	74.99694	75 38931	74.60153
2015-01-28 04:00:00	75 06591	75.97557	73.92366	2015-01-28 04:00:00	80.10044	80.92214	79 30992	2015-01-28 04:00:00	74.98424	75.4626	74.54656
2015-01-28 05:00:00	73.78199	78.52214	71.68855	2015-01-28 05:00:00	79.86339	81.96641	79 05344	2015-01-28 05:00:00	74.9904	76 98321	74.47328
2015-01-28 06:00:00	74.9482	76.34198	73.74046	2015-01-28 06:00:00	80.00038	83.12061	78.41221	2015-01-28 06:00:00	74.92847	75.60916	74.27176
2015-01-28 07:00:00	74 94452	76.19542	74.08855	2015-01-28 07:00:00	79.97317	80.39084	79 51145	2015-01-28 07:00:00	75.07954	76 90992	74.4916
2015-01-28 08:00:00	75 05834	75.81069	74.25344	2015-01-28 08:00:00	79.98871	80.40916	79 56641	2015-01-28 08:00:00	75.00833	75.40763	74.56489
2015-01-28 09:00:00	74 98105	75.88397	74.10687	2015-01-28 09:00:00	79.96823	80.37252	79 54809	2015-01-28 09:00:00	75.00442	75 33435	74.56489
2015-01-28 10:00:00	75 01222	76.1771	73.88702	2015-01-28 10:00:00	79.95962	80.55573	79.1084	2015-01-28 10:00:00	74.99329	75 51756	74.43664

E4 Flushing Report, March 2015

E4a Watermain Cleaning Reports 2012-2014

Winnipeg

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Water and Waste Department

Environmental Standards Division

2012 Water Main Cleaning Program

Water Quality Monitoring Summary Report

January 2013

2012 Water Main Cleaning Program

Water Quality Monitoring Summary Report

Compliance Reporting Technician

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Manager of Environmental Standards Division

January 2013

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SUMMARY

In 2012, The City of Winnipeg - Water & Waste Department worked on a watermain cleaning project that targeted approximately half of the area originally cleaned in 2005[1].

The flushing was carried out using a unidirectional flow technique. During unidirectional flushing, water system valves are operated to create one-way flow to the water main being cleaned. A hydrant connected to the main is then opened to remove the built-up sediment. This type of flushing increases the velocity of the water flow in the main to about two metres or six feet per second (it is normally less than 0.3 metres or 1 foot per second). This high velocity produces a scouring action in the mains, removing sediment deposits. The flushing starts at a clean water source (e.g., the water pumping stations) and moves toward the outer limits of the city. This ensures that clean water is always used to flush the mains.

This report summarizes the data and observations for 2012 obtained by Environmental Standards Division staff. The water quality monitoring carried out as part of the Water Main Cleaning Program included Local Monitoring to determine the impact on water quality in the neighbourhood being cleaned, Regional Monitoring to measure the long-term impact on the water quality of the region being cleaned, and Environmental Monitoring in response to concerns respecting discharges to the environment. In addition, four sensitive users were identified in the area where the flushing was taking place. The monitoring results for the sensitive users were reviewed regularly to ensure they were not being negatively affected by the program. Appendix A illustrates the areas cleaned in the 2012 program. The data generated from the program was entered into the Laboratory Information Management System and is included in the Appendices.

Local Monitoring

Local monitoring was conducted in some of the neighbourhoods being cleaned to determine the impact on local customers by the cleaning program. Monitoring locations, parameters and frequency for flushing operations are provided in Table 1 below.

TABLE 1: LOCAL AREA MONITORING

Locations	**Parameters**	**Frequency**
• Households/businesses (specific location determined in field) Normally 2 households/businesses for 2 sequences per weekday.	• Free Chlorine • Total Chlorine • Total Coliform • *E. coli* • Heterotrophic Plate Count • Turbidity • pH • Temperature • Colour, True	• Once (Pre Flush) • Once (Post Flush) • Once (Few Days Post Flush)*
* - Samples a few days post flush will be taken if water quality has not improved on post flush sample. - Additional post flush samples will be taken if required.		

The Local Monitoring results (Appendix B) were used to tabulate the short-term impact of water main flushing on the quality of water delivered to customers. Homes and businesses were chosen randomly to be representative of the neighborhoods being flushed. Comparing the pre-flush sample results with the post-flush sample results allowed the short-term impact of the flushing to be observed. Post-flush samples were usually collected the same day or the day following the flushing in the area. Occasionally, a post-flush sample was obtained several or more days after flushing, usually due to the customer not being home or the business being closed. A household or business was resampled if the post-flush sample contained a positive total coliform or E. coli, high heterotrophic plate count of >500 cfu/mL, and/or a turbidity of >1.0 NTU.

Chlorine Levels

The level of free chlorine in the post-flush samples showed a mean increase of 0.01 mg/L from the pre-flush samples, and the total chlorine mean showed no change. In most cases, a few days after flushing chlorine levels were slightly higher than the original pre-flush levels. The mean value of post-flush samples for free chlorine was 0.61 mg/L and the mean value for total chlorine levels was 0.77 mg/L.

Total Coliform, E. coli and HPC

The majority of the sample results from the local monitoring locations were negative for total coliform, E. coli and heterotrophic bacteria (HPC). The locations that showed a positive bacteria result for total coliform and/or E. coli, and/or had a heterotrophic plate count of >500 cfu/mL were resampled. A total of 6 locations were required to be resampled due to seven positive total coliform results. There were no positive E. coli results reported and no HPC counts of >500 cfu/mL. One resample came back positive for total coliform, and as a result the location was sampled again, as well as locations upstream and downstream. All resamples came back negative for E. coli and heterotrophic bacteria (HPC). Pre-flush samples that were positive were not resampled if the post-flush samples came back negative because the post-flush sample was treated as the resample. For the 2012 program, the bacterial analysis for the program was done by the contract laboratory ALS.

Turbidity

The mean pre-flush turbidity value was 0.34 NTU and the mean post-flush value was 0.26 NTU. All post-flush locations with results above 1.0 NTU were resampled. One post-flush sample had a turbidity value above 1.0 NTU. This location was resampled and found to have a turbidity of <1.0 NTU. On average the post-flush turbidity values measured this year were significantly lower than in 2011.

pH and Temperature

There was little variance between the mean pH for the pre flush samples and the mean pH for the post flush samples. The mean pH for the pre flush samples was 7.51 units with a range from 7.24 to 7.83 units. The mean pH for the post flush samples was 7.48 units with a range from 7.22 to 7.84 units. The drinking water guidelines[2] recommend a range of 6.5 to 8.5 units. All of the samples were well within this range. The temperature showed a minimal increase on average of 0.4°C from the pre to post flush. The mean pre-flush temperature was 12.2 degrees Celsius and the mean post flush temperature was 12.6 degrees Celsius.

True Colour

The mean pre-flush true colour was 1.01 colour units. The mean post-flush true colour was 1.04 colour units. The results show that there was little difference between the pre and post flush samples.

Regional Monitoring

Regional monitoring included the routine “weekly” monitoring locations in the region, three additional boundary locations, and four large sensitive users in the area. Appendix C provides a summary of the regional monitoring results. The sampling locations, parameters, and frequency of monitoring are provided in Table 2.

TABLE 2: REGIONAL AREA MONITORING

Locations	Parameters	Frequency
• SE-08 [redacted] • SW-04 • SW-06 • SW-07 • SW-08 • SW-14 ***Sensitive Users*** • [redacted] • • •	• Free Chlorine • Total Chlorine • Total Coliform • *E. Coli* • Heterotrophic Plate Count • Turbidity • pH • Temperature • Colour, True • Dissolved Oxygen	• Weekly

[redacted] were identified as sensitive user locations. These locations were monitored on a weekly basis. In addition, they were monitored daily while water main cleaning was being done in the area due to their high sensitivity to any water main disturbances. The maintenance staff at each location developed their own internal protocol should they experience dirty water due to the water main cleaning. In addition, the Water Services staff exercised a lot of caution when working near the sensitive users to minimize any disturbances in their systems.

Regional Monitoring of the six locations was performed to determine if disturbed water main sediment was affecting the entire area being cleaned as well as the distribution system outside of the area being cleaned. All of these locations were part of our routine distribution system water quality monitoring program.

Chlorine Levels

Chlorine dosages at MacLean, Hurst and McPhillips Pumping Stations were increased from 1.1 mg/L to 1.2 mg/L from the beginning of May to the middle of August to maintain target levels of disinfectant in the distribution system. The mean free chlorine at the six selected regional locations was 0.73 mg/L and the total chlorine was 0.91 mg/L.

Total Coliform, E. coli and HPC

The six regional locations were sampled weekly for total coliform, E. coli, and heterotrophic plate count throughout the duration of the program. No positive results were reported for total coliform or E. coli, and there were no HPC counts above 500 cfu/mL.

Turbidity

The mean turbidity for the regional monitoring was 0.26 NTU. The target for turbidity results in the distribution system is <1.0 NTU. Only one sample had a turbidity result of >1.0 NTU. This location was resampled and a result of 0.31 NTU was obtained.

pH and Temperature

The mean pH for the regional monitoring was 7.46 units with a range from 7.29 to 7.61 units. The drinking water guidelines recommend a range of 6.5 to 8.5 units. All of the samples were well within this range. The mean temperature for the regional monitoring was 15.9 degrees Celsius. The water temperature steadily increased as the ambient temperature increased.

True Colour

The mean true colour for the six regional locations was 1.3 colour units, with a range from 0.5 to 2.5 colour units.

Dissolved Oxygen

The mean dissolved oxygen level for the six regional locations was 10.2 mg/L with a range from 9.0 to 11.9 mg/L. These levels are within expected typical treated water ranges. An average value for dissolved oxygen in surface water sources[3] is 9.7 mg/L with a range from 6.9 mg/L to 12.2 mg/L.

Sensitive Users

Four sensitive users were identified for the 2012 watermain cleaning program; [redacted]

Sampling was performed at these locations weekly, with the exception of the days in which the flushing was done close to them, in which case sampling was done daily. The samples were analyzed for the same parameters as the regional monitoring locations. Appendix D provides a summary of the sensitive users monitoring results.

Chlorine Levels

The mean free chlorine for the four sensitive users was 0.69 mg/L and the total chlorine was 0.87 mg/L.

Total Coliform, E. coli and HPC

There were no positive results reported for total coliform or E. coli, and there were no HPC counts above 500 cfu/mL for all of the sensitive users.

Turbidity

The mean turbidity for the regional monitoring was 0.40 NTU. The target for turbidity results in the distribution system is <1.0 NTU. Three samples had a turbidity result of >1.0 NTU. had a turbidity result of 1.37 NTU on June 18 and 1.21 NTU on June 20. The location was resampled on June 19 and June 21, respectively, and both resamples reported turbidities of <1.0 NTU. had a turbidity of 1.36 NTU on June 12. This location was resampled on June 14 and a result of 0.59 NTU was obtained.

pH and Temperature

The mean pH for the sensitive users was 7.47 units with a range from 7.23 to 7.68 units. The drinking water guidelines recommend a range of 6.5 to 8.5 units. All of the samples were well within this range. The mean temperature for the sensitive users was 22.1 degrees Celsius. The water temperature steadily increased as the ambient temperature increased.

True Colour

The mean true colour for the four sensitive users was 1.2 colour units, with a range from 0.5 to 2.5 colour units.

Dissolved Oxygen

The mean dissolved oxygen level for the sensitive users was 10.0 mg/L with a range from 9.0 to 12.1 mg/L. These levels are within expected treated water ranges.

Environmental Monitoring

A baseline Environmental Monitoring Program was conducted as part of the operation. The program consisted of collecting grab samples from hydrant discharges from selected flushing sequences to determine background quality of the water being discharged to the catch basins of land drainage and combined sewers. One grab sample and one composite sample were taken each day. Appendix E provides a summary of the Environmental Monitoring results. The parameters monitored and the frequency of monitoring is provided in Table 3.

TABLE 3: ENVIRONMENTAL MONITORING

Locations	Parameters	Frequency
• Fire Hydrants (specific location(s) determined in field coinciding with sequence of household samples).	• Free Chlorine • Total Chlorine • Turbidity • pH • Temperature • True Colour • Total Suspended Solids • BOD • Dissolved Oxygen • Metal Scan	• Daily

Chlorine Levels

A dechlorination system was employed to remove chlorine from the discharged water prior to the water entering the catch basins of land drainage and combined sewers. Environmental Standards field staff performed random chlorine spot checks on the water being discharged to the catch basins to ensure the dechlorination system was functioning properly. Of the 116 samples analyzed, 8 had detectable chlorine levels. Chlorine was detected because the de-chlorinating dosing pump was not functioning properly on a few days. Most of the results indicate that the dechlorination system was functioning properly the majority of the time.

Turbidity

There were 58 hydrant composite samples collected and analyzed for the flushing program. The composite samples contained mainly the "dirty" water expelled during flushing resulting in relatively high turbidities. The mean turbidity for the hydrant composites was 24.2 NTU with a range from 0.73 to 204 NTU and generally decreased as flushing time increased. The hydrant discharge was flushed until it was clear.

pH and Temperature

The mean pH of the hydrant discharge was 7.82 units which is slightly higher than the distribution system average of 7.57 units for the same time period. The mean temperature for the environmental monitoring samples was 15.4 degrees Celsius which is normal for the distribution system during the summer.

True Colour

The mean true colour of the hydrant discharge was 1.3 colour units, with a range from 0.5 to 3.0 colour units. These are expected results for the distribution system during the summer.

BOD5 and Total Suspended Solids

BOD_5 results ranged from <2 to 17 mg/L for the hydrant composite samples with a mean value of 4.4 mg/L. Total suspended solids results ranged from <4 to 302 mg/L with a mean value of 29.9 mg/L. According to the Manitoba Conservation Report, *Manitoba Water Quality Standards, Objectives, and Guidelines*[4] (2002), the guidelines for municipal wastewater effluents are 30 mg/L BOD_5 and 30 mg/L total suspended solids. The mean results for both BOD_5 and total suspended solids were below the guideline.

Dissolved Oxygen

The mean dissolved oxygen level for the hydrant composite samples was 9.8 mg/L with a range from 8.2 to 11.7 mg/L. These levels are within expected treated water ranges.

Metals

A metal scan was added in the 2011 and 2012 monitoring program in response to the increased discoloured water complaints in 2010. The results for this year's program are provided in Table 4. With the exception of iron and manganese, the metal results are below the drinking water guidelines[2].

TABLE 4: METAL RESULT SUMMARY

	Total Calcium	**Total Copper**	**Total Iron**	**Total Magnesium**	**Total Manganese**	**Total Sodium**	**Total Lead**	**Total Zinc**
	(mg/L)							
Average	21.8	0.02	3.1	5.9	0.62	31.0	0.001	0.009
Maximum	32.7	0.05	12.4	11.9	1.88	37.5	0.010	0.047
Minimum	17.9	0.002	0.1	4.7	0.04	26.1	<0.001	0.002
Drinking Water Guideline[2]	None	<1.0	≤ 0.3	None	≤ 0.05	≤ 200	0.010	≤ 5.0

CONCLUSIONS

The following conclusions were determined from the Water Quality Monitoring Program:

- Local Monitoring generally did not show a change in chlorine or colour levels following the completion of water main cleaning in the area.
- Local Monitoring generally showed an improvement in turbidity levels. This year, post flush samples were generally not collected on the same day as flushing because it was found that post-flush samples collected the next day rather than later the same day showed significant improvement in turbidity.
- Regional Monitoring locations within the cleaning program area showed no difference in water quality from the water quality at the regular distribution system monitoring locations outside of the cleaning area.
- Environmental Monitoring showed that the dechlorination system was functioning effectively the majority of the time but there were days where the pump was not functioning properly.
- Both Local and Regional Monitoring showed that bacteria were not present in the water with the flushing disturbances. All resample results were reported to be negative.
- The BOD_5 and total suspended solids average results from the Environmental Monitoring hydrant discharge samples were below the guideline values.
- The average metal results from the Environmental Monitoring hydrant discharge samples were below the drinking water guidelines with the exception of manganese and iron. The results confirm the presence of iron and manganese in the hydrant discharges which were identified in AECOM's report[5] as the likely cause of discoloured water occurrences.

RECOMMENDATIONS

The following recommendations are provided for the future:

- Local Monitoring samples should continue to be obtained from businesses in the area where possible, since it was sometimes difficult to obtain samples from households, especially the initial post-flush sample.
- Pre-flush samples should be collected at least 2 sequences ahead of the flushing crew to prevent artificially high turbidity and colour results caused by disturbances from flushing nearby.
- Samples should continue to be obtained from households with water quality complaints or concerns. Any water complaints or concerns that occur during the weekend should be noted by Water Services staff and followed up by Environmental Standards staff the following workday.
- Environmental Monitoring should be continued to monitor the quality of the water being discharged to the catch basins. This monitoring should continue to include composite samples analyzed for chlorine, colour, total suspended solids, BOD_5, turbidity, pH, metal scan and dissolved oxygen. In 2012, discoloured water did not present itself as a significant issue for the program however it is recommended that we continue to sample for the additional parameters going forward so we may compare results from year to year as we monitor discoloured water occurrences.
- A spare de-chlorinating pump and Vita-D-Chlor pucks should be purchased and kept on hand for instances where the duty pump is not dosing properly to ensure chlorinated water is not being discharged into the environment.

- In order to ensure effective monitoring for the duration of the flushing program, the program should be scheduled to run from the beginning of May to the end of August. This will ensure that there is sufficient temporary staff available to perform the work.

REFERENCES

1. Marsland, M. et al. 2006. 2005 Water Main Cleaning Program. Water Quality Monitoring Summary Report. City of Winnipeg, Environmental Standards Division, Research Branch.

2. Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and Environment. May 2008. Guidelines for Canadian Drinking Water Quality Summary Table. Retrieved 3 January 2013 http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/2012-sum_guide-res_recom/2012-sum_guide-res_recom-eng.pdf

3. Red Water Release in Drinking Water Distribution Systems. Imran et al, September 2005 edition of the AWWA Journal

4. Williamson, Dwight. 2002. Manitoba Water Quality Standards, Objectives, and Guidelines. Manitoba Conservation Water Branch, Water Quality Management Section. Retrieved 3 January 2013 <http://www.gov.mb.ca/waterstewardship/water_quality/quality/mwqsog_2002.pdf>

5. AECOM. November 2011. City of Winnipeg Discoloured Water Investigation Report of Findings DRAFT. AECOM.

APPENDIX A

2012 Water Main Cleaning Program Area


2012 Water Main Cleaning Area
Osborne St.
Wilkes Ave.
Kenaston Blvd.
McGillivray Blvd.
Red River
Winnipeg
Water and Waste Department
Bishop Grandin Blvd.
Brady Rd.
Waverley St.
Pembina Hwy.
N
Perimeter Hwy.
Rue des Trappistes
April 2012

APPENDIX B

2012 Water Main Cleaning Program Laboratory Analysis Summary Local Monitoring

2012 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
7-May-12		31	324524	0.51	0 69	<1	<1	<10	0 22	7 5	7 82	1.0
8-May-12		31	324518	0.54	0.70	<1	<1	<10	0.17	8 5	7.42	1.5
7-May-12		31	324525	0.56	0.79	<1	<1	<10	1 22	7.7	7 54	2.0
8-May-12		31	324519	0.70	0 94	<1	<1	<10	0 20	9 2	7.47	2.0
7-May-12		32	324527	0.43	0 57	<1	<1	<10	0 26	7 9	7.72	1.0
8-May-12		32	324523	0.64	0 86	<1	<1	<10	0 23	8 8	7.48	2.0
7-May-12		32	324526	0.37	0 58	<1	<1	<10	0 27	7 8	7 83	1.0
8-May-12		32	324522	0.73	0 89	<1	<1	<10	0 27	8 9	7.45	2.0
8-May-12		40	325049	0.68	0 91	<1	<1	<10	0.16	10.0	7.46	1.0
9-May-12		40	325043	0.57	0.71	<1	<1	<10	0 20	9.1	7.45	1.0
8-May-12		40	325048	0.50	0.72	<1	<1	<10	0.15	10.5	7.47	1.5
9-May-12		40	325042	0.53	0 68	<1	<1	<10	0 22	9 0	7.42	1.0
8-May-12		41	325050	0.86	1 01	<1	<1	<10	0.19	8.7	7.47	1.5
9-May-12		41	325046	0.80	0 98	<1	<1	<10	0 39	8 8	7.46	1.0
8-May-12		41	325051	0.84	0.98	<1	<1	<10	0 28	9.4	7.47	1.0
9-May-12		41	325047	0.64	0.82	<1	<1	<10	0 25	8 9	7 58	1.0
9-May-12		48	325101	0.77	0.94	<1	<1	<10	0 60	10.1	7 54	1.0
10-May-12		48	325095	0.83	1.01	<1	<1	<10	0.16	10.2	7 33	1.0
9-May-12		48	325102	0.74	0.91	<1	<1	<10	0 28	10.3	7 53	1.0
10-May-12		48	325096	0.84	0.98	<1	<1	<10	0 22	10.6	7.48	1.0
9-May-12		49	325104	0.92	1.11	<1	<1	<10	0.16	11.2	7.73	1.0
10-May-12		49	325100	0.94	1.10	<1	<1	<10	0.18	12.1	7 52	2.0
9-May-12		49	325103	0.84	1.06	<1	<1	<10	0.17	11.4	7 54	1.0
10-May-12		49	325099	0.94	1.08	<1	<1	<10	0 27	11.9	7.42	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
10-May-12		56	325141	0.52	0.73	<1	<1	<10	0.18	9.4	7.42	1.0
11-May-12		56	325135	0.75	0 92	<1	<1	<10	0 20	6 9	7.42	1.5
10-May-12		56	325140	0.73	0 90	<1	<1	<10	0.13	6 9	7 39	1.0
11-May-12		56	325134	0.53	0 66	<1	<1	<10	0.18	8.7	7.45	2.0
10-May-12		59	325143	0.92	1.10	<1	<1	<10	0.17	9 9	7 55	2.0
14-May-12		59	325139	1.03	1.15	<1	<1	<10	0 99	9 8	7.46	2.0
10-May-12		59	325142	0.87	1 02	<1	<1	<10	0.19	10.4	7 52	1.0
14-May-12		59	325138	1.09	1 28	<1	<1	<10	0.42	9 8	7.47	1.0
11-May-12		64	325195	0.79	1 06	<1	<1	<10	0.17	8 9	7.44	1.0
14-May-12		64	325189	1.02	1.19	<1	<1	<10	0.44	9.1	7 38	1.0
11-May-12		64	325196	0.77	1.01	<1	<1	<10	0.16	8 5	7.42	2.0
14-May-12		64	325190	1.03	1.19	<1	<1	<10	0 26	8 8	7 39	1.0
11-May-12		65	325197	0.70	0.92	<1	<1	<10	0.15	6 5	7 39	1.0
14-May-12		65	325193	1.05	1.22	<1	<1	<10	0.74	8 8	7 37	1.0
11-May-12		65	325198	0.82	0.97	<1	<1	<10	0 29	7 3	7 36	1.0
14-May-12		65	325194	1.14	1.27	<1	<1	<10	0 34	9 0	7.41	2.0
14-May-12		94	325359	0.89	1.00	<1	<1	<10	0 20	7 9	7.42	1.0
15-May-12		94	325353	0.70	0.91	<1	<1	<10	0 22	8 3	7.44	1.5
14-May-12		94	325360	0.87	0.99	<1	<1	<10	0 24	7 8	7.46	1.0
15-May-12		94	325354	0.73	0.92	<1	<1	<10	0.19	8.1	7.49	1.0
14-May-12		95	325361	0.81	0.97	<1	<1	<10	0 36	7 8	7.41	1.0
15-May-12		95	325357	0.83	0.97	<1	<1	<10	0 21	9 0	7.56	1.0
14-May-12		95	325362	0.89	1.02	<1	<1	<10	0.15	8.7	7.56	1.0
15-May-12		95	325358	0.85	0.98	<1	<1	<10	0.16	8 8	7.58	1.5
15-May-12		101	325403	0.75	0.97	<1	<1	<10	0 27	7 8	7.45	2.5
16-May-12		101	325397	0.74	0.92	<1	<1	<10	0 21	8 9	7.33	2.0
15-May-12		101	325404	0.85	0.97	<1	<1	<10	0.19	7 3	7.51	2.0
16-May-12		101	325398	0.78	0.98	<1	<1	<10	0.19	8 8	7.43	1.0
15-May-12		102	325405	0.71	0.85	<1	<1	<10	1 07	9 8	7.61	2.0
16-May-12		102	325401	0.75	0.94	<1	<1	<10	0.20	9.1	7.51	2.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
15-May-12		102	325406	0.76	0 90	<1	<1	<10	0 84	9 2	7 62	2.5
16-May-12		102	325402	0.76	0 92	<1	<1	<10	0 22	9 2	7 55	2.0
16-May-12		113	325812	0.96	1.12	<1	<1	<10	0 22	8 8	7 67	1.0
17-May-12		113	325806	0.92	1 07	<1	<1	10	0.19	9.4	7 54	1.5
16-May-12		113	325811	0.95	1 09	<1	<1	<10	0 22	8 9	7 53	1.0
17-May-12		113	325805	0.90	1.08	<1	<1	<10	0 24	9 5	7 39	2.0
16-May-12		114	325814	0.91	1.06	<1	<1	<10	0.18	9.4	7 69	1.0
17-May-12		114	325810	0.84	0.97	<1	<1	20	0 23	10.5	7 60	1.0
16-May-12		114	325813	0.88	1.03	<1	<1	<10	0 21	9 6	7 62	1.0
17-May-12		114	325809	0.87	1.01	<1	<1	<10	0 23	10.2	7 50	1.0
17-May-12		130	325872	0.67	0.92	<1	<1	<10	0 22	9 0	7 52	1.0
18-May-12		130	325866	0.67	0.80	<1	<1	<10	0.17	10.0	7.42	1.0
17-May-12		130	325871	0.73	0.94	<1	<1	10	0 22	9 2	7 56	1.0
18-May-12		130	325865	0.69	0.89	<1	<1	<10	0.17	10.4	7 38	1.0
17-May-12		131	325873	0.68	0.84	<1	<1	<10	0 24	8 9	7 52	1.0
18-May-12		131	325869	0.90	1.11	<1	<1	<10	0.19	9 9	7.37	1.0
17-May-12		131	325874	0.80	1.03	<1	<1	30	0.14	9.1	7.50	1.5
18-May-12		131	325870	1.01	1.14	<1	<1	30	0 20	10.3	7.39	1.0
18-May-12		139	325916	0.70	0.84	NA	NA	NA	0.15	9 0	7.37	1.0
22-May-12		139	325910	0.80	1.03	<1	<1	<10	0.17	11.0	7.22	1.0
18-May-12		139	325917	0.66	0.89	NA	NA	NA	0.15	8 8	7.34	1.0
22-May-12		139	325911	0.90	1.06	<1	<1	<10	0.15	11.0	7.24	1.0
18-May-12		140	325918	0.49	0.68	NA	NA	NA	0.16	8 2	7.42	1.0
22-May-12		140	325914	0.87	1.04	<1	<1	<10	0.15	11.1	7.33	1 5
18-May-12		140	325919	0.64	0.78	NA	NA	NA	0.19	8.7	7.36	1 0
22-May-12		140	325915	0.94	1.11	<1	<1	<10	0.16	10.8	7.32	1 0
22-May-12		186	326070	0.19	0.31	<1	<1	10	1.97	8.7	7.31	1 0
23-May-12		186	326064	0.57	0.75	<1	<1	10	0.55	8.7	7.54	1 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
22-May-12		186	326069	0.77	0 94	<1	<1	70	0.17	12.7	7 36	1.5
23-May-12		186	326063	0.70	0 88	<1	<1	20	0.16	9.1	7.44	1.0
22-May-12		188	326072	0.71	0 84	<1	<1	<10	0.16	11.1	7.47	1.0
23-May-12		188	326068	0.79	0 86	<1	<1	<10	0.18	11.0	7 55	1.0
22-May-12		188	326071	0.67	0 85	<1	<1	<10	0.17	10.1	7.44	1.0
23-May-12		188	326067	0.75	0 91	<1	<1	70	0.17	11.5	7 51	1.0
23-May-12		198	326534	0.61	0.77	<1	<1	<10	0 20	9 3	7 68	1.0
24-May-12		198	326528	0.59	0.73	<1	<1	NR	0.19	9.7	7 32	1.0
23-May-12		198	326535	0.58	0.77	<1	<1	<10	0.19	9.1	7 66	1.0
24-May-12		198	326529	0.57	0.80	<1	<1	NR	0.19	9.4	7 34	1.0
23-May-12		199	326536	0.65	0.79	<1	<1	<10	0.17	9.4	7.77	1.0
24-May-12		199	326532	0.55	0.74	<1	<1	NR	0.18	10.2	7.41	1.0
23-May-12		199	326537	0.58	0.72	<1	<1	<10	0.19	9 2	7.78	1.0
24-May-12		199	326533	0.60	0.74	<1	<1	NR	0.17	10.1	7.39	1.0
24-May-12		208	326573	0.61	0.74	<1	<1	NR	0.16	10.2	7.27	1.0
25-May-12		208	326567	0.64	0.84	<1	<1	<10	0 22	11.9	7.52	1.0
24-May-12		208	326572	0.44	0.59	<1	<1	NR	0.17	9 8	7.34	1.0
25-May-12		208	326566	0.38	0.53	<1	<1	<10	0.18	10.1	7.52	1.0
24-May-12		209	326575	0.51	0.66	<1	<1	NR	0.17	8 2	7.31	1.0
28-May-12		209	326571	0.75	0.90	<1	<1	30	0 21	8.4	7.45	1.0
24-May-12		209	326574	0.52	0.74	<1	<1	NR	0 26	9 2	7.24	1.0
28-May-12		209	326570	0.67	0.86	<1	<1	<10	0 20	10.1	7.48	1.0
25-May-12		223	326608	0.77	0.89	<1	<1	1180	0 23	8 2	7.38	1.5
28-May-12		223	326602	0.63	0.82	<1	<1	10	0.17	9.7	7.52	1.0
25-May-12		223	326607	0.66	0.81	<1	<1	<10	0.21	8 6	7.42	1.0
28-May-12		223	326601	0.53	0.70	<1	<1	<10	0.16	10.3	7.57	1 0
25-May-12		225	326610	0.66	0.75	<1	<1	<10	0.20	9 0	7.32	1 0
28-May-12		225	326606	0.45	0.77	<1	<1	10	0.14	9 5	7.48	1 0
25-May-12		225	326609	0.64	0.77	<1	<1	<10	0.21	9 2	7.39	1 0
28-May-12		225	326605	0.63	0.82	<1	<1	10	0.16	10.1	7.59	1 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
28-May-12		256	326813	0.49	0 67	<1	<1	<10	0 32	7.4	7 36	1.0
1-Jun-12		256	326807	0.56	0 68	<1	<1	<10	0 26	7.4	7 52	1.0
28-May-12		256	326812	0.60	0.74	<1	<1	<10	0.40	9.1	7 28	1.0
1-Jun-12		256	326806	0.53	0 67	<1	<1	<10	0 27	8 3	7.46	0.5
28-May-12		258	326815	0.61	0.73	<1	<1	<10	0.18	9 2	7.41	1.0
1-Jun-12		258	326811	0.62	0.73	<1	<1	<10	0.15	8 8	7 56	0.5
28-May-12		258	326814	0.70	0.85	<1	<1	10	0.16	9 3	7.46	1.0
1-Jun-12		258	326810	0.53	0.73	<1	<1	<10	0.15	9.7	7 54	1.0
29-May-12		270	326847	0.75	0.91	NA	NA	NA	0.41	8.7	7 35	0.5
30-May-12		270	326841	0.54	0.76	<1	<1	<10	0.19	9.1	7.42	1.0
29-May-12		270	326848	0.72	0.80	NA	NA	NA	0 34	8 6	7.40	0.5
30-May-12		270	326842	0.57	0.80	<1	<1	<10	0.19	9 3	7.46	1.0
29-May-12		272	326849	0.70	0.83	NA	NA	NA	0 33	9 0	7.40	0.5
30-May-12		272	326845	0.53	0.66	<1	<1	<10	0 20	9.4	7.42	1.0
29-May-12		272	326850	0.69	0.79	NA	NA	NA	0 24	9.7	7 55	1.0
30-May-12		272	326846	0.70	0.83	<1	<1	<10	0.18	9 6	7 54	1.0
30-May-12		281	327249	0.62	0.80	NA	NA	NA	0 08	9.4	7.49	1.0
31-May-12		281	327243	0.74	0.90	<1	<1	<10	0 07	10.0	7.84	1.0
30-May-12		281	327250	0.69	0.84	NA	NA	NA	0 20	9.4	7.48	1.0
31-May-12		281	327244	0.80	0.91	<1	<1	40	0.17	10.0	7.80	1.0
30-May-12		283	327251	0.67	0.80	NA	NA	NA	0.17	10.0	7.55	1.0
31-May-12		283	327247	0.55	0.76	<1	<1	<10	0.16	10.3	7.81	0.5
30-May-12		283	327252	0.56	0.75	NA	NA	NA	0 20	9 0	7.52	1.0
31-May-12		283	327248	0.54	0.67	<1	<1	<10	0.17	8 5	7.80	1.0
31-May-12		295	327289	0.45	0.90	<1	<1	10	0.17	10.3	7.75	1 0
1-Jun-12		295	327283	0.40	0.61	<1	<1	<10	0.24	9.7	7.49	1 0
31-May-12		295	327290	0.78	0.95	<1	<1	<10	0.16	11.8	7.75	1 0
1-Jun-12		295	327284	0.46	0.58	<1	<1	10	0.21	8 6	7.49	1 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
31-May-12		296	327292	0.65	0 83	<1	<1	<10	0.16	10.9	7.77	0.5
1-Jun-12		296	327288	0.64	0 80	<1	<1	<10	0.43	10.1	7 51	1.0
31-May-12		296	327291	0.77	0 92	3	<1	30	0.16	12.2	7 81	1.0
1-Jun-12		296	327287	0.51	0 64	<1	<1	<10	0 25	9 0	7.47	1.0
1-Jun-12		304	327333	0.50	0 60	<1	<1	<10	0.18	13.2	7 59	1.0
4-Jun-12		304	327327	0.52	0 66	<1	<1	10	0.15	13.2	7 50	1.0
1-Jun-12		304	327332	0.62	0 85	<1	<1	<10	0.12	11.2	7 58	1.0
4-Jun-12		304	327326	0.55	0.75	<1	<1	<10	0.19	11.9	7 37	1.0
1-Jun-12		306	327335	0.85	1 05	<1	<1	<10	0 69	13.1	7 56	1.0
4-Jun-12		306	327331	0.64	0 84	<1	<1	10	0.16	11.5	7 54	1.0
1-Jun-12		306	327334	0.87	1 02	<1	<1	<10	0.73	12.8	7 55	1.0
4-Jun-12		306	327330	0.66	0 87	<1	<1	<10	0.14	11.8	7 52	1.5
4-Jun-12		337	327523	0.74	0.88	101	<1	<10	0.15	10.7	7.44	1.5
5-Jun-12		337	327517	0.70	0 85	41	<1	10	0 25	11.4	7 50	1.0
7-Jun-12		337	328099	0.84	0 99	200	<1	10	0 20	11.7	NA	NA
7-Jun-12		337	328100	0.84	1 03	<1	<1	<10	0 21	11.6	NA	NA
7-Jun-12		337	328101	0.82	0 97	<1	<1	<10	0.19	11.4	NA	NA
11-Jun-12		337	328309	0.70	0 91	<1	<1	30	0.19	12.7	NA	NA
11-Jun-12		337	328310	NA	NA	<1	<1	<10	NA	NA	NA	NA
11-Jun-12		337	328311	0.73	0.89	<1	<1	<10	0.15	12.6	NA	NA
11-Jun-12		337	328313	0.73	0.92	<1	<1	<10	0 22	12.9	NA	NA
4-Jun-12		337	327522	0.57	0.79	<1	<1	<10	0.17	10.8	7.44	1.0
5-Jun-12		337	327516	0.70	0.87	<1	<1	<10	0 21	11.0	7 51	0.5
4-Jun-12		338	327524	0.71	0.88	<1	<1	10	0.13	13.3	7 53	1.0
5-Jun-12		338	327520	0.73	0.85	<1	<1	<10	0 25	11.5	7 54	1.0
4-Jun-12		338	327525	0.82	0.93	<1	<1	<10	0.13	13.8	7.48	1.0
5-Jun-12		338	327521	0.92	1.03	<1	<1	<10	0.16	13.1	7.41	1.0
5-Jun-12		348	327936	0.74	0.91	1	<1	<10	0 20	12.4	7.48	1.0
6-Jun-12		348	327930	0.76	0.89	<1	<1	<10	0.13	11.2	7 28	1.0
5-Jun-12		348	327937	0.71	0.97	<1	<1	<10	0.19	12.5	7 54	1.0
6-Jun-12		348	327931	0.82	0.97	<1	<1	<10	0.13	11.6	7 32	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
5-Jun-12		349	327939	0.79	0 91	<1	<1	<10	0 21	11.7	7 59	0.5
6-Jun-12		349	327935	0.86	1 00	<1	<1	<10	0.16	13.3	7 33	1.5
5-Jun-12		349	327938	0.85	0 99	<1	<1	10	0 22	13.4	7 50	1.0
6-Jun-12		349	327934	0.83	1 05	<1	<1	<10	0.18	14.9	7.45	1.0
6-Jun-12		360	328002	0.88	1 08	<1	<1	<10	0 83	14.0	7.49	0.5
7-Jun-12		360	327996	0.85	1 00	<1	<1	<10	0 25	13.4	7 37	1.0
6-Jun-12		360	328001	0.70	0 84	<1	<1	<10	0 39	10.6	7 51	1.0
7-Jun-12		360	327995	0.83	0 98	<1	<1	<10	0 34	10.7	7 31	0.5
6-Jun-12		361	328004	0.37	0.49	<1	<1	<10	0.44	9 2	7.49	1.0
7-Jun-12		361	328000	0.78	0.91	<1	<1	<10	0.19	11.5	7.43	1.0
6-Jun-12		361	328003	0.53	0.64	1	<1	<10	0 60	9 3	7 54	1.0
7-Jun-12		361	327999	0.72	0.89	<1	<1	<10	0 50	10.9	7.40	1.0
7-Jun-12		374	328080	0.83	1.02	<1	<1	<10	0.18	13.4	7.45	1.0
8-Jun-12		374	328074	0.81	0.97	<1	<1	<10	0 27	13.6	7.46	1.0
7-Jun-12		374	328079	0.74	0.96	<1	<1	<10	0.16	13.4	7 39	1.0
8-Jun-12		374	328073	0.71	0.94	<1	<1	<10	0.48	13.7	7.42	1.0
7-Jun-12		375	328082	0.76	0.91	<1	<1	10	0 21	12.5	7.36	1.0
8-Jun-12		375	328078	0.73	0.91	<1	<1	<10	0 37	13.8	7.45	1.0
7-Jun-12		375	328081	0.93	1.06	<1	<1	<10	0 21	14.5	7.40	0.5
8-Jun-12		375	328077	0.72	0.94	<1	<1	<10	0 23	15.2	7.44	0.5
8-Jun-12		383	328131	0.53	0.67	<1	<1	<10	0 27	11.9	7.46	1.0
11-Jun-12		383	328125	0.49	0.64	<1	<1	<10	0 32	10.3	7.60	0.5
8-Jun-12		383	328130	0.58	0.81	<1	<1	<10	0 26	10.3	7.49	0.5
11-Jun-12		383	328124	0.53	0.68	<1	<1	<10	0 23	10.1	7.52	1.0
8-Jun-12		384	328132	0.63	0.81	2	<1	<10	0.17	12.1	7.33	1.5
11-Jun-12		384	328128	0.70	0.91	<1	<1	<10	0 22	11.9	7.58	1.0
8-Jun-12		384	328133	0.75	0.85	<1	<1	10	0 21	11.9	7.33	1.0
11-Jun-12		384	328129	0.49	0.66	<1	<1	<10	0.19	11.9	7.53	0.5
11-Jun-12		418	328343	0.38	0.56	<1	<1	<10	0 31	8.7	7.80	0.5
12-Jun-12		418	328337	0.61	0.76	<1	<1	<10	0.17	11.0	7.54	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
11-Jun-12		418	328344	0.36	0 50	<1	<1	<10	0 32	9.1	7 82	1.0
12-Jun-12		418	328338	0.62	0.72	<1	<1	<10	0.17	11.1	7 52	1.0
11-Jun-12		420	328346	0.40	0 55	<1	<1	<10	0 92	10.0	7.72	1.0
12-Jun-12		420	328342	0.53	0 65	<1	<1	40	0 26	10.4	7 55	1.0
11-Jun-12		420	328345	0.40	0 56	<1	<1	<10	0 51	9 9	7 68	0.5
12-Jun-12		420	328341	0.39	0 50	<1	<1	10	0 27	10.2	7 61	1.0
12-Jun-12		429	328706	0.50	0 64	<1	<1	<10	0 22	10.2	7 58	0.5
13-Jun-12		429	328700	0.33	0.44	<1	<1	<10	0.44	11.1	7.47	2.0
12-Jun-12		429	328705	0.48	0 62	2	<1	<10	0.19	9.4	7 58	1.0
13-Jun-12		429	328699	0.32	0.49	<1	<1	<10	0.48	10.3	7 35	1.0
12-Jun-12		431	328707	0.45	0 65	<1	<1	<10	0.19	11.2	7 52	1.0
13-Jun-12		431	328703	0.25	0 38	<1	<1	10	0.49	12.1	7 37	1.0
12-Jun-12		431	328708	0.46	0.62	1	<1	10	0 20	10.1	7 57	0.5
13-Jun-12		431	328704	0.21	0.33	<1	<1	<10	0 60	10.2	7.40	1.0
13-Jun-12		442	328760	0.41	0.50	<1	<1	<10	0 60	10.7	7.48	1.0
14-Jun-12		442	328756	0.31	0.43	<1	<1	<10	0 23	11.1	7 52	2.5
13-Jun-12		442	328759	0.36	0.50	<1	<1	<10	0.48	10.6	7.43	2.0
14-Jun-12		442	328755	0.38	0.50	<1	<1	<10	0 23	10.5	7 52	1.0
13-Jun-12		447	328758	0.38	0.48	<1	<1	10	0 24	12.4	7.42	2.0
14-Jun-12		447	328752	0.36	0.49	<1	<1	<10	0 30	11.2	7.49	1.0
13-Jun-12		447	328757	0.21	0.31	<1	<1	<10	0 20	14.2	7.42	2.0
14-Jun-12		447	328751	0.32	0.51	<1	<1	<10	0 29	10.9	7 60	3.0
14-Jun-12		452	328854	0.39	0.58	<1	<1	<10	0 32	13.4	7 57	1.0
15-Jun-12		452	328848	0.65	0.75	<1	<1	<10	0 34	13.8	7.55	1.0
14-Jun-12		452	328853	0.40	0.66	<1	<1	20	0 34	11.3	7.55	1.0
15-Jun-12		452	328847	0.63	0.77	<1	<1	<10	0 36	14.1	7.31	0.5
14-Jun-12		453	328856	0.72	0.96	<1	<1	<10	1.79	12.3	7.52	2.5
15-Jun-12		453	328852	0.53	0.67	<1	<1	<10	0.19	12.2	7.45	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
14-Jun-12	[redacted]	453	328855	0.45	0 66	<1	<1	<10	0 25	12.3	7.49	1.0
15-Jun-12	[redacted]	453	328851	0.62	0.77	<1	<1	10	0.18	12.3	7.47	1.0
15-Jun-12	[redacted]	466	328873	0.36	0 52	<1	<1	10	0 23	10.2	7.46	1.0
18-Jun-12	[redacted]	466	328867	0.35	0 54	<1	<1	<10	0 29	10.8	7 28	1.0
15-Jun-12	[redacted]	466	328874	0.34	0 51	<1	<1	<10	0 23	10.5	7.45	0.5
18-Jun-12	[redacted]	466	328868	0.25	0 51	<1	<1	<10	0 21	11.6	7.43	1.0
15-Jun-12	[redacted]	467	328875	0.46	0 58	<1	<1	<10	0 39	11.2	7.47	1.0
18-Jun-12	[redacted]	467	328871	0.19	0 34	<1	<1	<10	0 21	11.9	7.40	1.0
15-Jun-12	[redacted]	467	328876	0.37	0 50	<1	<1	<10	0 34	10.9	7 55	1.0
18-Jun-12	[redacted]	467	328872	0.22	0.39	1	<1	<10	0 35	11.5	7.42	1.0
20-Jun-12	[redacted]	467	329523	0.34	0.45	<1	<1	NR	0 23	13.9	NA	NA
18-Jun-12	[redacted]	495	329064	0.61	0.84	8	<1	<10	1.78	12.3	7 50	1.0
19-Jun-12	[redacted]	495	329058	0.67	0.80	1	<1	360	0 24	13.7	7.40	0.5
21-Jun-12	[redacted]	495	329544	0.64	0.81	<1	<1	320	0 31	11.5	NA	NA
18-Jun-12	[redacted]	495	329065	0.79	0.94	<1	<1	<10	1 04	14.4	7.45	1.0
19-Jun-12	[redacted]	495	329059	0.65	0.96	<1	<1	<10	0.16	14.5	7.41	1.0
18-Jun-12	[redacted]	498	329066	0.91	1.03	4	<1	<10	1.16	14.3	7.47	1.0
19-Jun-12	[redacted]	498	329062	0.74	0.91	<1	<1	<10	0.19	14.4	7 36	1.0
18-Jun-12	[redacted]	498	329067	0.63	0.77	<1	<1	<10	0 28	13.7	7.45	1.0
19-Jun-12	[redacted]	498	329063	0.61	0.82	<1	<1	<10	0 31	13.1	7.41	0.5
19-Jun-12	[redacted]	506	329115	0.38	0.53	<1	<1	<10	0 28	11.7	7.45	1.0
20-Jun-12	[redacted]	506	329109	0.23	0.35	<1	<1	NR	0 23	11.8	7 57	1.0
19-Jun-12	[redacted]	506	329116	0.39	0.52	<1	<1	80	0 25	10.7	7.47	1.0
20-Jun-12	[redacted]	506	329110	0.42	0.53	<1	<1	NR	0 24	11.2	7 62	1.0
19-Jun-12	[redacted]	507	329117	0.38	0.51	<1	<1	260	0 26	12.0	7.46	1.0
20-Jun-12	[redacted]	507	329113	0.38	0.50	10	<1	NR	0 25	11.8	7 52	1.5
22-Jun-12	[redacted]	507	329595	0.37	0.50	<1	<1	<10	0 26	12.2	NA	NA
19-Jun-12	[redacted]	507	329118	0.35	0.48	<1	<1	50	0 24	11.7	7.46	1.0
20-Jun-12	[redacted]	507	329114	0.33	0.45	<1	<1	NR	0 21	11.3	7 50	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
20-Jun-12		518	329495	0.11	0 21	<1	<1	NR	0 53	10.4	7 60	1.0
21-Jun-12		518	329489	0.04	0.14	<1	<1	<10	0 57	11.0	7 56	1.0
22-Jun-12		518	329731	0.05	0.15	NA	NA	NA	NA	10.9	NA	NA
25-Jun-12		518	329793	0.27	0.42	NA	NA	NA	NA	11.8	NA	NA
20-Jun-12		518	329494	0.10	0 20	<1	<1	NR	0 61	10.1	7 63	1.0
21-Jun-12		518	329488	0.08	0.15	3	<1	<10	0 83	11.4	7 55	1.0
22-Jun-12		page ppp	329730	<0.02	0.08	NA	NA	NA	NA	10.9	NA	NA
25-Jun-12		518	329732	0.18	0.30	<1	<1	<10	0 94	13.2	NA	NA
20-Jun-12		519	329496	0.12	0.26	<1	<1	NR	0 30	12.0	7 59	0.5
21-Jun-12		519	329492	0.14	0.26	4	<1	<10	0.48	11.3	7 60	0.5
25-Jun-12		519	329773	0.15	0.26	<1	<1	<10	0.46	12.6	NA	NA
20-Jun-12		519	329497	0.20	0.32	<1	<1	NR	0 29	12.0	7 56	1.0
21-Jun-12		519	329493	0.12	0.28	<1	<1	<10	0.42	11.4	7.58	1.0
21-Jun-12		531	329540	0.26	0.37	<1	<1	10	0 32	12.4	7.52	1.0
22-Jun-12		531	329534	0.23	0.31	<1	<1	<10	0 62	13.0	7.51	1.0
21-Jun-12		531	329539	0.20	0.32	<1	<1	10	0 36	11.2	7.55	1.0
22-Jun-12		531	329533	0.30	0.48	<1	<1	<10	0 23	11.0	7.39	1.0
21-Jun-12		533	329542	0.72	0.85	<1	<1	<10	0.78	14.1	7.52	1.0
22-Jun-12		533	329538	0.74	0.90	<1	<1	<10	0 23	15.2	7.44	1.0
21-Jun-12		533	329541	0.63	0.88	<1	<1	<10	1 03	13.7	7.62	1.0
22-Jun-12		533	329537	0.67	0.84	<1	<1	<10	0 32	15.2	7.55	1.0
22-Jun-12		542	329603	0.36	0.49	<1	<1	<10	0 28	11.9	7.49	1.0
25-Jun-12		542	329597	0.13	0.27	<1	<1	<10	0.48	11.4	7.58	1.0
22-Jun-12		542	329602	0.26	0.47	<1	<1	<10	0 27	11.3	7.49	0.5
25-Jun-12		542	329596	0.18	0.32	<1	<1	<10	0 50	11.7	7.67	1.0
22-Jun-12		544	329604	1.13	1.22	<1	<1	<10	5.45	14.1	7.59	1.0
25-Jun-12		544	329600	0.72	0.81	<1	<1	<10	0.17	13.8	7.60	1.0
22-Jun-12		544	329605	0.94	1.09	2	<1	<10	2 80	11.5	7.50	0.5
25-Jun-12		544	329601	0.91	1.09	<1	<1	<10	0 84	15.2	7.46	1.0
25-Jun-12		564	329781	0.44	0.57	<1	<1	<10	0 30	13.8	7.51	1.0
26-Jun-12		564	329775	0.39	0.62	<1	<1	<10	0.27	15.0	7.44	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
25-Jun-12		564	329780	0.40	0 59	<1	<1	10	0 28	12.3	7 58	1.0
26-Jun-12		564	329774	0.36	0 60	1	<1	<10	0 27	14.4	7.40	0.5
28-Jun-12		564	330263	0.36	0 50	<1	<1	<10	0 30	12.0	NA	NA
25-Jun-12		567	329783	0.10	0 22	<1	<1	<10	1 60	10.6	7 55	1.0
26-Jun-12		567	329779	0.37	0.48	<1	<1	<10	0 25	11.0	7.46	1.0
25-Jun-12		567	329782	0.11	0.20	<1	<1	20	1.48	10.7	7.40	1.0
26-Jun-12		567	329778	0.42	0.52	<1	<1	10	0 26	10.5	7.48	1.0
26-Jun-12		580	329816	0.72	0.92	<1	<1	10	0.19	13.2	7 39	1.0
28-Jun-12		580	329810	0.71	0.91	<1	<1	<10	0 36	16.0	7 60	1.0
26-Jun-12		580	329817	0.82	0.97	<1	<1	<10	0.15	16.0	7 52	1.0
28-Jun-12		580	329811	0.72	0.91	<1	<1	<10	0 39	18.0	7 64	1.0
26-Jun-12		581	329819	0.67	0.88	<1	<1	<10	0.13	13.5	7 50	1.0
28-Jun-12		581	329815	0.84	1.00	<1	<1	<10	0 37	14.6	7 59	0.5
26-Jun-12		581	329818	0.68	0.85	1	<1	<10	0.14	14.2	7 50	1.0
28-Jun-12		581	329814	0.80	0.95	<1	<1	<10	0 38	14.3	7.62	0.5
27-Jun-12		588	330208	0.64	0.86	<1	<1	<10	0 33	13.3	7.65	1.0
28-Jun-12		588	330202	0.77	0.89	<1	<1	<10	0.16	14.7	7.62	1.0
27-Jun-12		588	330207	0.65	0.90	<1	<1	<10	0.13	13.6	7.67	1.0
28-Jun-12		588	330201	0.68	0.82	<1	<1	<10	0.16	14.5	7.58	1.0
27-Jun-12		589	330209	0.33	0.49	<1	<1	<10	0.13	13.4	7.66	1.0
28-Jun-12		589	330205	0.25	0.35	<1	<1	<10	0 21	13.8	7.66	1.0
27-Jun-12		589	330210	0.31	0.45	<1	<1	<10	0.13	13.7	7.56	1.0
28-Jun-12		589	330206	0.23	0.36	<1	<1	40	0 20	13.1	7.52	1.0
28-Jun-12		601	330261	0.64	0.80	<1	<1	<10	0.13	13.7	7.62	0.5
3-Jul-12		601	330257	0.80	0.94	<1	<1	<10	0.22	16.5	7.60	1 0
28-Jun-12		601	330260	0.61	0.77	<1	<1	<10	0.18	13.4	7.70	1.0
3-Jul-12		601	330256	0.81	0.93	<1	<1	<10	0.29	16.3	7.57	1 5
28-Jun-12		602	330258	0.59	0.79	<1	<1	<10	0.13	13.9	7.68	1 0
3-Jul-12		602	330252	0.78	0.89	<1	<1	<10	0.21	16.0	7.44	1 0

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28-Jun-12		602	330259	0.67	0 80	<1	<1	<10	0 24	13.4	7 64	1.0
3-Jul-12		602	330253	0.73	0.92	<1	<1	<10	0.18	15.2	7.40	1 5
3-Jul-12		657	330299	0.56	0.69	<1	<1	<10	0.14	11.4	7.48	1 0
4-Jul-12		657	330293	0.15	0.24	<1	<1	<10	0 25	12.1	7.46	1 0
3-Jul-12		657	330298	0.76	0.97	<1	<1	<10	0.13	12.3	7 50	1 5
4-Jul-12		657	330292	0.64	0.73	<1	<1	<10	0.13	12.3	7 35	0 5
3-Jul-12		658	330301	0.37	0.58	<1	<1	<10	0.15	11.2	7.45	1 0
4-Jul-12		658	330297	0.36	0.59	<1	<1	10	0 21	12.2	7.42	1 0
3-Jul-12		658	330300	0.59	0.71	<1	<1	<10	0.15	11.3	7.48	1 0
4-Jul-12		658	330296	0.17	0.31	<1	<1	<10	0 24	11.5	7.45	0 5
4-Jul-12		667	330907	0.70	0.81	<1	<1	<10	0.14	12.2	7.49	0 5
5-Jul-12		667	330903	0.59	0.77	<1	<1	<10	0.19	12.1	7.45	1 0
4-Jul-12		667	330908	0.71	0.81	<1	<1	10	0.14	12.2	7.49	1 0
6-Jul-12		667	330904	0.43	0.61	<1	<1	<10	0.18	11.3	7.42	0 5
4-Jul-12		668	330905	0.75	0.98	<1	<1	510	0.16	12.2	7 53	1 0
5-Jul-12		668	330899	0.40	0.60	<1	<1	<10	0.17	11.4	7.47	0 5
4-Jul-12		668	330906	0.76	0.91	<1	<1	<10	0.16	10.3	7 50	1 0
5-Jul-12		668	330900	0.47	0.58	<1	<1	<10	0.17	9 9	7.44	1 0
5-Jul-12		677	330952	0.70	0.88	<1	<1	<10	0 20	11.4	7 50	0 5
6-Jul-12		677	330946	0.54	0.81	<1	<1	<10	0 21	12.5	7.42	1 0
5-Jul-12		677	330953	0.45	0.63	<1	<1	180	0.18	12.5	7 50	0 5
6-Jul-12		677	330947	0.54	0.75	<1	<1	80	0 21	13.2	7.49	1 0
5-Jul-12		678	330955	0.53	0.66	<1	<1	<10	0.18	11.9	7.46	0 5
6-Jul-12		678	330951	0.67	0.82	<1	<1	<10	0 20	12.3	7.44	0 5
5-Jul-12		678	330954	0.47	0.65	<1	<1	<10	0.17	12.6	7.45	1 0
6-Jul-12		678	330950	0.66	0.80	<1	<1	<10	0.18	12.5	7 50	0.5
6-Jul-12		685	330998	0.60	0.78	<1	<1	10	0.17	13.3	7 53	0.5
9-Jul-12		685	330992	0.47	0.70	<1	<1	<10	0.13	12.0	7 54	1.0
6-Jul-12		685	330997	0.58	0.83	<1	<1	<10	0.16	13.5	7 64	1.0
9-Jul-12		685	330991	0.60	0.74	<1	<1	<10	0.14	13.2	7 61	0.5

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6-Jul-12		686	330999	0.40	0.63	<1	<1	10	0.15	12.1	7 56	0 5
9-Jul-12		686	330995	0.49	0.68	<1	<1	>3000	0.14	11.2	7 57	0 5
17-Jul-12		686	332325	0.27	0.45	<1	<1	<10	0.15	14.9	NA	NA
6-Jul-12		686	331000	0.61	0.83	<1	<1	10	0.14	11.6	7 55	1 0
9-Jul-12		686	330996	0.42	0.56	<1	<1	<10	0.14	13.5	7 62	1 0
9-Jul-12		718	331182	0.46	0.64	<1	<1	<10	0 24	14.2	7 57	1 0
10-Jul-12		718	331178	0.71	0.86	<1	<1	<10	0 24	16.6	7 38	1 0
9-Jul-12		718	331181	0.17	0.34	<1	<1	<10	0.17	14.5	7 62	1 0
10-Jul-12		718	331177	0.10	0.26	<1	<1	<10	0.16	14.5	7.40	0 5
9-Jul-12		721	331180	0.60	0.75	1	<1	<10	0.19	13.6	7 62	0 5
10-Jul-12		721	331174	0.75	0.90	<1	<1	<10	0 20	14.5	7.40	0 5
9-Jul-12		721	331179	0.51	0.66	<1	<1	<10	0 29	16.5	7 62	1 0
10-Jul-12		721	331173	0.78	0.98	<1	<1	<10	1.19	15.3	7 35	1 0
10-Jul-12		721	331127	0.78	0.98	<1	<1	<10	0.78	15.3	7.45	1 0
10-Jul-12		732	331222	0.91	1.07	<1	<1	<10	0 52	15.5	7.41	1 0
12-Jul-12		732	331216	0.90	1.02	<1	<1	<10	0.19	15.6	7.43	1 0
10-Jul-12		732	331221	0.81	1.02	<1	<1	<10	0 29	16.2	7 52	1 0
12-Jul-12		732	331215	0.73	0.92	<1	<1	10	0 21	16.4	7.48	0 5
10-Jul-12		733	331223	1.06	1.19	<1	<1	<10	0.15	17.9	7 55	1 0
11-Jul-12		733	331219	0.82	0.94	<1	<1	<10	0 54	17.1	7.49	1 0
10-Jul-12		733	331224	0.97	1.12	<1	<1	<10	0.15	17.1	7.49	0 5
11-Jul-12		733	331220	0.89	1.00	<1	<1	<10	0 52	16.0	7.41	1 0
11-Jul-12		743	331647	0.13	0.31	<1	<1	<10	0.19	12.0	7.47	0 5
16-Jul-12		743	331641	0.71	0.81	<1	<1	10	0.17	15.4	7.46	1 0
11-Jul-12		743	331646	0.92	1.12	<1	<1	<10	0 24	19.5	7.49	1 0
16-Jul-12		743	331640	0.32	0.44	<1	<1	<10	0.18	15.0	7.42	0 5
11-Jul-12		744	331648	1.03	1.23	<1	<1	<10	0.79	17.3	7 59	1 0
16-Jul-12		744	331644	0.66	0.77	<1	<1	<10	0.17	15.9	7 58	1 0
11-Jul-12		744	331649	0.62	0.76	<1	<1	<10	0 35	12.9	7.45	1.0
16-Jul-12		744	331645	0.81	0.91	<1	<1	<10	0 23	14.0	7.47	0.5

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13-Jul-12		747	331695	0.88	1.07	<1	<1	<10	0.19	17.7	7 52	1 0
16-Jul-12		747	331689	0.63	0.85	<1	<1	<10	0 23	17.2	7.46	1 0
13-Jul-12		747	331696	0.79	0.92	<1	<1	<10	0 20	16.5	7.48	1 0
16-Jul-12		747	331690	0.76	0.98	<1	<1	<10	0 20	18.8	7.41	0 5
13-Jul-12		748	331697	0.85	1.05	<1	<1	<10	0 25	17.5	7.48	1 0
16-Jul-12		748	331693	0.80	0.93	<1	<1	<10	0.15	19.0	7.42	1 0
13-Jul-12		748	331698	0.66	0.85	<1	<1	<10	0 20	16.2	7 53	1 0
16-Jul-12		748	331694	0.81	0.93	<1	<1	<10	0.16	20.0	7.42	1 5
16-Jul-12		785	331910	0.75	0.91	<1	<1	<10	0.19	14.0	7 54	1 0
17-Jul-12		785	331904	0.58	0.76	<1	<1	<10	0.15	15.3	7.48	2 0
16-Jul-12		785	331911	0.55	0.72	<1	<1	10	0.16	14.2	7.43	1 0
17-Jul-12		785	331905	0.60	0.79	<1	<1	10	0.14	17.0	7.42	2 0
16-Jul-12		786	331913	0.60	0.80	<1	<1	<10	0.14	13.6	7.44	1 5
17-Jul-12		786	331909	0.72	0.89	<1	<1	<10	0.17	15.3	7.46	1 5
16-Jul-12		786	331912	0.66	0.81	<1	<1	<10	0.15	13.1	7.47	1 0
17-Jul-12		786	331908	0.66	0.86	<1	<1	<10	0 20	15.8	7.46	1 5
17-Jul-12		801	331976	0.69	0.86	<1	<1	<10	0.16	16.8	7 39	1 5
18-Jul-12		801	331970	0.64	0.87	<1	<1	<10	0.15	14.4	7 33	2 5
17-Jul-12		801	331977	0.71	0.92	<1	<1	<10	0.12	18.0	7.41	2 0
18-Jul-12		801	331971	0.76	0.92	<1	<1	10	0.15	14.6	7 35	2 5
17-Jul-12		802	331978	0.70	0.87	<1	<1	<10	0.13	15.9	7.42	1 5
18-Jul-12		802	331974	0.65	0.82	<1	<1	10	0 32	12.8	7.42	2 0
17-Jul-12		802	331979	0.66	0.85	<1	<1	<10	0.12	17.1	7 39	2 5
18-Jul-12		802	331975	0.71	0.84	<1	<1	<10	0 28	13.0	7.41	2 5
18-Jul-12		810	332358	0.51	0.66	<1	<1	<10	0.14	14.0	7.42	1 5
19-Jul-12		810	332352	0.70	0.86	<1	<1	10	0 21	16.8	7.42	0 5
18-Jul-12		810	332359	0.56	0.69	<1	<1	<10	0.14	14.2	7 39	1 0
19-Jul-12		810	332353	0.28	0.41	<1	<1	<10	0.19	14.1	7 37	0 5

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18-Jul-12		812	332360	0.82	0.95	<1	<1	20	0.12	14.6	7.40	1 0
19-Jul-12		812	332356	0.59	0.78	<1	<1	<10	0.14	15.3	7.40	0 5
18-Jul-12		812	332361	0.44	0.56	<1	<1	<10	0.12	13.4	7.41	1 5
19-Jul-12		812	332357	0.60	0.83	<1	<1	<10	0.14	13.8	7.42	0 5
19-Jul-12		824	332419	0.43	0.64	<1	<1	<10	0.19	15.8	7 59	0 5
20-Jul-12		824	332413	0.86	1.04	<1	<1	<10	0 33	15.4	7 63	0 5
19-Jul-12		824	332420	0.78	0.94	<1	<1	<10	0 21	13.8	7 56	1 0
20-Jul-12		824	332414	0.45	0.65	<1	<1	<10	0 21	13.1	7 56	1 0
19-Jul-12		825	332421	0.60	0.78	<1	<1	<10	0.16	13.1	7 55	0 5
20-Jul-12		825	332417	0.99	1.11	<1	<1	<10	0 31	15.7	7.48	1 0
19-Jul-12		825	332422	0.81	0.99	<1	<1	10	0.76	13.5	7.49	0 5
20-Jul-12		825	332418	0.98	1.10	<1	<1	<10	0 32	15.5	7.48	0 5
20-Jul-12		837	332457	0.69	0.85	<1	<1	<10	0.76	12.1	7 52	1 0
23-Jul-12		837	332451	0.36	0.53	<1	<1	<10	0 30	15.8	7 59	0 5
20-Jul-12		837	332456	0.43	0.64	<1	<1	<10	0 26	12.8	7 51	0 5
23-Jul-12		837	332450	0.38	0.54	<1	<1	<10	0 30	15.8	7 60	1 0
20-Jul-12		838	332458	0.47	0.59	<1	<1	<10	0.15	14.5	7 53	1 0
23-Jul-12		838	332454	0.41	0.52	<1	<1	10	0 28	11.7	7 51	1 0
20-Jul-12		838	332459	0.47	0.62	<1	<1	<10	0 22	15.2	7 52	0 5
23-Jul-12		838	332455	0.42	0.50	<1	<1	<10	0 28	11.9	7.49	1 0
23-Jul-12		867	332650	0.80	0.92	<1	<1	<10	0.40	16.5	7 37	1 0
24-Jul-12		867	332644	0.63	0.79	<1	<1	40	0 27	16.6	7 31	0 5
23-Jul-12		867	332649	0.64	0.82	<1	<1	<10	0.17	15.5	7 58	0 5
24-Jul-12		867	332643	0.62	0.78	<1	<1	60	0 26	16.0	7.42	1 0
23-Jul-12		868	332652	0.15	0.29	<1	<1	10	0 28	14.0	7.43	1 0
24-Jul-12		868	332648	0.42	0.55	<1	<1	100	0 27	15.5	7.44	1 0
23-Jul-12		868	332651	0.19	0.32	<1	<1	<10	0 25	14.8	7.49	0 5
24-Jul-12		868	332647	0.17	0.32	<1	<1	110	0 54	14.2	7.41	0 5
24-Jul-12		879	332732	0.61	0.75	<1	<1	200	0 35	17.4	7 38	1 0
25-Jul-12		879	332726	0.65	0.77	<1	<1	<10	0 35	18.1	7.44	0 5

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24-Jul-12		879	332731	0.30	0.50	<1	<1	280	0 30	16.8	7.40	1 5
25-Jul-12		879	332725	0.59	0.81	<1	<1	10	0.40	17.3	7.47	0 5
24-Jul-12		880	332734	0.55	0.75	<1	<1	50	0 50	14.9	7.42	1 0
25-Jul-12		880	332730	0.72	0.85	<1	<1	<10	0 29	16.6	7.47	1 0
24-Jul-12		880	332733	0.48	0.63	<1	<1	30	0.44	13.8	7 38	1 0
25-Jul-12		880	332729	0.67	0.84	<1	<1	<10	0 28	16.9	7 51	1 0
25-Jul-12		893	333135	0.62	0.82	<1	<1	10	0 23	14.3	7.49	1 0
26-Jul-12		893	333129	0.63	0.83	<1	<1	10	0 20	14.6	7 54	1 0
25-Jul-12		893	333134	0.62	0.82	<1	<1	<10	0.16	15.3	7.48	0 5
26-Jul-12		893	333128	0.63	0.81	<1	<1	<10	0.18	14.5	7.46	1 0
25-Jul-12		894	333137	0.45	0.65	<1	<1	<10	0 33	14.2	7 62	0 5
26-Jul-12		894	333133	0.54	0.66	<1	<1	120	0 33	13.9	7 61	1 0
25-Jul-12		894	333136	0.46	0.62	<1	<1	10	0 31	15.3	7 60	0 5
26-Jul-12		894	333132	0.43	0.59	<1	<1	<10	0 25	14.8	7 51	0 5
26-Jul-12		907	333174	0.82	0.96	3	<1	10	0 93	16.0	7 53	1 0
27-Jul-12		907	333168	0.86	0.99	<1	<1	<10	0 29	19.0	7 52	1 0
26-Jul-12		907	333173	0.72	0.91	<1	<1	<10	1.48	16.8	7 52	1 0
27-Jul-12		907	333167	0.57	0.80	<1	<1	10	0 21	16.0	7 66	1 0
26-Jul-12		908	333176	0.47	0.66	<1	<1	10	0.15	13.8	7.46	1 0
27-Jul-12		908	333172	0.43	0.63	<1	<1	<10	0 22	14.9	7.47	1 0
26-Jul-12		908	333175	0.56	0.77	<1	<1	<10	0.16	14.8	7 51	0 5
27-Jul-12		908	333171	0.43	0.59	<1	<1	<10	0 22	15.0	7.48	1 0
27-Jul-12		917	333214	0.44	0.64	<1	<1	<10	0.18	17.6	7 58	1 0
30-Jul-12		917	333208	0.77	0.93	<1	<1	<10	0 20	17.5	7 51	1 0
27-Jul-12		917	333213	0.56	0.77	<1	<1	10	0.18	16.2	7 53	1 0
30-Jul-12		917	333207	0.76	0.91	<1	<1	20	0.19	16.5	7.45	1 0
27-Jul-12		919	333215	0.32	0.50	<1	<1	10	0 28	14.9	7 61	1 0
30-Jul-12		919	333211	0.32	0.45	<1	<1	<10	0 26	16.9	7 53	1 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
27-Jul-12		919	333216	0.72	0.85	<1	<1	<10	0 60	16.1	7 62	1 0
30-Jul-12		919	333212	0.44	0.56	<1	<1	<10	0 23	16.3	7 56	1 0
30-Jul-12		950	333377	0.39	0.66	<1	<1	<10	0 28	14.3	7 64	0 5
31-Jul-12		950	333371	0.49	0.65	<1	<1	<10	0 26	14.9	7 61	1 0
30-Jul-12		950	333378	0.53	0.69	<1	<1	<10	0 32	14.5	7 58	1 0
31-Jul-12		950	333372	0.46	0.72	<1	<1	<10	0 22	15.5	7 52	0 5
30-Jul-12		951	333380	0.41	0.61	<1	<1	<10	0 26	14.8	7 58	0 5
31-Jul-12		951	333376	0.52	0.64	<1	<1	<10	0 20	14.5	7 57	1 0
30-Jul-12		951	333379	0.47	0.64	<1	<1	<10	0 27	13.4	7 61	1 0
31-Jul-12		951	333375	0.43	0.62	<1	<1	<10	0 23	13.8	7 58	1 0
31-Jul-12		960	333449	0.67	0.90	<1	<1	<10	0 26	12.7	7 58	1 0
1-Aug-12		960	333443	0.66	0.97	1	<1	10	0.74	14.3	7.49	1 0
3-Aug-12		960	333897	0.63	0.78	<1	<1	<10	0.18	13.4	NA	NA
31-Jul-12		960	333450	0.76	0.89	<1	<1	<10	0 29	12.6	7 52	0 5
1-Aug-12		960	333444	0.83	1.05	<1	<1	<10	0 69	14.1	7 57	1 0
31-Jul-12		961	333451	0.62	0.80	<1	<1	<10	0 24	15.0	7.42	1 0
1-Aug-12		961	333447	0.68	0.83	<1	<1	<10	0 27	14.7	7.46	1 0
31-Jul-12		961	333452	0.47	0.67	<1	<1	<10	0 26	14.9	7.49	1 0
1-Aug-12		961	333448	0.72	0.87	<1	<1	<10	0 25	14.5	7.48	1 0
1-Aug-12		974	333806	0.60	0.77	<1	<1	<10	0.15	15.0	7.40	1 0
2-Aug-12		974	333802	0.62	0.76	<1	<1	<10	0 22	16.3	7.47	1 0
1-Aug-12		974	333805	0.66	0.82	<1	<1	<10	0.15	15.6	7.47	1 0
2-Aug-12		974	333801	0.67	0.82	<1	<1	<10	0 22	15.9	7 51	1 0
1-Aug-12		975	333804	0.68	0.86	<1	<1	30	0 22	17.6	7.44	1 0
2-Aug-12		975	333798	0.58	0.70	<1	<1	<10	0 30	15.0	7.48	1 0
1-Aug-12		975	333803	0.55	0.76	<1	<1	10	0.17	14.5	7.45	1 0
2-Aug-12		975	333797	0.60	0.72	<1	<1	<10	0.41	14.0	7 52	1 0
2-Aug-12		979	333858	0.50	0.75	<1	<1	<10	0.18	16.0	7.45	1 0
3-Aug-12		979	333852	0.65	0.78	<1	<1	<10	0 63	16.7	7 51	1 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
2-Aug-12	[redacted]	979	333857	0.53	0.74	<1	<1	<10	0.17	14.9	7.46	1 0
3-Aug-12	[redacted]	979	333851	0.61	0.80	<1	<1	10	0 21	16.2	7 51	1 0
2-Aug-12	[redacted]	980	333859	0.44	0.64	<1	<1	<10	0.17	14.0	7 54	0 5
3-Aug-12	[redacted]	980	333855	0.61	0.77	<1	<1	<10	0 23	17.1	7 55	1 5
2-Aug-12	[redacted]	980	333860	0.72	0.84	<1	<1	<10	0.19	16.0	7.49	1 0
3-Aug-12	[redacted]	980	333856	0.51	0.67	<1	<1	<10	0 24	17.0	7 56	1 0
3-Aug-12	[redacted]	992	333891	0.60	0.78	<1	<1	<10	0 20	16.1	7 52	1 0
7-Aug-12	[redacted]	992	333885	0.42	0.53	<1	<1	<10	0.19	14.1	7 56	1 0
3-Aug-12	[redacted]	992	333892	0.51	0.71	<1	<1	<10	0 20	14.4	7.48	1 0
7-Aug-12	[redacted]	992	333886	0.47	0.58	<1	<1	<10	0 20	15.6	7 62	1 0
3-Aug-12	[redacted]	993	333894	0.36	0.48	<1	<1	<10	0.40	17.3	7 50	1 5
7-Aug-12	[redacted]	993	333890	0.69	0.81	<1	<1	<10	0 24	16.6	7 60	1 0
3-Aug-12	[redacted]	993	333893	0.38	0.58	<1	<1	10	0 26	17.4	7 51	1 0
7-Aug-12	[redacted]	993	333889	0.74	0.86	<1	<1	100	0.19	16.0	7 59	1 0

NR - No result NA - Not analyzed

Comments:

On May 18, 29 and 30, pre-flush bacteriological sample were not analyzed due to a technician error.

On May 24 and June 20 there were no results for HPC due to a contract lab error.

*Bracketed ( ) addresses indicate alternate location was sampled because initial location was inaccessible for the Post-Flush or Few days Post-Flush sampling.

No re-sample collected when a pre-flush sample test positive for bacti and the post-flush is negative.

APPENDIX C

2012 Water Main Cleaning Program Laboratory Analysis Summary Regional Monitoring

2012 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE08_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324570	0.67	0.90	<1	<1	20	0.25	9.9	1.0	7.43	NA[1]
14-May-12	325235	0.75	0.99	<1	<1	<10	0.30	11.6	1.0	7.47	NA[1]
23-May-12	325973	0.62	0.82	<1	<1	<10	0.21	12.4	1.0	7.46	11.2
31-May-12	326685	0.65	0.81	<1	<1	<10	0.36	12.9	1.5	7.56	10.9
5-Jun-12	327429	0.80	0.96	<1	<1	10	0.21	14.0	1.0	7.48	11.2
12-Jun-12	328203	0.63	0.83	<1	<1	<10	0.16	15.3	2.0	7.51	11.6
19-Jun-12	328910	0.71	0.86	<1	<1	<10	0.18	16.4	1.0	7.45	10.0
26-Jun-12	329637	0.75	0.89	<1	<1	<10	0.25	16.1	0.5	7.46	10.0
3-Jul-12	330429	0.65	0.79	<1	<1	<10	0.20	19.2	2.0	7.48	10.0
10-Jul-12	331110	0.74	0.96	<1	<1	<10	0.18	20.5	1.0	7.56	9.1
16-Jul-12	331840	0.61	0.83	<1	<1	<10	0.21	21.4	2.0	7.48	9.1
24-Jul-12	332627	0.64	0.80	<1	<1	10	0.19	21.4	1.0	7.45	9.2
31-Jul-12	333349	0.63	0.81	<1	<1	<10	0.29	21.2	1.0	7.52	9.4
8-Aug-12	333948	0.66	0.82	<1	<1	<10	0.23	21.4	1.5	7.47	NA[2]
14-Aug-12	334711	0.66	0.81	<1	<1	<10	0.24	20.8	0.5	7.52	9.9

SW04_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324579	0.77	0.95	<1	<1	30	0.31	7.9	1.5	7.45	NA[1]
14-May-12	325244	0.86	1.03	<1	<1	<10	0.14	9.2	1.0	7.29	NA[1]
22-May-12	325982	0.62	0.79	<1	<1	<10	0.17	10.3	1.0	7.41	11.3
31-May-12	326694	0.78	0.99	<1	<1	<10	0.15	11.4	2.0	7.52	11.1
5-Jun-12	327438	0.81	0.97	<1	<1	10	0.36	11.5	1.0	7.48	11.3
12-Jun-12	328212	0.74	0.93	<1	<1	<10	0.15	12.9	2.5	7.46	11.6
19-Jun-12	328919	0.79	0.94	<1	<1	<10	0.15	13.8	1.0	7.42	10.1
26-Jun-12	329646	0.78	0.94	<1	<1	<10	0.14	15.1	0.5	7.43	10.0
3-Jul-12	330422	0.74	0.95	<1	<1	<10	0.19	16.4	2.0	7.41	10.3
10-Jul-12	331103	0.83	1.02	<1	<1	<10	0.17	19.0	1.0	7.46	9.5
16-Jul-12	331833	0.74	0.89	<1	<1	<10	0.13	17.6	2.0	7.43	9.3
24-Jul-12	332620	0.76	0.90	<1	<1	<10	0.20	19.0	2.0	7.39	9.4
31-Jul-12	333342	0.76	0.90	<1	<1	10	0.19	19.1	1.0	7.45	9.5
8-Aug-12	333957	0.78	0.94	<1	<1	<10	0.32	18.9	1.0	7.45	9.3
14-Aug-12	334720	0.71	0.92	<1	<1	<10	0.19	19.8	1.0	7.47	10.2

SW06_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
1-May-12	323961	0.83	1.06	<1	<1	<10	0.16	8.3	1.0	7.47	NA[1]
8-May-12	324581	0.84	1.14	<1	<1	<10	0.19	10.1	1.0	7.47	NA[1]
15-May-12	325246	0.95	1.13	<1	<1	<10	0.15	12.6	1.0	7.56	11.9
22-May-12	325984	0.83	1.04	<1	<1	<10	0.14	14.2	1.0	7.41	11.2
28-May-12	326696	0.83	1.04	<1	<1	<10	0.15	14.7	2.0	7.52	11.0
4-Jun-12	327440	0.90	1.10	<1	<1	<10	0.16	14.8	1.0	7.40	11.5
12-Jun-12	328214	0.90	1.07	<1	<1	<10	0.14	17.5	2.0	7.48	10.6
18-Jun-12	328921	0.98	1.14	<1	<1	<10	0.15	18.2	1.0	7.42	10.3
26-Jun-12	329648	0.89	1.08	<1	<1	<10	0.15	18.7	1.0	7.45	10.2
3-Jul-12	330423	0.87	1.06	<1	<1	<10	0.16	21.5	2.0	7.44	10.2
9-Jul-12	331104	0.86	1.06	<1	<1	<10	0.17	22.7	1.0	7.46	9.5
16-Jul-12	331834	0.96	1.13	<1	<1	<10	0.20	23.9	2.0	7.39	9.5
24-Jul-12	332621	0.92	1.16	<1	<1	60	0.18	23.6	1.0	7.39	9.1
31-Jul-12	333343	0.99	1.20	<1	<1	<10	0.21	23.6	1.0	7.49	9.7
7-Aug-12	333959	0.80	0.99	<1	<1	<10	0.18	23.0	1.0	7.47	10.7
14-Aug-12	334722	0.96	1.11	<1	<1	<10	0.20	22.2	0.5	7.45	10.2

SW07_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324582	0.79	0.97	<1	<1	<10	0.19	10.3	1.0	7.33	NA[1]
14-May-12	325247	1.05	1.23	<1	<1	<10	0.22	11.7	1.0	7.46	NA[1]
22-May-12	325985	0.67	0.85	<1	<1	<10	0.14	10.2	1.0	7.41	11.3
31-May-12	326697	0.81	0.99	<1	<1	<10	0.18	11.6	1.5	7.56	11.1
5-Jun-12	327441	0.83	1.00	<1	<1	20	0.17	13.0	1.0	7.49	11.3
12-Jun-12	328215	0.72	0.91	<1	<1	<10	0.14	14.4	2.0	7.46	11.6
19-Jun-12	328922	0.73	0.89	<1	<1	<10	0.43	13.8	1.5	7.41	10.1
26-Jun-12	329649	0.87	1.05	<1	<1	10	0.24	15.5	1.0	7.52	9.9
3-Jul-12	330424	0.77	0.92	<1	<1	<10	0.25	16.8	2.0	7.43	10.0
10-Jul-12	331105	0.97	1.11	<1	<1	<10	0.19	19.4	1.0	7.49	9.4
16-Jul-12	331835	0.74	0.97	<1	<1	<10	0.21	19.0	2.0	7.43	9.4
24-Jul-12	332622	0.78	0.98	<1	<1	<10	0.15	21.1	2.0	7.38	9.4
31-Jul-12	333344	0.79	0.93	<1	<1	<10	0.24	19.5	1.0	7.44	9.4
8-Aug-12	333960	0.80	0.95	<1	<1	<10	0.21	18.8	1.5	7.44	9.4
14-Aug-12	334723	0.76	0.92	<1	<1	<10	0.23	19.9	1.5	7.46	10.0

SW08

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324583	0.50	0.66	<1	<1	<10	0.19	9.0	1.0	7.42	NA[1]
14-May-12	325248	0.83	0.99	<1	<1	<10	0.24	9.6	1.0	7.54	NA[1]
22-May-12	325986	0.64	0.83	<1	<1	<10	0.14	10.2	1.0	7.33	11.2
28-May-12	326698	0.52	0.69	<1	<1	<10	0.15	10.5	2.0	7.61	11.3
5-Jun-12	327442	0.64	0.79	<1	<1	20	0.14	10.7	1.0	7.54	11.4
11-Jun-12	328216	0.56	0.76	<1	<1	<10	0.13	12.1	1.0	7.50	10.7
19-Jun-12	328923	0.59	0.78	<1	<1	<10	0.18	12.4	1.0	7.42	10.1
26-Jun-12	329650	0.72	0.87	<1	<1	<10	0.13	13.2	1.0	7.44	10.1
3-Jul-12	330425	0.78	0.96	<1	<1	<10	0.35	15.0	2.0	7.48	10.1
9-Jul-12	331106	0.79	1.00	<1	<1	<10	0.31	15.9	1.0	7.48	9.6
16-Jul-12	331836	0.64	0.83	<1	<1	<10	0.34	16.8	2.0	7.43	9.3
24-Jul-12	332623	0.62	0.79	<1	<1	10	0.27	21.1	1.0	7.43	9.4
31-Jul-12	333345	0.54	0.74	<1	<1	<10	3.84	18.5	1.0	7.51	9.3
01-Aug-12*	333850	NA	NA	NA	NA	NA	0.31	NA	NA	NA	NA
8-Aug-12	333961	0.61	0.82	<1	<1	<10	0.25	19.1	1.5	7.47	NA[2]
13-Aug-12	334724	0.47	0.62	<1	<1	<10	0.28	18.0	0.5	7.52	10.3

*On August 1, the location was re-sampled due to a high turbidity of 3.84 NTU on July 31. Other parameters were not analysed for the re-sample.

SW14_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324588	0.77	0.92	<1	<1	<10	0.24	7.9	1.0	7.40	NA[1]
14-May-12	325253	0.84	1.01	<1	<1	<10	0.14	9.3	1.0	7.49	NA[1]
22-May-12	325991	0.59	0.77	<1	<1	<10	0.15	10.3	1.0	7.51	11.2
31-May-12	326703	0.55	0.71	<1	<1	<10	0.52	12.5	2.0	7.56	10.9
5-Jun-12	327447	0.68	0.85	<1	<1	<10	0.24	12.9	1.0	7.46	11.0
12-Jun-12	328221	0.51	0.67	<1	<1	<10	0.33	14.3	2.0	7.49	11.3
19-Jun-12	328928	0.53	0.72	<1	<1	<10	0.32	14.5	1.0	7.46	9.9
26-Jun-12	329655	0.58	0.79	<1	<1	<10	0.36	16.1	1.0	7.44	9.8
3-Jul-12	330427	0.54	0.72	<1	<1	<10	0.36	17.7	2.0	7.49	9.9
10-Jul-12	331108	0.54	0.68	<1	<1	<10	0.41	18.1	1.0	7.52	9.2
16-Jul-12	331838	0.54	0.71	<1	<1	10	0.31	19.0	2.0	7.44	9.0
24-Jul-12	332625	0.59	0.76	<1	<1	10	0.34	21.3	1.0	7.33	9.2
31-Jul-12	333347	0.55	0.73	<1	<1	<10	0.22	20.2	1.0	7.42	9.2
8-Aug-12	333966	0.46	0.58	<1	<1	<10	0.22	20.6	1.5	7.37	9.3
14-Aug-12	334729	0.54	0.70	<1	<1	<10	0.32	20.2	0.5	7.45	9.7

NA: Not analysed NR: No result

[1]Dissolved oxygen was not analysed prior to May 14, 2012.

[2]Dissolved oxygen was not analysed due to instrument error/malfunction.

APPENDIX D

2012 Water Main Cleaning Program Laboratory Analysis Summary Sensitive Users Monitoring

2012 Water Main Cleaning Program

Laboratory Analysis Report Sensitive Users Monitoring

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
1-May-12	324028	0.69	0.86	<1	<1	<10	0.31	8 0	1.0	7.46	NA[1]
7-May-12	324530	0.58	0.73	<1	<1	<10	0.19	8.4	1.0	7.58	NA[1]
14-May-12	325307	0.66	0.84	<1	<1	<10	0.21	9 0	2.0	7.32	12.1
22-May-12	326041	0.53	0.74	<1	<1	<10	0.17	9.1	1.0	7.39	11.3
31-May-12	326739	0.67	0.89	<1	<1	<10	0.42	10.4	1.0	7 59	11.1
5-Jun-12	327501	0.66	0.85	<1	<1	<10	0.15	10.8	1.0	7 30	11.5
12-Jun-12	328257	0.63	0.79	<1	<1	<10	0.16	11.8	2.0	7.45	12.0
19-Jun-12	328982	0.71	0.90	<1	<1	<10	0.18	14.1	1.0	7.46	10.2
26-Jun-12	329709	0.72	0.91	<1	<1	<10	0.26	13.2	1.0	7.44	10.0
3-Jul-12	330421	0.76	0.95	<1	<1	<10	0.16	14 8	2.0	7 38	10.4
9-Jul-12	331126	0.51	0.66	<1	<1	<10	0 29	16 5	1.0	7.62	9.5
10-Jul-12	331102	0.78	0.98	<1	<1	<10	0.78	15 3	1.0	7.45	9.5
10-Jul-12	331127	0.78	0.98	<1	<1	<10	0.78	15 3	1.0	7.45	9.5
11-Jul-12	331128	0.74	0.95	<1	<1	<10	0 34	16 9	1.0	7 38	9.6
12-Jul-12	331129	0.86	1.03	<1	<1	<10	0 30	15 9	1.0	7 39	9.6
13-Jul-12	331130	0.77	0.93	<1	<1	<10	0 23	16 5	1.0	7.44	9.3
16-Jul-12	331832	0.79	0.94	<1	<1	<10	0 26	16.4	2.5	7.44	9.4
24-Jul-12	332619	0.85	1.03	<1	<1	<10	0 87	20 2	1.0	7 37	9.5
31-Jul-12	333341	0.79	0.96	<1	<1	<10	0 36	17.7	1.0	7.44	9.3
8-Aug-12	334016	0.56	0.73	<1	<1	<10	0 25	18.4	1.0	7.43	NA[2]
14-Aug-12	334795	0.66	0.93	<1	<1	<10	0 25	19 5	1.0	7.43	10.0

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
1-May-12	324027	0.64	0.86	<1	<1	<10	0.25	8.1	1.0	7.48	NA[1]
7-May-12	324529	0.67	0.82	<1	<1	<10	0.21	8 5	1.0	7.57	NA[1]
14-May-12	325306	0.79	0.99	<1	<1	<10	0.24	9.1	1.0	7.36	11.8
22-May-12	326040	0.71	0.88	<1	<1	<10	0.21	10.1	1.0	7.37	11.2
31-May-12	326738	0.63	0.85	<1	<1	<10	0.18	11.3	2.0	7.51	11.1
5-Jun-12	327500	0.76	0.91	<1	<1	<10	0.18	12.1	1.0	7.23	11.3
12-Jun-12	328256	0.62	0.77	<1	<1	<10	0.18	13.3	2.0	7.47	11.5
20-Jun-12	328981	0.59	0.75	<1	<1	NR[3]	0.27	14.8	0.5	7.43	9.9
26-Jun-12	329708	0.74	0.91	<1	<1	<10	0.32	15.3	1.0	7.43	10.0
3-Jul-12	330420	0.69	0.89	<1	<1	<10	0.41	18.0	2.0	7.38	10.1
9-Jul-12	331122	0.56	0.71	<1	<1	<10	1.14	18.0	2.0	7.51	9.5
9-Jul-12	331121	0.56	0.71	<1	<1	<10	0.20	18.0	1.0	7.58	9.5
10-Jul-12	331101	0.71	0.89	<1	<1	<10	0.28	15.4	1.0	7.44	9.4
11-Jul-12	331123	0.72	0.89	<1	<1	<10	0.25	20.5	1.0	7.35	9.5
12-Jul-12	331124	0.72	0.95	<1	<1	<10	0.22	19.5	1.0	7.37	9.5
13-Jul-12	331125	0.71	0.88	<1	<1	<10	0.31	20.5	1.0	7.40	9.1
16-Jul-12	331831	0.67	0.87	<1	<1	<10	0.31	19.1	2.0	7.39	9.3
24-Jul-12	332618	0.76	0.92	<1	<1	<10	0.33	20.3	1.0	7.50	9.4
31-Jul-12	333340	0.76	0.93	<1	<1	<10	0.30	20.7	1.0	7.48	9.4
8-Aug-12	334015	0.67	0.87	<1	<1	<10	0.35	20.2	1.0	7.44	NA[2]
14-Aug-12	334794	0.79	0.93	<1	<1	<10	0.41	20.0	1.0	7.46	9.9

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324590	0.78	1.03	<1	<1	<10	0.20	8.6	1.0	7.51	NA[1]
14-May-12	325255	0.90	1.09	<1	<1	<10	0.21	9.4	1.0	7.53	NA[1]
22-May-12	325993	0.71	0.86	<1	<1	<10	0.15	9 8	1.0	7.46	11.2
31-May-12	326705	0.61	0.78	<1	<1	<10	0.17	11.4	2.0	7.64	10.8
5-Jun-12	327449	0.84	1.00	<1	<1	10	0.22	12.4	1.0	7.53	11.1
12-Jun-12	328223	0.65	0.81	<1	<1	<10	0.24	12.9	2.0	7.50	11.6
18-Jun-12	328930	0.68	0.84	<1	<1	<10	1.37	14.7	2.0	7 52	9.7
19-Jun-12	329093	0.77	0.96	<1	<1	<10	0 56	15 3	1.0	7.52	10.1
19-Jun-12	329092	0.74	0.89	<1	<1	<10	0.49	14.1	1.0	7.45	10.1
20-Jun-12	329094	0.80	0.95	<1	<1	NR[3]	1 21	15 2	1.0	7.63	9.9
21-Jun-12	329096	0.70	0.86	<1	<1	<10	0 39	15.7	1.0	7.60	9.9
21-Jun-12	329095	0.62	0.80	<1	<1	<10	0 97	14.1	1.0	7.52	10.1
26-Jun-12	329657	0.71	0.91	<1	<1	<10	0.19	15.3	1.0	7.43	9.9
3-Jul-12	330428	0.73	0.95	<1	<1	<10	0.24	16.8	2.0	7.53	10.1
10-Jul-12	331109	0.68	0.84	<1	<1	10	0.17	20.4	1.0	7.61	9.3
16-Jul-12	331839	0.60	0.81	<1	<1	<10	0.24	18.4	2.0	7.50	9.1
24-Jul-12	332626	0.87	1.02	<1	<1	130	0.18	21.6	1.0	7.42	9.1
31-Jul-12	333348	0.60	0.75	<1	<1	<10	0.20	19.5	1.0	7.48	9.1
8-Aug-12	333968	0.54	0.70	<1	<1	20	0.24	20.1	1.5	7.57	9.0
14-Aug-12	334731	0.72	0.88	<1	<1	<10	0.28	20.1	0.5	7.68	9.0

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324585	0.59	0.80	<1	<1	<10	0.33	12.1	1.0	7.43	NA[1]
14-May-12	325250	0.79	1.03	<1	<1	<10	0.91	12.1	1.0	7.54	NA[1]
22-May-12	325988	0.67	0.87	<1	<1	<10	0.66	12 0	1.0	7.41	11.2
31-May-12	326700	0.67	0.86	<1	<1	<10	0 28	11.7	1.0	7.60	11.0
5-Jun-12	327444	0.79	1.00	<1	<1	<10	0 29	14.4	1.0	7.52	11.2
12-Jun-12	328218	0.41	0.62	<1	<1	<10	1 36	14.7	2.5	7.50	11.4
14-June-12*	328878	NA	NA	NA	NA	NA	0 59	NA	NA	NA	NA
19-Jun-12	328925	0.60	0.79	<1	<1	<10	0 28	13 3	1.0	7.46	10.0
26-Jun-12	329652	0.72	0.87	<1	<1	<10	0.73	16.1	1.0	7.49	9.9
3-Jul-12	330426	0.61	0.80	<1	<1	<10	0.48	19 0	2.5	7.45	10.1
9-Jul-12	331131	0.66	0.85	<1	<1	<10	0.60	18.6	1.5	7.52	9.4
10-Jul-12	331107	0.78	0.96	<1	<1	<10	0 59	20.7	1.0	7.47	9.4
10-Jul-12	331132	0.78	0.96	<1	<1	<10	0.49	20.7	1.0	7.44	9.4
11-Jul-12	331133	0.80	0.95	<1	<1	<10	0.66	20 9	1.0	7.41	9.4
12-Jul-12	331134	0.84	1.00	<1	<1	<10	0.77	20 0	1.0	7.43	9.5
13-Jul-12	331135	0.65	0.82	<1	<1	<10	0 50	20 2	1.0	7.42	9.0
16-Jul-12	331797	0.59	0.79	<1	<1	20	0.42	21.7	2.5	7.51	9.1
24-Jul-12	332566	0.61	0.76	<1	<1	40	0 58	21 8	1.0	7.39	9.1
31-Jul-12	333288	0.65	0.78	<1	<1	<10	0 38	22.1	1.0	7.44	9.3
8-Aug-12	333963	0.52	0.69	<1	<1	<10	0.44	22 0	1.5	7.47	NA[2]
14-Aug-12	334726	0.70	0.82	<1	<1	<10	0 37	20 8	0.5	7.52	9.9

*On June 14, the location was re-sampled due to a high turbidity of 1.36 NTU on June 12. Other parameters were not analysed for the re-sample.

NA: Not analysed NR: No result

NOTE:

[1]Dissolved oxygen was not analysed prior to May 14, 2012.

[2]Dissolved oxygen was not analysed due to instrument error/malfunction.

[3]No HPC result reported by the contract lab.

APPENDIX E

2012 Water Main Cleaning Program Laboratory Analysis Summary Environmental Monitoring

Winnipeg

2012 Water Main Cleaning Program

Laboratory Analysis Report Environmental Monitoring

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
7-May-12	Hydrant Flush Comp.	60004003	30	324520	<0.02	<0.02	29.4	8.7	7.93	2.5	45	4	11.5	21.8	0.01	1.25	5.6	0.745	30.5	<0.001	0.001	21.5	0.036	6.4	5.8	1.330	30.4	0.002	0.015
7-May-12	Hydrant Flush,	60003982	29	324521	<0.02	<0.02																							
8-May-12	Hydrant Flush Comp.	60004320	36	325044	<0.02	<0.02	9.43	9.1	7.81	1.0	13	3	11.6	21.9	0.01	1.05	5.3	0.515	30.3	<0.001	0.002	22.5	0.020	2.2	5.8	0.771	30.0	<0.001	0.011
8-May-12	Hydrant Flush,	60005346	39	325045	<0.02	<0.02																							
9-May-12	Hydrant Flush Comp.	60001453	49	325097	<0.02	<0.02	11.9	10.4	7.91	1.0	19	5	11.5	21.7	<0.01	0.11	5.6	0.573	29.3	<0.001	<0.001	22.3	0.027	1.8	5.7	1.100	30.4	<0.001	0.012
9-May-12	Hydrant Flush,	70020348	50	325098	<0.02	<0.02																							
11-May-12	Hydrant Flush Comp.	60004445	63	325191	<0.02	<0.02	1.89	11.1	7.83	3.0	<4	3	11.0	20.2	0.03	0.32	5.6	0.078	30.3	<0.001	<0.001	22.1	0.045	0.7	6.4	0.093	32.1	<0.001	<0.003
11-May-12	Hydrant Flush,	60004091	62	325192	<0.02	<0.02																							
14-May-12	Hydrant Flush Comp.	70007303	96	325355	<0.02	<0.02	0.73	10.9	7.75	2.0	<4	2	11.0	20.3	<0.01	0.02	5.4	0.011	29.1	<0.001	<0.001	20.3	0.005	0.1	5.6	0.042	29.3	<0.001	<0.003
14-May-12	Hydrant Flush,	70005216	93	325356	<0.02	<0.02																							
15-May-12	Hydrant Flush Comp.	70007290	102	325399	<0.02	<0.02	14.9	10.4	7.76	2.0	18	3	11.3	18.0	<0.01	0.06	4.9	0.202	27.0	<0.001	<0.001	17.9	0.011	0.7	5.0	0.272	27.6	0.001	<0.003
15-May-12	Hydrant Flush,	70007289	103	325400	<0.02	<0.02																							
16-May-12	Hydrant Flush Comp.	60004108	113	325807	<0.02	<0.02	30.2	11.7	7.88	2.0	36	5	10.7	20.2	<0.01	0.89	5.5	0.561	29.5	<0.001	<0.001	20.7	0.017	4.2	5.7	0.911	29.8	0.004	0.008
16-May-12	Hydrant Flush,	60005328	112	325808	<0.02	<0.02																							
17-May-12	Hydrant Flush Comp.	60004203	129	325867	<0.02	<0.02	6.93	13.4	7.90	1.0	8	<2	10.5	19.0	<0.01	0.03	5.5	0.009	28.6	<0.001	<0.001	21.9	0.007	0.9	5.5	0.100	32.5	<0.001	<0.003
17-May-12	Hydrant Flush,	60004210	130	325868	<0.02	<0.02																							
18-May-12	Hydrant Flush Comp.	60005386	139	325912	<0.02	<0.02	14.4	12.7	7.75	1.5	17	4	10.4	24.4	<0.01	0.42	5.8	0.509	33.8	<0.001	<0.001	24.3	0.020	1.7	6.4	0.629	35.3	<0.001	0.029
18-May-12	Hydrant Flush,	60004160	138	325913	<0.02	<0.02																							
22-May-12	Hydrant Flush Comp.	60003604	187	326065	<0.02	<0.02	9.18	14.2	7.84	1.0	13	NR	10.2	24.2	<0.01	0.61	5.9	0.246	34.0	<0.001	<0.001	24.0	0.018	0.9	6.4	0.352	35.0	<0.001	<0.003
22-May-12	Hydrant Flush,	60001373	188	326066	<0.02	<0.02																							
23-May-12	Hydrant Flush Comp.	60003780	196	326530	<0.02	<0.02	21.4	11.7	7.88	2.0	27	NR	10.6	22.0	<0.01	0.20	5.8	0.126	31.8	<0.001	<0.001	22.4	0.046	2.1	5.9	0.657	35.3	0.001	0.019
23-May-12	Hydrant Flush,	60004791	197	326531	<0.02	<0.02																							
24-May-12	Hydrant Flush Comp.	60003768	208	326568	<0.02	<0.02	32.4	12.1	7.69	2.5	36	<2	10.5	22.8	<0.01	<0.01	5.7	0.068	31.5	<0.001	<0.001	23.0	0.003	0.1	6.3	0.211	32.3	<0.001	<0.003
24-May-12	Hydrant Flush,	60003768	209	326569	<0.02	<0.02																							
25-May-12	Hydrant Flush Comp.	70004875	222	326603	<0.02	<0.02	1.65	10.2	7.85	1.0	<4	3	11.0	17.9	<0.01	0.01	5.2	0.055	26.6	<0.001	<0.001	17.9	0.005	0.2	5.3	0.061	27.0	<0.001	<0.003
25-May-12	Hydrant Flush,	60005119	219	326604	<0.02	<0.02																							
28-May-12	Hydrant Flush Comp.	70005856	259	326808	<0.02	<0.02	17.3	11.9	7.85	2.5	35	<2	10.8	19.1	0.01	0.82	5.3	0.820	26.1	<0.001	0.003	19.5	0.038	3.0	5.3	1.360	27.6	0.001	0.021
28-May-12	Hydrant Flush,	60003484	253	326809	<0.02	<0.02																							
29-May-12	Hydrant Flush Comp.	60003578	268	326843	<0.02	<0.02	30.3	10.1	7.91	0.5	42	2	10.8	20.1	<0.01	0.17	5.8	0.427	28.7	<0.001	<0.001	21.3	0.033	2.2	5.9	0.880	29.3	0.002	0.014
29-May-12	Hydrant Flush,	60007401	265	326844	<0.02	<0.02																							
30-May-12	Hydrant Flush Comp.	70003038	282	327245	<0.02	<0.02	6.11	10.2	7.92	2.0	9	3	10.7	20.5	<0.01	0.27	5.3	0.752	30.8	<0.001	<0.001	20.4	0.031	11.5	5.3	1.190	30.9	0.002	0.014
30-May-12	Hydrant Flush,	70002454	278	327246	<0.02	<0.02																							
31-May-12	Hydrant Flush Comp.	60001574	292	327285	<0.02	<0.02	65.5	15.1	7.80	0.5	52	4	9.8	19.5	<0.01	0.07	5.5	0.702	30.7	<0.001	<0.001	19.2	0.028	2.0	5.6	0.999	30.3	<0.001	0.011
31-May-12	Hydrant Flush,	60000882	289	327286	<0.02	<0.02																							
1-Jun-12	Hydrant Flush Comp.	60000867	301	327328	<0.02	<0.02	20.6	14.5	7.70	1.0	22	7	9.9	23.7	<0.01	0.25	6.4	0.175	35.1	<0.001	<0.001	24.9	0.012	4.4	6.9	0.238	35.6	0.002	0.019
1-Jun-12	Hydrant Flush,	60000867	302	327329	<0.02	<0.02																							
4-Jun-12	Hydrant Flush Comp.	70004607	335	327518	<0.02	<0.02	13.2	NR	7.82	1.5	29	7	NR	24.0	0.01	1.16	6.2	1.140	35.1	<0.001	0.006	24.4	0.025	2.6	6.1	1.290	36.7	0.001	0.016
4-Jun-12	Hydrant Flush,	70004607	334	327519	<0.02	<0.02																							

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
5-Jun-12	Hydrant Flush Comp.	60000782	348	327932	<0.02	<0.02	19.8	15.4	7.84	1.0	33	6	10.2	24.5	<0.01	0.14	6.3	0.550	36.3	<0.001	<0.001	24.6	0.018	1.9	6.3	0.636	36.8	0.010	0.008
5-Jun-12	Hydrant Flush,	60000568	344	327933	<0.02	<0.02																							
6-Jun-12	Hydrant Flush Comp.	60000777	358	327997	<0.02	<0.02	44.4	14.5	7.79	1.5	65	7	9.9	20.6	<0.01	0.08	5.2	1.300	33.5	<0.001	<0.001	24.9	0.044	11.5	6.8	1.880	34.3	0.004	0.022
6-Jun-12	Hydrant Flush,	60001349	356	327998	<0.02	<0.02																							
7-Jun-12	Hydrant Flush Comp.	60003932	372	328075	<0.02	<0.02	24.6	14.9	7.68	1.5	22	<2	10.3	19.8	<0.01	2.11	5.5	0.326	29.6	<0.001	0.002	20.4	0.015	3.8	5.7	0.508	30.7	<0.001	0.004
7-Jun-12	Hydrant Flush,	60000760	370	328076	<0.02	<0.02																							
8-Jun-12	Hydrant Flush Comp.	60003391	381	328126	<0.02	<0.02	26.2	14.7	7.83	1.0	26	6	9.6	19.3	<0.01	0.17	5.5	0.139	29.6	<0.001	<0.001	21.5	0.009	4.0	6.0	0.208	31.6	<0.001	<0.003
8-Jun-12	Hydrant Flush,	60003391	380	328127	<0.02	<0.02																							
11-Jun-12	Hydrant Flush Comp.	60000763	419	328339	<0.02	<0.02	127	10.8	7.58	1.5	114	2	10.3	21.3	<0.01	0.61	5.7	0.382	31.1	<0.001	<0.001	24.4	0.027	8.9	6.0	1.020	32.7	0.004	0.012
11-Jun-12	Hydrant Flush,	70011266	419	328340	<0.02	<0.02																							
12-Jun-12	Hydrant Flush Comp.	60001970	424	328701	<0.02	<0.02	31.1	10.9	7.85	0.5	25	5	11.7	19.5	<0.01	0.09	5.8	0.294	29.6	<0.001	<0.001	19.6	0.011	1.4	5.9	0.398	32.9	0.001	<0.003
12-Jun-12	Hydrant Flush,	60000509	430	328702	<0.02	<0.02																							
13-Jun-12	Hydrant Flush Comp.	60000510	440	328753	<0.02	<0.02	8.92	10.3	7.70	2.0	5	9	10.5	17.5	<0.01	0.02	4.5	0.043	26.8	<0.001	<0.001	19.7	0.002	0.8	4.9	0.050	30.2	<0.001	<0.003
13-Jun-12	Hydrant Flush,	60000515	439	328754	<0.02	<0.02																							
14-Jun-12	Hydrant Flush Comp.	60006445	449	328849	<0.02	<0.02	13.9	13.8	7.83	2.5	15	5	10.0	18.8	<0.01	0.62	5.0	0.445	27.4	<0.001	<0.001	18.6	0.019	3.9	4.9	0.653	27.7	0.002	0.009
14-Jun-12	Hydrant Flush,	60006446	450	328850	<0.02	<0.02																							
15-Jun-12	Hydrant Flush Comp.	60004432	462	328869	<0.02	<0.02	204	12.1	7.89	1.0	302	14	10.8	20.3	0.07	0.58	5.4	0.140	29.0	<0.001	<0.001	20.7	0.013	3.7	5.5	0.407	29.2	0.003	0.017
15-Jun-12	Hydrant Flush,	60007470	459	328870	<0.02	<0.02																							
18-Jun-12	Hydrant Flush Comp.	70002036	493	329060	<0.02	<0.02	3.98	16.1	7.84	1.0	4	<2	9.4	18.9	<0.01	0.04	5.3	0.033	27.3	<0.001	<0.001	22.0	0.005	0.5	5.4	0.110	30.5	<0.001	<0.003
18-Jun-12	Hydrant Flush,	60005401	495	329061	<0.02	<0.02																							
19-Jun-12	Hydrant Flush Comp.	60004548	506	329111	<0.02	<0.02	9.56	11.1	7.70	1.0	10	3	10.3	19.5	<0.01	0.12	5.5	0.168	30.5	<0.001	<0.001	21.5	0.006	1.4	5.9	0.255	31.7	0.001	<0.003
19-Jun-12	Hydrant Flush,	60004549	505	329112	<0.02	<0.02																							
20-Jun-12	Hydrant Flush Comp.	60004601	517	329490	<0.02	<0.02	15.1	11.5	7.79	1.0	16	10	10.2	22.9	<0.01	0.99	5.6	0.517	34.2	<0.001	<0.001	23.6	0.014	5.2	5.7	0.749	35.2	0.002	0.004
20-Jun-12	Hydrant Flush,	60003492	518	329491	<0.02	<0.02																							
21-Jun-12	Hydrant Flush Comp.	60007194	530	329535	<0.02	<0.02	55.2	14.1	7.99	1.5	53	6	10.2	18.9	<0.01	0.06	5.0	0.719	27.0	<0.001	<0.001	21.1	0.030	12.4	5.6	1.630	29.4	0.003	0.013
21-Jun-12	Hydrant Flush,	60007194	531	329536	<0.02	<0.02																							
22-Jun-12	Hydrant Flush Comp.	60004806	538	329598	<0.02	<0.02	16.7	16.4	7.70	1.0	12	4	9.6	21.3	<0.01	1.15	5.8	0.158	32.7	<0.001	<0.001	22.0	0.005	5.2	5.9	0.217	33.1	<0.001	<0.003
22-Jun-12	Hydrant Flush,	60004806	537	329599	<0.02	<0.02																							
25-Jun-12	Hydrant Flush Comp.	70003496	564	329776	<0.02	<0.02	24.1	15.3	7.81	1.5	31	<2	9.7	22.0	<0.01	1.00	5.8	0.191	30.8	<0.001	<0.001	23.1	0.021	4.6	6.3	0.670	30.8	0.003	0.010
25-Jun-12	Hydrant Flush,	60006329	566	329777	<0.02	<0.02																							
27-Jun-12	Hydrant Flush Comp.	70004974	575	330203	<0.02	<0.02	29.6	17.7	8.01	1.0	51	10	9.3	22.9	<0.01	0.42	5.9	0.905	33.3	<0.001	<0.001	24.3	0.033	4.3	6.6	1.460	35.1	0.003	0.015
27-Jun-12	Hydrant Flush,	70004974	576	330204	<0.02	<0.02																							
28-Jun-12	Hydrant Flush Comp.	60001232	591	330254	<0.02	<0.02	22.2	17.5	7.86	1.0	33	17	9.3	20.3	<0.01	1.31	4.8	0.920	30.0	<0.001	0.002	21.6	0.023	5.2	5.5	1.100	30.1	0.003	0.010
28-Jun-12	Hydrant Flush,	60000705	589	330255	<0.02	<0.02																							
29-Jun-12	Hydrant Flush Comp.	60001143	601	330294	<0.02	<0.02	8.77	18.8	7.84	1.0	12	3	9.1	18.6	<0.01	0.30	4.7	0.475	27.0	<0.001	<0.001	19.5	0.013	2.6	5.0	0.606	27.4	0.001	0.004
29-Jun-12	Hydrant Flush,	60001143	602	330295	<0.02	<0.02																							
4-Jul-12	Hydrant Flush Comp.	70038578	661	330901	<0.02	<0.02	4.9	15.5	7.71	1.0	5	4	9.4	21.2	0.02	<0.01	5.0	0.055	28.2	<0.001	0.002	21.5	0.032	0.3	5.4	0.067	29.4	0.002	0.004
4-Jul-12	Hydrant Flush,	70025567	663	330902	<0.02	<0.02																							
5-Jul-12	Hydrant Flush Comp.	70025556	672	330948	<0.02	<0.02	1.4	19.0	7.80	1.0	<4	3	9.1	18.8	<0.01	0.06	4.7	0.297	26.5	<0.001	<0.001	18.7	0.009	0.4	4.7	0.356	26.1	<0.001	0.003
5-Jul-12	Hydrant Flush,	70025556	670	330949	<0.02	<0.02																							
6-Jul-12	Hydrant Flush Comp.	70025506	683	330993	<0.02	<0.02	2.0	17.1	7.75	0.5	4	6	9.1	18.3	<0.01	0.10	4.9	0.075	27.0	<0.001	<0.001	19.0	0.005	0.2	5.0	0.077	27.0	<0.001	<0.003
6-Jul-12	Hydrant Flush,	70025578	685	330994	<0.02	<0.02																							
9-Jul-12	Hydrant Flush Comp.	60000441	715	331175	<0.02	<0.02	4.4	21.0	7.83	1.0	6	<3	8.7	19.3	<0.01	0.13	5.4	0.269	29.0	<0.001	<0.001	19.5	0.008	1.3	5.4	0.337	29.5	<0.001	<0.003
9-Jul-12	Hydrant Flush,	70045004	721	331176	<0.02	<0.02																							
10-Jul-12	Hydrant Flush Comp.	60005397	726	331217	<0.02	<0.02	19.8	21.8	7.76	1.0	35	5	8.5	20.4	<0.01	0.10	5.3	0.297	29.3	<0.001	<0.001	21.3	0.010	1.8	6.6	0.451	29.3	0.001	0.007
10-Jul-12	Hydrant Flush,	60005397	725	331218	<0.02	<0.02																							
11-Jul-12	Hydrant Flush Comp.	60000077	735	331642	<0.02	<0.02	5.5	21.1	7.80	1.0	6	<3	8.7	20.7	<0.01	0.11	5.3	0.043	29.6	<0.001	<0.001	20.7	0.010	0.9	5.5	0.237	30.8	<0.001	<0.003

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
11-Jul-12	Hydrant Flush,	60000077	736	331643	<0.02	<0.02																							
13-Jul-12	Hydrant Flush Comp.	70011365	743	331691	<0.02	<0.02	5.6	21.9	7.71	0.5	13	4	8.3	20.2	0.01	0.65	5.4	1.110	30.4	<0.001	0.005	22.0	0.035	1.8	5.6	1.460	30.3	<0.001	0.014
13-Jul-12	Hydrant Flush,	70011365	744	331692	<0.02	<0.02																							
16-Jul-12	Hydrant Flush Comp.	60000507	780	331906	0.67	0.82	16.7	18.2	7.87	1.5	18	NR	9.1	21.3	<0.01	0.08	5.3	0.022	28.4	<0.001	<0.001	21.5	0.011	2.1	5.6	0.270	28.5	0.002	0.006
16-Jul-12	Hydrant Flush,	60004633	782	331907	0.56	0.72																							
17-Jul-12	Hydrant Flush Comp.	60000269	797	331972	<0.02	<0.02	14.4	17.2	7.80	2.5	22	3	9.2	19.6	<0.01	0.31	4.8	0.889	27.6	<0.001	<0.001	20.5	0.022	1.7	4.9	1.220	27.9	<0.001	0.010
17-Jul-12	Hydrant Flush,	60001656	798	331973	<0.02	<0.02																							
18-Jul-12	Hydrant Flush Comp.	60000633	804	332354	0.62	0.73	87.5	20.9	7.84	2.0	38	<3	8.5	20.6	<0.01	4.14	5.4	0.160	28.2	<0.001	<0.001	21.3	0.014	9.4	5.8	0.467	28.1	<0.001	<0.003
18-Jul-12	Hydrant Flush,	60000387	803	332355	0.89	0.98																							
19-Jul-12	Hydrant Flush Comp.	70000799	820	332415	<0.02	<0.02	37.2	21.7	7.96	1.0	67	<3	8.5	21.2	<0.01	0.11	6.1	0.193	28.3	<0.001	<0.001	32.7	0.021	2.5	11.9	0.922	30.0	<0.001	0.007
19-Jul-12	Hydrant Flush,	70000799	818	332416	<0.02	<0.02																							
20-Jul-12	Hydrant Flush Comp.	60000410	831	332452	<0.02	<0.02	16.8	22.0	7.87	0.5	29	<3	8.6	21.5	<0.01	0.22	5.9	0.256	29.3	<0.001	0.005	22.5	0.015	2.1	6.2	0.709	29.2	<0.001	0.004
20-Jul-12	Hydrant Flush,	60001695	829	332453	<0.02	<0.02																							
23-Jul-12	Hydrant Flush Comp.	60000203	860	332645	<0.02	<0.02	20.6	20.4	7.84	1.0	51	<3	8.6	20.7	<0.01	0.01	5.4	0.086	27.9	<0.001	<0.001	22.0	0.025	7.8	5.7	1.150	29.2	<0.001	0.013
23-Jul-12	Hydrant Flush,	60000283	863	332646	0.57	0.74																							
24-Jul-12	Hydrant Flush Comp.	60000190	876	332727	<0.02	<0.02	30.1	18.5	7.76	1.0	32	9	8.8	20.9	<0.01	1.64	5.4	0.335	33.8	<0.001	<0.001	21.3	0.007	1.8	5.5	0.358	34.2	<0.001	<0.003
24-Jul-12	Hydrant Flush,	60000170	878	332728	<0.02	<0.02																							
25-Jul-12	Hydrant Flush Comp.	60001733	888	333130	<0.02	<0.02	9.2	19.5	7.82	0.5	11	<3	8.8	20.9	<0.01	0.15	5.4	0.109	30.0	<0.001	<0.001	21.5	0.009	1.5	5.5	0.344	30.3	<0.001	<0.003
25-Jul-12	Hydrant Flush,	60001797	886	333131	<0.02	<0.02																							
26-Jul-12	Hydrant Flush Comp.	60003270	901	333169	<0.02	<0.02	3.9	20.1	7.89	1.0	5	<3	8.8	20.3	<0.01	0.15	5.1	0.046	28.6	<0.001	<0.001	20.9	0.005	0.7	5.2	0.117	29.4	<0.001	<0.003
26-Jul-12	Hydrant Flush,	60000163	904	333170	<0.02	<0.02																							
27-Jul-12	Hydrant Flush Comp.	60001758	912	333209	<0.02	<0.02	36.1	19.7	7.90	1.5	37	14	8.6	20.9	<0.01	0.20	5.4	0.699	32.1	<0.001	<0.001	22.9	0.024	5.8	6.0	0.934	33.1	<0.001	0.013
27-Jul-12	Hydrant Flush,	60001758	914	333210	<0.02	<0.02																							
30-Jul-12	Hydrant Flush Comp.	60004027	942	333373	<0.02	<0.02	10.4	18.1	7.79	1.0	12	3	9.3	21.1	<0.01	0.28	5.1	0.264	29.8	<0.001	<0.001	22.4	0.011	2.0	5.6	0.356	30.7	<0.001	0.004
30-Jul-12	Hydrant Flush,	70000093	940	333374	0.21	0.37																							
31-Jul-12	Hydrant Flush Comp.	60006219	956	333445	<0.02	<0.02	14.7	21.9	7.82	1.0	20	7	8.2	20.8	<0.01	0.01	5.3	0.343	37.3	<0.001	0.004	21.8	0.016	2.5	5.7	0.416	37.5	<0.001	0.047
31-Jul-12	Hydrant Flush,	60004806	958	333446	<0.02	<0.02																							
1-Aug-12	Hydrant Flush Comp.	60004018	968	333799	<0.02	<0.02	8.0	20.9	7.77	1.0	10	4	8.7	20.8	<0.01	0.04	5.4	0.235	30.6	<0.001	0.004	20.8	0.009	1.8	5.6	0.349	30.3	<0.001	0.004
1-Aug-12	Hydrant Flush,	60004019	967	333800	<0.02	<0.02																							
3-Aug-12	Hydrant Flush Comp.	60004765	985	333887	0.10	0.26	30.8	19.1	7.90	1.5	53	<3	8.9	21.0	<0.01	0.03	5.7	0.031	29.7	<0.001	<0.001	24.7	0.018	3.9	7.1	0.324	30.0	<0.001	0.010
3-Aug-12	Hydrant Flush,	60006235	987	333888	0.64	0.77																							

NR - No result NA - Not analyzed NS - No sample

NOTE On May 22, 23, and July 16 there were no results for BOD5 due to QC failure.
On June 4 there were no results for temperature and dissolved oxygen due to an instrument error.
On July 16 there was no BOD result due to QC failure.
On July 16, 18, 23, 30 and August 3 the chlorine levels were above 0.02 mg/L because the pump used for dechlorinating was intermittently malfunctionning.

Winnipeg

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Water and Waste Department

Environmental Standards Division

2013 Water Main Cleaning Program

Water Quality Monitoring Summary Report

April 2014

2013 Water Main Cleaning Program

Water Quality Monitoring Summary Report

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Compliance Reporting Technician

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Laboratory Technician

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April 2014

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SUMMARY

In 2013, The City of Winnipeg - Water and Waste Department worked on a watermain cleaning project that targeted approximately half of the area originally cleaned in 2005 and a portion of the area originally cleaned in 2006[1].

The flushing was carried out using a unidirectional flow technique. During unidirectional flushing, water system valves are operated to create one-way flow to the water main being cleaned. A hydrant connected to the main is then opened to remove the built-up sediment. This type of flushing increases the velocity of the water flow in the main to about two metres or six feet per second (it is normally less than 0.3 metres or 1 foot per second). This high velocity produces a scouring action in the mains, removing sediment deposits. The flushing starts at a clean water source (e.g., the water pumping stations) and moves toward the outer limits of the city. This ensures that clean water is always used to flush the mains.

This report summarizes the data and observations for 2013 obtained by Environmental Standards Division staff. The water quality monitoring carried out as part of the Water Main Cleaning Program included Local Monitoring to determine the impact on water quality in the neighbourhood being cleaned, Regional Monitoring to measure the long-term impact on the water quality of the region being cleaned, and Environmental Monitoring in response to concerns respecting discharges to the environment. In addition, two sensitive users were identified in the area where the flushing was taking place. The monitoring results for the sensitive users were reviewed regularly to ensure they were not being negatively affected by the program. Appendix A illustrates the areas cleaned in the 2013 program. The data generated from the program was entered into the Laboratory Information Management System and is included in the Appendices.

In 2013, the City of Winnipeg experienced an unprecedented increase in discoloured water events. The Water and Waste Department engaged the engineering consulting firm of CH2M Hill to assist in investigating the cause of the increase in reports of discoloured water in the water distribution system, and to provide recommendations to mitigate future recurrences of discoloured water [2]. While this review was ongoing, Winnipeg experienced an unprecedented spike in customer reports of discoloured water in mid-August 2013. These discoloured water events contributed to the increased results for certain parameters analysed during this program.

Local Monitoring

Local monitoring was conducted in some of the neighbourhoods being cleaned to determine the impact on local customers by the cleaning program. Monitoring locations, parameters and frequency for flushing operations are provided in Table 1 below.

TABLE 1: LOCAL AREA MONITORING

Locations	Parameters	Frequency
• Households/businesses (specific location determined in field) Normally 2 households/businesses for 2 sequences per weekday.	• Free Chlorine • Total Chlorine • Total Coliform • *E. coli* • Heterotrophic Plate Count • Turbidity • pH • Temperature • Colour, True	• Once (Pre-Flush) • Once (Post-Flush) • Once (Few Days Post-Flush)*
* - Samples a few days post-flush will be taken if water quality has not improved on post-flush samples. - Additional post-flush samples will be taken if required.		

The Local Monitoring results (Appendix B) were used to tabulate the short-term impact of water main flushing on the quality of water delivered to customers. A summary of the local monitoring results are provided in Table 2. Homes and businesses were chosen randomly to be representative of the neighborhoods being flushed. Comparing the pre-flush sample results with the post-flush sample results allowed the short-term impact of the flushing to be observed. Post-flush samples were usually collected the same day or the day following the flushing in the area. Occasionally, a post-flush sample was obtained several or more days after flushing, usually due to the customer not being home or the business being closed. A household or business was resampled if the post-flush sample contained a positive total coliform or E. coli, high heterotrophic plate count of >500 cfu/mL, and/or a turbidity of >1.0 NTU.

Chlorine Levels

The level of free chlorine in the post-flush samples showed a mean increase of 0.02 mg/L from the pre-flush samples, and the total chlorine showed a mean increase of 0.01 mg/L. In most cases, a few days after flushing chlorine levels were slightly higher than the original pre-flush levels. The mean value of post-flush samples for free chlorine was 0.65 mg/L and the mean value for total chlorine levels was 0.82 mg/L.

Total Coliform, E. coli and HPC

The majority of the sample results from the local monitoring locations were negative for total coliform, E. coli and heterotrophic bacteria (HPC). The locations that showed a positive bacteria result for total coliform and/or E. coli, and/or had a heterotrophic plate count of >500 cfu/mL were resampled. A total of 3 locations were required to be resampled due to positive total coliform results. Two of the resampled locations were reported positive for total coliform, and as a result the locations were resampled again, as well as locations up stream and downstream. There were no positive E. coli results reported. There was one HPC result of >500 cfu/mL and the resample were reported negative. Pre-flush samples that were positive were not resampled if the post-flush samples came back negative because the post-flush sample was treated as the resample. For the 2013 program, the bacterial analysis for the program was done by the contract laboratory ALS.

Turbidity

The mean pre-flush turbidity value was 0.52 NTU and the mean post-flush value was 0.46 NTU. All post-flush locations with results above 1.0 NTU were resampled. Four post-flush samples had a turbidity value above 1.0 NTU. These locations were resampled and found to have a turbidity of <1.0 NTU. On average the post-flush turbidity values measured this year were higher than in 2012. It is thought that this was due to the increase in discoloured water events.

pH and Temperature

There was no variance between the mean pH for the pre-flush samples and the mean pH for the post-flush samples. The mean pH for the pre-flush samples was 7.58 units with a range from 7.38 to 7.81 units. The mean pH for the post-flush samples was 7.58 units with a range from 7.29 to 7.84 units. The drinking water guidelines [3] recommend a range of 6.5 to 8.5 units. All of the samples were well within this range. The temperature showed a minimal increase on average of 0.5°C from the pre to post-flush. The mean pre-flush temperature was 10.8 degrees Celsius and the mean post-flush temperature was 11.3 Celsius.

True Colour

The mean pre-flush true colour was 0.85 colour units. The mean post-flush true colour was 0.86 colour units. The results show that there was little difference between the pre and post flush samples.

TABLE 2: LOCAL MONITORING RESULTS SUMMARY

Parameters		Mean	Minimum	Maximum
Free Chlorine (mg/L)	Pre-flush	0.63	0.17	1.43
	Post-flush	0.65	0.21	1.10
Total Chlorine (mg/L)	Pre-flush	0.81	0.32	1.67
	Post-Flush	0.82	0.32	1.26
Turbidity (NTU)	Pre-flush	0.52	0.10	24.6
	Post-flush	0.46	0.10	10.7
pH (units)	Pre-flush	7.58	7.38	7.81
	Post-flush	7.58	7.29	7.84
Temp (˚C)	Pre-flush	10.8	5.0	17.8
	Post-flush	11.3	5.1	17.7
True Colour (TCU)	Pre-flush	0.9	0.5	2.5
	Post-flush	0.9	0.5	3.0

Regional Monitoring

Regional m onitoring included the routine "weekl y" m onitoring locations in the region, three additional boundary locations, and two large sens itive users in the area. Appendix C provides a summary of the regional m onitoring results. The sam pling locations, param eters, and frequency of monitoring are provided in Table 3.

TABLE 3: REGIONAL AREA MONITORING

Locations	**Parameters**	**Frequency**
• SW-01 • SW-03 • SW-17 • WC-04 • WC-05 • WC-06 • WC-08 • WC-10 • WC-11 ***Sensitive Users*** • •	• Free Chlorine • Total Chlorine • Total Coliform • *E. Coli* • Heterotrophic Plate Count • Turbidity • pH • Temperature • Colour, True • Dissolved Oxygen	• Weekly

Regional Monitoring of the nine locations was performed to determine if disturbed water main sediment was af fecting th e e ntire a rea b eing c leaned as we ll a s the dis tribution system outside of the area being cleaned. All of thes e location s are part of our routine distribution system water quality m onitoring program . A s ummary of the regional m onitoring results are provided in Table 4.

Chlorine Levels

Chlorine dosages at MacLean, Hurst and McPhillips Pumping Stations were not adjusted in 2013. MacLean Pumping Station was m aintained at 1.3 m g/L while Hurst and McPhillips

Pumping Stations were maintained at 1.2 mg/L to achieve target levels of disinfectant in the distribution system. The mean free chlorine at the nine selected regional locations was 0.68 mg/L and the total chlorine was 0.84 mg/L.

Total Coliform, E. coli and HPC

The nine regional locations were sampled weekly for total coliform, E. coli, and heterotrophic plate count throughout the duration of the program. One sample had a total coliform result of 1 MPNU/100 mL. This location was resampled and a result of <1 MPNU/100 mL was reported. No positive results were reported for E. coli, and there were no HPC counts above 500 cfu/mL.

Turbidity

The mean turbidity for the regional monitoring was 0.33 NTU. The target for turbidity results in the distribution system is <1.0 NTU. Three samples had turbidity results of >1.0 NTU. These locations were resampled and results of 0.25, 0.40, and 0.57 NTU were obtained.

pH and Temperature

The mean pH for the regional monitoring was 7.58 units with a range from 7.36 to 7.99 units. The drinking water guidelines[3] recommend a range of 6.5 to 8.5 units. All of the samples were well within this range. The mean temperature for the regional monitoring was 11.1 degrees Celsius. The water temperature steadily increased as the ambient temperature increased.

True Colour

The mean true colour for the nine regional locations was 1.7 colour units, with a range from 0.5 to 6.0 colour units.

Dissolved Oxygen

The mean dissolved oxygen level for the nine regional locations was 10.5 mg/L with a range from 7.9 to 13.3 mg/L. An average value for dissolved oxygen in surface water sources[4] is

9.7 mg/L with a range from 6.9 mg/L to 12.2 mg/L. All results that were higher than 12.2 mg/L were obtained in April and early May. As the temperature increased, dissolved oxygen results decreased due to the inverse relationship between temperature and dissolved oxygen.

TABLE 4: REGIONAL MONITORING RESULTS SUMMARY

Parameters	**Mean**	**Minimum**	**Maximum**
Free Chlorine (mg/L)	0.68	0.23	1.03
Total Chlorine (mg/L)	0.84	0.39	1.24
Turbidity (NTU)	0.31	0.12	2.02
pH (units)	7.58	7.36	7.99
Temp (˚C)	11.0	4.0	19.7
True Colour (TCU)	1.7	0.5	6.0
Dissolved Oxygen (mg/L)	10.5	7.9	13.3

Sensitive Users

Two sensitive users were identified for the 2013 watermain cleaning program; [redacted] Sampling was performed at these locations weekly, with the exception of the days in which the flushing was done close to them, in which case sampling was done daily. The maintenance staff at each location developed their own internal protocol should they experience dirty water due to the water main cleaning. In addition, the Water Services staff exercised a lot of caution when working near the sensitive users to minimize any disturbances in their systems. The samples were analyzed for the same parameters as the regional monitoring locations. Appendix D provides a summary of the sensitive users monitoring results. A summary of the sensitive users monitoring results are provided in Table 5.

Chlorine Levels

The mean free chlorine for the two sensitive users was 0.64 mg/L and the total chlorine was 0.82 mg/L.

Total Coliform, E. coli and HPC

There were no positive results reported for total coliform or E. coli, and there were no HPC counts above 500 cfu/mL for the two sensitive user locations.

Turbidity

The mean turbidity for the sensitive user samples was 0.50 NTU. The target for turbidity results in the distribution system is <1.0 NTU. One sample had a turbidity result of >1.0 NTU. The location was resampled and a result of 0.40 NTU was reported.

pH and Temperature

The mean pH for the sensitive user samples was 7.60 units with a range from 7.44 to 7.91 units. The drinking water guidelines[3] recommend a range of 6.5 to 8.5 units. All of the samples were well within this range. The water temperature steadily increased as the ambient temperature increased.

True Colour

The mean true colour for the two sensitive user samples was 1.5 colour units, with a range from 0.5 to 3.0 colour units.

Dissolved Oxygen

The mean dissolved oxygen level for the sensitive user samples was 10.3 mg/L with a range from 8.0 to 13.1 mg/L. An average value for dissolved oxygen in surface water sources[4] is 9.7 mg/L with a range from 6.9 mg/L to 12.2 mg/L. All results that were higher than 12.2 mg/L were obtained from April to mid-May. As the temperature increased, dissolved oxygen results decreased due to the inverse relationship between temperature and dissolved oxygen.

TABLE 5: SENSITIVE USERS MONITORING RESULTS SUMMARY

Parameters	Mean	Minimum	Maximum
Free Chlorine (mg/L)	0.66	0.40	0.84
Total Chlorine (mg/L)	0.84	0.58	1.09
Turbidity (NTU)	0.44	0.19	2.01
pH (units)	7.60	7.44	7.91
Temp (˚C)	11.6℃	4.0	18.4
True Colour (TCU)	1.5	0.5	3.0
Dissolved Oxygen (mg/L)	10.3	8.0	13.1

Environmental Monitoring

A baseline Environmental Monitoring Program was conducted as part of the 2013 program. The program consisted of collecting grab samples from hydrant discharges from selected flushing sequences to determine background quality of the water being discharged to the catch basins of land drainage and combined sewers. One grab sample and one composite sample were taken each day. Appendix E provides a summary of the Environmental Monitoring results. The parameters monitored and the frequency of monitoring are provided in Table 6. A summary of the environmental monitoring results are provided in Table 7.

TABLE 6: ENVIRONMENTAL MONITORING

Locations	Parameters	Frequency
• Fire Hydrants (specific location(s) determined in field coinciding with sequence of household samples).	• Free Chlorine • Total Chlorine • Turbidity • pH • Temperature • Colour, True • Total Suspended Solids • BOD_5 • Dissolved Oxygen • Metal Scan	• Daily

Chlorine Levels

A dechlorination system was employed to remove chlorine from the discharged water prior to the water entering the catch basins of land drainage and combined sewers. Environmental Standards field staff performed random chlorine spot checks on the water being discharged to the catch basins to ensure the dechlorination system was functioning properly. Of the 125 samples analyzed, 5 had detectable chlorine levels. Chlorine was detected because Water Services flushing crews had operational issues on those few days. Most of the results indicate that the dechlorination system was functioning properly.

Turbidity

There were 61 hydrant composite samples collected and analyzed for the flushing program. The composite samples contained mainly the "dirty" water expelled during flushing resulting in relatively high turbidities. The mean turbidity for the hydrant composites was 37.3 NTU with a range from 3.11 to 237 NTU and generally decreased as flushing time increased. The hydrant discharge was flushed until it was clear.

pH and Temperature

The mean pH of the hydrant composite samples was 7.82 units which is higher than the distribution system average of 7.51 units for the same time period. The mean temperature for the environmental monitoring samples was 12.8 degrees Celsius which is normal for the distribution system during the summer.

True Colour

The mean true colour of the hydrant composite samples was 1.1 colour units, with a range from 0.5 to 3.0 colour units. These are expected results for the distribution system during the summer.

BOD5 and Total Suspended Solids

BOD_5 results ranged from <3 to 20 mg/L for the hydrant composite samples with a mean value of 5.5 mg/L. Total suspended solids results ranged from 4 to 566 mg/L with a mean value of 49 mg/L. According to the Manitoba Conservation Report, *Manitoba Water Quality Standards, Objectives, and Guidelines*[5] (2002), the guidelines for municipal wastewater effluents are 30 mg/L BOD_5 and 30 mg/L total suspended solids. The mean result for BOD_5 was below the guideline. The mean result for total suspended solids was above the guideline which was caused by the increase in discoloured water events in 2013.

Dissolved Oxygen

An average value for dissolved oxygen in surface water sources[4] is 9.7 mg/L with a range from 6.9 mg/L to 12.2 mg/L. The two results that were higher than 12.2 mg/L were obtained from April to mid-May. As the temperature increased, dissolved oxygen results decreased due to the inverse relationship between temperature and dissolved oxygen.

TABLE 7: ENVIRONMENTAL MONITORING RESULT SUMMARY

Parameters	**Mean**	**Minimum**	**Maximum**
Free Chlorine (mg/L)	0.02	<0.02	0.68
Total Chlorine (mg/L)	0.03	<0.02	0.81
Turbidity (NTU)	37.3	3.11	237
pH (units)	7.82	7.33	8.00
Temp (˚C)	12.8	5.1	20.3
True Colour (TCU)	1.1	0.5	3.0
BOD_5 (mg/L)	5.5	<3	>20
Total Suspended Solids (mg/L)	49	4	566
Dissolved Oxygen (mg/L)	10.0	8.8	12.6

Metals

A metal scan was added for the hydrant discharge samples in the 2011, 2012, and 2013 monitoring programs in response to the increased discoloured water complaints in 2010. The results for this year's program are provided in Table 8. With the exception of iron, manganese, and lead, the metal results are below the drinking water guidelines[3]. A summary is provided in Table 8 below.

TABLE 8: METAL RESULT SUMMARY

	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
	(mg/L)							
Average	25.2	0.03	6.5	6.1	0.87	39.4	0.003	0.010
Maximum	82.8	0.17	34.5	19.1	4.31	36.1	0.035	0.082
Minimum	19.8	0.006	0.21	4.4	0.09	23.8	<0.001	<0.003
Drinking Water Guideline[3]	None	<1.0	$\leq$ 0.3	None	$\leq$ 0.05	$\leq$ 200	0.010	$\leq$ 5.0

CONCLUSIONS

The following conclusions were determined from the Water Quality Monitoring Program:

- Local Monitoring generally did not show a change in chlorine or colour levels following the completion of water main cleaning in the area.
- Local Monitoring generally showed an improvement in turbidity levels. This year, post flush samples were generally not collected on the same day as flushing because it was found that post-flush samples collected the next day rather than later the same day showed significant improvement in turbidity.
- Regional Monitoring locations within the cleaning program area showed no difference in water quality from the water quality at the regular distribution system monitoring locations outside of the cleaning area.
- Environmental Monitoring showed that the dechlorination system was functioning properly with the exception of a few days when Water Services had operational issues.
- Both Local and Regional Monitoring showed that bacteria were not present in the water with the flushing disturbances. All resample results were reported to be negative.
- The BOD_5 average result from the Environmental Monitoring hydrant discharge samples was below the guideline value.
- The total suspended solid results from the Environmental Monitoring hydrant samples were above the guideline. It is thought that this was caused by the increase in discoloured water events in 2013.

- The average metal results from the Environmental Monitoring hydrant discharge samples were below the drinking water guidelines[3] with the exception of manganese, iron, and lead. The results confirm the presence of iron and manganese in the hydrant discharges which were identified in CH2M Hill's report[2] as the likely cause of discoloured water occurrences. The lead results were higher than the guidelines for three samples.

RECOMMENDATIONS

The following recommendations are provided:

- Local Monitoring samples should continue to be obtained from businesses in the area where possible, since it was sometimes difficult to obtain samples from households, especially the initial post-flush sample.
- Pre-flush samples should be collected at least 5 sequences ahead of the flushing crew to prevent artificially high turbidity and colour results caused by disturbances from flushing nearby.
- Samples should continue to be obtained from households with water quality complaints or concerns. Any water complaints or concerns that occur during the weekend should be noted by Water Services staff and followed up by Environmental Standards staff the following workday.
- Environmental Monitoring should be continued to monitor the quality of the water being discharged to the catch basins. This monitoring should continue to include composite samples analyzed for chlorine, colour, total suspended solids, BOD_5, turbidity, pH, metal scan and dissolved oxygen so we may compare results from year to year as we monitor discoloured water occurrences.
- A spare de-chlorinating pump and Vita-D-Chlor pucks should be purchased and kept on hand for instances when the de-chlorinating system is not dosing properly to ensure chlorinated water is not being discharged into the environment.

REFERENCES

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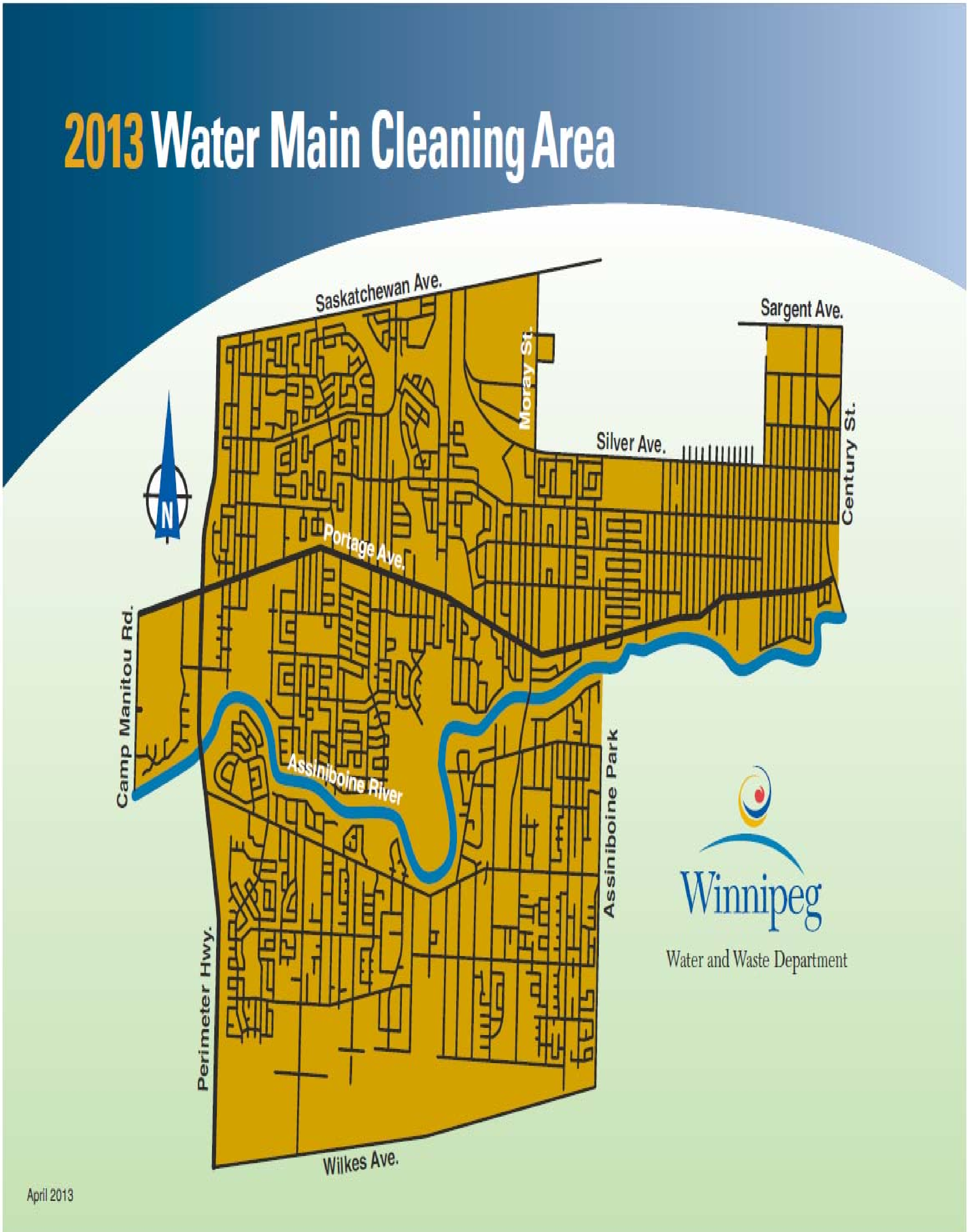
3. Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and Environment. August 2012. Guidelines for Canadian Drinking Water Quality Summary Table. Retrieved 5 March 2014 http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/2012-sum_guide-res_recom/2012-sum_guide-res_recom-eng.pdf

4. Red Water Release in Drinking Water Distribution Systems. Imran et al, September 2005 edition of the AWWA Journal

5. Williamson, Dwight. 2002. Manitoba Water Quality Standards, Objectives, and Guidelines. Manitoba Conservation Water Branch, Water Quality Management Section. Retrieved 3 January 2013 http://www.gov.mb.ca/waterstewardship/water_quality/quality/mwqsog_2002.pdf

APPENDIX A

2013 Water Main Cleaning Program Area


2013 Water Main Cleaning Area
Saskatchewan Ave.
Sargent Ave.
Moray St.
Silver Ave.
Century St.
N
Portage Ave.
Camp Manitou Rd.
Assiniboine River
Assiniboine Park
Winnipeg
Water and Waste Department
Perimeter Hwy.
Wilkes Ave.
April 2013

APPENDIX B

2013 Water Main Cleaning Program Laboratory Analysis Summary Local Monitoring

APPENDIX C

2013 Water Main Cleaning Program Laboratory Analysis Summary Regional Monitoring

APPENDIX D

2013 Water Main Cleaning Program Laboratory Analysis Summary Sensitive Users Monitoring

APPENDIX E

2013 Water Main Cleaning Program Laboratory Analysis Summary Environmental Monitoring

Winnipeg

Water and Waste Department
Environmental Standards Division

2014 Water Main Cleaning Program

Water Quality Monitoring Summary Report

January 2015

2014 Water Main Cleaning Program

Water Quality Monitoring Summary Report

Compliance Reporting Technician

Laboratory Technician

Laboratory Technician

Laboratory Technician

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Laboratory Technician

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January 2015

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SUMMARY

In 2014, The City of Winnipeg – Water and Waste Department worked on a watermain cleaning project that targeted approximately half of the area of The City of Winnipeg. Based on recommendations outlined in the Winnipeg Discoloured Water Investigation consultant report[1], for the 2014 Water Main Cleaning Program (WMCP), the City implemented an accelerated water main cleaning program. The intent of the accelerated cleaning program was to revisit all areas that were previously cleaned over the past six years, re-flush the water mains within a two year period and therefore minimize the impact of discoloured water events.

The flushing was carried out using a unidirectional flow technique. During unidirectional flushing, water system valves are operated to create one-way flow to the water main being cleaned. A hydrant connected to the main is then opened to remove the built-up sediment. This type of flushing increases the velocity of the water flow in the main to about two metres or six feet per second (it is normally less than 0.3 metres or 1 foot per second). This high velocity produces a scouring action in the mains, removing sediment deposits. The flushing starts at a clean water source (e.g., the water pumping stations) and moves toward the outer limits of the city. This ensures that clean water is always used to flush the mains.

This report summarizes the data and observations for 2014 obtained by Environmental Standards Division staff. The water quality monitoring carried out as part of the Water Main Cleaning Program included Local Monitoring to determine the impact on water quality in the neighbourhood being cleaned, Regional Monitoring to measure the long-term impact on the water quality of the region being cleaned, and Environmental Monitoring in response to concerns respecting discharges to the environment. In addition, two sensitive users were identified in the area where the flushing was taking place. The monitoring results for the sensitive users were reviewed regularly to ensure they were not being negatively affected by the program. Appendix A illustrates the areas cleaned in the 2014 program.

The data generated from the program was entered into the Laboratory Information Management System and is included in the Appendices.

Local Monitoring

Local monitoring was conducted in some of the neighbourhoods being cleaned to determine the impact on local customers by the cleaning program. Monitoring locations, parameters and frequency for flushing operations are provided in Table 1 below.

TABLE 1: LOCAL AREA MONITORING

Locations	Parameters	Frequency
• Households/businesses (specific location determined in field) Normally 2 households/businesses for 2 sequences per weekday.	• Free Chlorine • Total Chlorine • Total Coliform • E. coli • Heterotrophic Plate Count • Turbidity • pH • Temperature • Colour, True	• Once (Pre-Flush) • Once (Post-Flush) • Once (Few Days Post-Flush)*
* - Samples a few days post-flush will be taken if water quality has not improved on post-flush samples. - Additional post-flush samples will be taken if required.		

The Local Monitoring results (Appendix B) were used to tabulate the short-term impact of water main flushing on the quality of water delivered to customers. A summary of the local monitoring results are provided in Table 2. Homes and businesses were chosen randomly to be representative of the neighborhoods being flushed. Comparing the pre-flush sample results with the post-flush sample results allowed the short-term impact of the flushing to be observed. Post-flush samples were usually collected the same day or the day following the flushing in the area. Occasionally, a post-flush sample was obtained several or more days after flushing, usually due to the customer not being home or the business being closed. A household or business was resampled if the post-flush sample contained a positive total coliform or E. coli, high heterotrophic plate count of >500 cfu/mL, free chlorine of <0.10 mg/L, and/or a turbidity of >1.00 NTU, until the results reported were acceptable.

Environmental Standards staff responds to all water quality complaints or concerns received during regular working hours and when applicable will collect a sample from that location. Complaints and concerns that are received after hours are noted by Water Services staff and followed up by Environmental Standards staff the following workday.

TABLE 2: LOCAL MONITORING RESULTS SUMMARY

Parameters		**Mean**	**Minimum**	**Maximum**
Free Chlorine (mg/L)	**Pre-flush**	**0.67**	**0.06**	**1.33**
	Post-flush	**0.65**	**<0.02**[1]	**1.25**
Total Chlorine (mg/L)	**Pre-flush**	**0.85**	**0.14**	**1.55**
	Post-Flush	**0.82**	**<0.02**[1]	**1.40**
Turbidity (NTU)	**Pre-flush**	**0.54**	**0.11**	**8.60**[2]
	Post-flush	**0.38**	**0.14**	**3.29**[2]
pH (units)	**Pre-flush**	**7.54**	**7.36**	**8.03**
	Post-flush	**7.55**	**7.34**	**8.18**
Temperature (˚C)	**Pre-flush**	**16.1**	**10.1**	**24.0**
	Post-flush	**16.2**	**9.7**	**22.0**
True Colour (TCU)	**Pre-flush**	**1.6**	**0.5**	**7.0**
	Post-flush	**1.6**	**0.5**	**7.0**

1 - There were two instances where the post flush free chlorine was below 0.10 mg/L. Additional flushing was performed at these locations until chlorine results were satisfactory.
2 – There were fourteen results for turbidity that were higher than 1.00 ntu. The locations were resampled a few days post flush, until the turbidity results were adequate.

Regional Monitoring

Regional monitoring included nine routine "weekly" monitoring locations in the region, three pumping stations, and two large sensitive users in the area. Appendix C provides a summary of the regional monitoring results. The sampling locations, parameters, and frequency of monitoring are provided in Table 3.

TABLE 3: REGIONAL AREA MONITORING

Locations	**Parameters**	**Frequency**
• NE-01 • NWFM • NW-01 • SE-01 • SE-02 • SE-05 • SE-11 • SE-14 • SW-04 • SW-06 • WC-01 • WC-12 **Sensitive Users** • •	• Free Chlorine • Total Chlorine • Total Coliform • E. Coli • Heterotrophic Plate Count • Turbidity • pH • Temperature • Colour, True • Dissolved Oxygen	• Weekly

Regional Monitoring of the nine locations was performed to determine if disturbed water main sediment was affecting the entire area being cleaned as well as the distribution system outside of the area being cleaned. All of these locations are part of our routine distribution system water quality monitoring program. A summary of the regional monitoring results are provided in Table 4.

TABLE 4: REGIONAL MONITORING RESULTS SUMMARY

Parameters	**Mean**	**Minimum**	**Maximum**
Free Chlorine (mg/L)	**0.89**	**0.52**	**1.37**
Total Chlorine (mg/L)	**1.08**	**0.70**	**1.58**
Turbidity (NTU)	**0.22**	**0.09**	**0.96**
pH (units)	**7.52**	**6.42**	**7.87**
Temperature (˚C)	**16.1**	**7.8**	**22.9**
True Colour (TCU)	**1.2**	**0.5**	**10.0**
Dissolved Oxygen (mg/L)	**10.2**	**8.3**	**12.9**

Sensitive Users

Two sensitive users were identified for the 2014 water main cleaning program; [redacted] Sampling was performed at these locations weekly, with the exception of the days in which the flushing was being done in the area, in which case sampling was done daily. The maintenance staff at each location developed their own internal protocol should they experience dirty water due to the water main cleaning. In addition, the Water Services staff exercised a lot of caution when working near the sensitive users to minimize any disturbances in their systems. The samples were analyzed for the same parameters as the regional monitoring locations. Appendix D provides a summary of the sensitive users monitoring results. A summary of the sensitive users monitoring results are provided in Table 5.

TABLE 5: SENSITIVE USERS MONITORING RESULTS SUMMARY

Parameters	**Guideline**	**Mean**	**Minimum**	**Maximum**
Free Chlorine (mg/L)	**>0.10**	**0.76**	**0.16**	**1.16**
Total Chlorine (mg/L)	**>0.10**	**0.94**	**0.21**	**1.36**
Turbidity (NTU)	**<1.00**	**0.35**	**0.12**	**2.06**[1]
pH (units)	**6.5 – 8.5**	**7.59**	**7.41**	**7.93**
Temperature (˚C)	**<15.0**	**15.5**	**11.2**	**20.0**
True Colour (TCU)	**<15.0**	**1.2**	**0.5**	**5.0**
Dissolved Oxygen (mg/L)	**no guideline**	**9.9**	**9.0**	**11.8**

1 - There were two occurrences where the post flush turbidity was higher than 1.0 ntu. The locations were resampled a few days post flush, until the turbidity results were below the guideline of 1.0 ntu.

Environmental Monitoring

A baseline Environmental Monitoring Program was conducted as part of the 2014 program. The program consisted of collecting grab samples from hydrant discharges from selected flushing sequences to determine background quality of the water being discharged to the catch basins of land drainage and combined sewers. One grab sample and one composite sample were taken each day. Appendix E provides a summary of the Environmental Monitoring results. The parameters monitored and the frequency of monitoring is provided in Table 6. A summary of the environmental monitoring results are provided in Table 7.

TABLE 6: ENVIRONMENTAL MONITORING

Locations	**Parameters**	**Frequency**
Fire Hydrants (specific location(s) determined in field coinciding with sequence of household samples).	• Free Chlorine • Total Chlorine • Turbidity • pH • Temperature • Colour, True • Total Suspended Solids • BOD5 • Dissolved Oxygen • Metal Scan	• Daily

TABLE 7: ENVIRONMENTAL MONITORING RESULT SUMMARY

Parameters	Mean	Minimum	Maximum
Free Chlorine (mg/L)	**0.03**	**<0.02**	**0.96[2]**
Total Chlorine (mg/L)	**0.03**	**<0.02**	**1.13[2]**
Turbidity (NTU)	**73.7**	**2.56**	**525**
pH (units)	**7.70**	**7.22**	**8.00**
Temperature (˚C)	**17.0**	**11.7**	**21.1**
True Colour (TCU)	**2.3**	**0.5**	**13**
BOD5 (mg/L) [1]	**5.7**	**<3.0**	**>18.3**
Total Suspended Solids (mg/L)[1]	**48**	**<3**	**270**
Dissolved Oxygen (mg/L)	**9.3**	**8.4**	**10.8**

1 - According to the Manitoba Conservation Report, Manitoba Water Quality Standards, Objectives, and Guidelines[3] (2002), the guidelines for municipal wastewater effluents are 25 mg/L BOD5 and 25 mg/L total suspended solids.
2 - There were fifteen instances where chlorine was >0.02 mg/L because Water Services flushing crews had operational issues with the dechlorination system on those days. Most of the results indicated that the dechlorination system was functioning properly.

Metals

A metal scan was added for the hydrant discharge samples in the 2011, 2012, 2013, and 2014 monitoring programs in response to the increased discoloured water complaints in 2010. The results for this year's program are provided in Table 8. With the exception of iron, manganese, and lead, the metal results are below the drinking water guidelines[2]. A summary is provided in Table 8 below.

TABLE 8: METAL RESULT SUMMARY

	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
	(mg/L)							
Average	22.2	0.0559	14.6	5.55	1.315	28.6	0.0149	0.0313
Maximum	26.4	0.2509	79.9	6.92	6.358	36.1	0.2165	0.1575
Minimum	18.3	0.0024	0.32	4.70	0.041	24.3	<0.0004	0.0034
Drinking Water Guideline[2]	None	≤1.0*	≤0.3*	None	≤0.05*	≤200*	0.010	≤5.0*

* Aesthetic objective: These guidelines have an objective and not a maximum acceptable limit. These parameters should not impact the safety of the water to drink and there is no anticipated health risk for short-term exposures.

CONCLUSIONS

The following conclusions were determined from the Water Quality Monitoring Program:

- Local Monitoring generally did not show a change in chlorine or colour levels following the completion of water main cleaning in the area.
- Local Monitoring generally showed an improvement in turbidity levels. This year, post flush samples were generally not collected on the same day as flushing because it was found that post-flush samples collected the next day rather than later the same day showed significant improvement in turbidity.
- Regional Monitoring locations within the cleaning program area showed no difference in water quality from the water quality at the regular distribution system monitoring locations outside of the cleaning area.
- Environmental Monitoring showed that the dechlorination system was functioning properly with the exception of a few days when Water Services had operational issues.
- Both Local and Regional Monitoring showed that bacteria were not present in the water with the flushing disturbances. All resample results were reported to be negative.
- The BOD5 average result from the Environmental Monitoring hydrant discharge samples was below the guideline value.
- The total suspended solid average result from the Environmental Monitoring hydrant samples was above the guideline value.
- The average metal results from the Environmental Monitoring hydrant discharge samples were below the drinking water guidelines[2] with the exception of manganese, iron, and lead.

RECOMMENDATIONS

The following recommendations are provided:

- Local Monitoring samples should continue to be obtained from businesses in the area where possible, since it was sometimes difficult to obtain samples from households, especially the initial post-flush sample.
- Pre-flush samples should be collected at least 5 sequences ahead of the flushing crew to prevent artificially high turbidity and colour results caused by disturbances from flushing nearby.
- Samples should continue to be obtained from households with water quality complaints or concerns. Any water complaints or concerns that occur during the weekend should be noted by Water Services staff and followed up by Environmental Standards staff the following workday.
- Environmental Monitoring should be continued to monitor the quality of the water being discharged to the catch basins. This monitoring should continue to include composite samples analyzed for chlorine, colour, total suspended solids, BOD5, turbidity, pH, metal scan and dissolved oxygen so we may compare results from year to year as we monitor discoloured water occurrences.
- A spare de-chlorinating pump and Vita-D-Chlor pucks should be purchased and kept on hand for instances when the de-chlorinating system is not dosing properly to ensure chlorinated water is not being discharged into the environment.

REFERENCES

1. CH2M Hill. December 2013. Winnipeg Discoloured Water Investigation. Summary Report.
2. Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and Environment. October 2014. Guidelines for Canadian Drinking Water Quality Summary Table. Retrieved February 4, 2015. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/sum_guide-res_recom/index-eng.php.
3. Manitoba Water Stewardship. July 2011. Manitoba Water Quality Standards, Objectives, and Guidelines. Retrieved February 4, 2015. http://www.gov.mb.ca/waterstewardship/water_quality/quality/website_notice_mwqsog_2011.html.

APPENDIX A

2014 Water Main Cleaning Program Area

APPENDIX B

2014 Water Main Cleaning Program Laboratory Analysis Summary Local Monitoring

APPENDIX C

2014 Water Main Cleaning Program Laboratory Analysis Summary Regional Monitoring

APPENDIX D

2014 Water Main Cleaning Program Laboratory Analysis Summary Sensitive Users Monitoring

APPENDIX E

2014 Water Main Cleaning Program Laboratory Analysis Summary
Environmental Monitoring

E4b Environmental Monitoring (Hydrants) Reports 2011-2014

2011 Water Main Cleaning Program

Laboratory Analysis Report Environmental Monitoring

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
26-May-11	Hydrant Flush Comp.	50002807	2	293027	0.04	0.05	53.5	12.4	7 81	NA	NA	73	5	10.7	20.2	<0 01	<0.01	5 5	0.444	31 8	<0.001	<0.001	25 3	0.056	12 0	6.7	1.480	36.0	0.002	0 019
26-May-11	Hydrant Flush,	50002839	1	293026	<0 02	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27-May-11	Hydrant Flush Comp.	50003347	10	293334	0.22	0.35	51.5	12 3	7 66	18.0	7 5	40	<2	10.4	20.7	<0 01	<0.01	5 8	0.002	31.7	<0.001	<0.001	21 0	0.018	10 2	5.7	0.165	31.4	0.001	<0.003
27-May-11	Hydrant Flush,	50004233	11	293335	0.23	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-May-11	Hydrant Flush Comp.	70003111	41	293317	0.04	0.07	34.0	11.7	7.75	10.0	2 5	41	2	NR	19.6	<0 01	0.02	5 5	0.320	31 9	<0.001	<0.001	21 6	0.012	3.4	6 0	0.455	33.3	0.001	<0.003
30-May-11	Hydrant Flush,	50004195	40	293318	0.05	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
31-May-11	Hydrant Flush Comp.	50003822	47	293389	0.08	0.10	17.9	11 6	7 93	100 0	2 5	18	<2	10.6	20.1	<0 01	<0.01	5 3	0.039	30 5	<0.001	<0.001	21 5	0.028	4.1	5.7	0 649	31.6	0.002	0 007
31-May-11	Hydrant Flush,	50001199	50	293390	0.05	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Jun-11	Hydrant Flush Comp.	50004647	55	293850	<0 02	<0 02	12.0	10 8	7.86	7 5	5 0	10	2	10.8	21.9	<0 01	<0.01	6 0	0.262	35.1	<0.001	<0.001	22 5	0.012	2.3	6 0	0 389	34.3	0.001	<0.003
1-Jun-11	Hydrant Flush,	50003847	56	293851	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Jun-11	Hydrant Flush Comp.	50003840	63	293899	<0 02	<0 02	6.90	10 9	7.82	25.0	3 5	6	4	10.6	22.2	<0 01	0.02	6 0	0.133	36 0	<0.001	<0.001	22.1	0.006	1.1	6 0	0.164	35.5	0.001	<0.003
2-Jun-11	Hydrant Flush,	50001215	62	293900	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Jun-11	Hydrant Flush Comp.	70001566	73	294153	<0 02	<0 02	9.70	12 5	7.73	50.0	2 5	16	3	10.5	22.8	<0 01	<0.01	6 8	0.725	41 5	<0.001	<0.001	23 6	0.026	2.7	5 5	0 843	39.9	0.001	<0.003
3-Jun-11	Hydrant Flush,	70013254	72	294154	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6-Jun-11	Hydrant Flush Comp.	50003632	98	294168	<0 02	<0 02	17.0	12.4	7 81	100 0	5 0	24	6	10.3	20.4	<0 01	<0.01	5.7	0.280	33.4	<0.001	<0.001	21 0	0.016	3.2	5 8	0 397	36.3	0.002	<0.003
6-Jun-11	Hydrant Flush,	50003669	94	294169	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-Jun-11	Hydrant Flush Comp.	50003679	106	294586	<0 02	<0 02	170	12.1	7.73	250 0	7 5	42	8	10.7	20.2	<0 01	<0.01	5 8	0.369	35 9	<0.001	<0.001	22 5	0.021	35 3	5.7	0 830	39.0	0.025	<0.003
7-Jun-11	Hydrant Flush,	50003677	105	294587	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8-Jun-11	Hydrant Flush Comp.	50003794	117	294631	<0 02	<0 02	9.20	12 3	7.77	25.0	2 0	9	9	10.3	18.2	<0 01	<0.01	5 5	0.174	33 8	<0.001	<0.001	22 8	0.016	3.2	6 6	0 270	39.4	<0 001	<0.003
8-Jun-11	Hydrant Flush,	50003734	116	294632	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9-Jun-11	Hydrant Flush Comp.	700009375	122	294647	<0 02	<0 02	8.00	12.1	7.75	25.0	2 5	11	7	10.5	18.1	<0 01	<0.01	5 5	0.101	33 3	<0.001	<0.001	20 8	0.006	1.3	5 9	0.130	36.5	<0 001	<0.003
9-Jun-11	Hydrant Flush,	50004771	123	294648	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10-Jun-11	Hydrant Flush Comp.	50003353	130	294772	<0 02	<0 02	12.5	12.1	7.73	25.0	3 0	11	7	10.5	23.6	<0 01	<0.01	6 8	0.080	42 3	<0.001	<0.001	21.4	0.004	1.7	6 6	0.133	39.9	0.001	<0.003
10-Jun-11	Hydrant Flush,	50003353	131	294773	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13-Jun-11	Hydrant Flush Comp.	70019639	79	294990	<0 02	<0 02	0.95	13.1	7.78	13.0	7 5	<4	5	10.0	22.3	<0 01	<0.01	7 0	0.065	42.1	<0.001	<0.001	23 8	0.004	0.3	7 5	0 083	46.5	<0 001	<0.003
13-Jun-11	Hydrant Flush,	50002944	78	294991	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14-Jun-11	Hydrant Flush Comp.	50002774	156	295326	<0 02	<0 02	7.91	12 5	7.73	88.0	7 5	11	3	10.1	24.8	<0 01	<0.01	7.4	0.474	45 8	<0.001	<0.001	24.1	0.014	1.8	7 3	0 638	42.9	0.002	<0.003
14-Jun-11	Hydrant Flush,	50002774	157	295327	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15-Jun-11	Hydrant Flush Comp.	40003084	163	295377	<0 02	<0 02	8.40	12.7	7.79	130 0	13.0	13	5	9 6	23.1	<0 01	<0.01	6 2	0.116	35 6	<0.001	<0.001	22 9	0.006	0.8	6 5	0.142	33.3	0.001	<0.003
15-Jun-11	Hydrant Flush,	500033268	162	295378	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
16-Jun-11	Hydrant Flush Comp.	40002651	173	295439	<0 02	<0 02	8.84	13.1	7 86	13.0	2 5	18	7	10.1	21.3	<0 01	<0.01	6 2	0.655	33 8	<0.001	<0.001	23.4	0.024	2.5	6 2	0 887	35.5	0.001	<0.003
16-Jun-11	Hydrant Flush,	40003056	171	295440	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17-Jun-11	Hydrant Flush Comp.	40003279	181	295510	<0 02	<0 02	37.6	12 3	7.74	150 0	5 0	29	7	10.6	22.4	<0 01	<0.01	5 9	0.242	34 5	<0.001	<0.001	24.4	0.016	8.0	6 2	0.466	35.7	0.001	<0.003
17-Jun-11	Hydrant Flush,	40003273	179	295511	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
20-Jun-11	Hydrant Flush Comp.	70002654	144	295681	<0 02	<0 02	23.0	15.1	7 63	75.0	5 0	16	10	9 8	22.5	<0 01	0.02	6.1	0.157	37 3	<0.001	<0.001	21 6	0.009	5.3	5 8	0.191	34.8	<0 001	<0.003
20-Jun-11	Hydrant Flush,	70002654	143	295682	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21-Jun-11	Hydrant Flush Comp.	50000470	155	296040	<0 02	<0 02	23.8	12 5	7 84	130 0	7 5	32	<2	10.3	23.0	<0 01	<0.01	5.7	0.176	33 9	<0.001	<0.001	22 2	0.017	3.7	5 8	0 528	32.4	0.001	<0.003
21-Jun-11	Hydrant Flush,	50000072	154	296041	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22-Jun-11	Hydrant Flush Comp.	40003326	229	296073	<0 02	<0 02	1.96	15 2	7.70	13.0	2 5	5	11	9.7	21.1	<0 01	<0.01	4 5	0.073	26.7	<0.001	<0.001	21.4	0.004	0.3	6 5	0 070	44.8	<0 001	<0.003
22-Jun-11	Hydrant Flush,	40003378	228	296074	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
23-Jun-11	Hydrant Flush Comp.	40000598	239	296141	<0 02	<0 02	16.3	15.4	7 82	120 0	5 0	15	6	9 5	19.5	<0 01	<0.01	5 0	0.353	34 6	<0.001	<0.001	21 5	0.007	1.8	5 2	0.484	37.4	0.002	<0.003
23-Jun-11	Hydrant Flush,	40000323	238	296142	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24-Jun-11	Hydrant Flush Comp.	50001649	185	296326	<0 02	<0 02	15 0	12.4	7.75	150.0	13.0	14	6	10.2	20.9	<0 01	<0.01	6 0	0.177	34.4	<0.001	<0.001	24 8	0.009	1.4	6 6	0 267	48.0	<0 001	<0.003
24-Jun-11	Hydrant Flush,	50001649	184	296327	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27-Jun-11	Hydrant Flush Comp.	50002061	195	296371	<0 02	<0 02	19.1	14.7	7 80	160.0	15.0	29	7	9 8	19.1	<0 01	<0.01	4 9	0.525	34.1	<0.001	<0.001	18.4	0.014	2.0	4.7	0 692	31.7	0.001	0 004
27-Jun-11	Hydrant Flush,	50004105	194	296372	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28-Jun-11	Hydrant Flush Comp.	50002220	205	296764	<0 02	<0 02	74.1	14.1	7 85	250.0	15.0	108	4	10.1	19.6	<0 01	<0.01	5 2	0.325	33 0	<0.001	<0.001	24.4	0.014	6.1	6 9	0 556	33.5	0.002	0 004
28-Jun-11	Hydrant Flush,	50002218	204	296765	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29-Jun-11	Hydrant Flush Comp.	50000792	219	296812	<0 02	<0 02	32.4	15.7	7 88	150.0	10.0	57	NR	9 5	19.5	<0 01	<0.01	5.1	0.343	32 2	<0.001	<0.001	20.1	0.012	1.0	5 2	0 352	34.7	<0 001	0 006
29-Jun-11	Hydrant Flush,	70001988	218	296813	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-Jun-11	Hydrant Flush Comp.	70020942	231	296853	<0 02	<0 02	40.2	15 6	7.76	150 0	7 5	70	10	9 8	21.1	<0 01	<0.01	4.4	0.828	28.1	<0.001	<0.001	20 3	0.027	10 3	4 3	1 090	34.7	0.001	0 019
30-Jun-11	Hydrant Flush,	70020942	230	296854	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Jul-11	Hydrant Flush Comp.	50001371	246	297082	<0 02	<0 02	3.54	15 6	7.68	15.0	2 0	6	2	9 8	17.9	<0 01	<0.01	5 0	0.041	30 5	<0.001	<0.001	19 2	0.004	1.2	5.4	0 060	31.7	<0 001	<0.003
4-Jul-11	Hydrant Flush,	50001371	245	297083	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-Jul-11	Hydrant Flush Comp.	40001350	332	297445	<0 02	<0 02	4.91	16 5	7.74	18.0	2 5	8	16	9 9	18.0	<0 01	<0.01	5.1	0.214	33 3	<0.001	<0.001	17 9	0.006	1.0	5.4	0 253	33.3	<0 001	0 003
5-Jul-11	Hydrant Flush,	40001350	333	297446	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6-Jul-11	Hydrant Flush Comp.	50002184	262	297508	<0 02	<0 02	23.5	15 6	7 60	25.0	2 5	15	19	9 6	19.2	<0 01	0.02	5 0	0.168	33.1	<0.001	<0.001	21.1	0.011	4.7	5.1	0 215	35.2	<0 001	0 007
6-Jul-11	Hydrant Flush,	50000318	261	297509	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-Jul-11	Hydrant Flush Comp.	50001688	273	297578	<0 02	<0 02	2.90	16 0	7.72	15.0	NR	4	3	9 6	20.6	<0 01	<0.01	5 3	0.053	33.1	<0.001	<0.001	21 8	0.005	0.6	5.4	0 072	33.5	<0 001	<0.003
7-Jul-11	Hydrant Flush,	50002058	272	297579	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8-Jul-11	Hydrant Flush Comp.	50002178	280	297646	<0 02	<0 02	10.9	16.1	7 54	21.0	NR	4	10	9.7	17.4	<0 01	<0.01	4.7	0.065	28 6	<0.001	<0.001	19 3	0.005	2.1	5 2	0 087	32.1	<0 001	<0.003
8-Jul-11	Hydrant Flush,	50002178	281	297647	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12-Jul-11	Hydrant Flush Comp.	50002832	300	298172	<0 02	<0 02	12.2	14 8	7.49	50.0	NR	12	6	9.7	18.9	<0 01	<0.01	5 0	0.235	29 8	<0.001	<0.001	19 3	0.016	2.1	5 2	0 282	29.7	0.001	0 005
12-Jul-11	Hydrant Flush,	50002842	298	298173	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13-Jul-11	Hydrant Flush Comp.	50000411	308	298200	<0 02	<0 02	7.34	16 2	7.79	50.0	5 0	8	4	9 3	18.0	<0 01	<0.01	4 9	0.292	28.7	<0.001	<0.001	17 9	0.009	1.0	5 0	0 335	29.0	<0 001	<0.003
13-Jul-11	Hydrant Flush,	50000411	309	298201	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
14-Jul-11	Hydrant Flush Comp.	50002714	319	298252	<0 02	<0 02	14.6	19.1	7.85	63.0	5 0	17	<5	9 0	18.4	<0 01	0.01	5 0	0.370	31 3	<0.001	<0.001	18 9	0.014	3.3	5.1	0.452	32.4	0.002	<0.003
14-Jul-11	Hydrant Flush,	50002644	318	298253	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15-Jul-11	Hydrant Flush Comp.	50003088	329	298344	<0 02	<0 02	13.2	20 2	7.77	100 0	5 0	27	9	9.1	18.7	<0 01	<0.01	5 0	0.713	30.4	<0.001	<0.001	18 6	0.025	4.3	5.1	1 060	30.8	0.002	0 013
15-Jul-11	Hydrant Flush,	50003088	328	298345	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18-Jul-11	Hydrant Flush Comp.	70001182	361	298532	<0 02	<0 02	4.00	20 5	7.72	10.0	0 5	6	5	8 9	18.9	<0 01	<0.01	5.4	0.093	30 8	<0.001	<0.001	18.7	0.007	0.9	5.1	0.108	30.2	<0 001	<0.003
18-Jul-11	Hydrant Flush,	70000988	363	298533	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19-Jul-11	Hydrant Flush Comp.	50002746	370	298903	<0 02	<0 02	56.0	20.4	7.74	120 0	2 5	53	3	8 9	19.7	<0 01	0.02	5 5	0.689	30.1	<0.001	0 015	20 0	0.031	14 9	5 6	1 560	29.4	0.005	0 043
19-Jul-11	Hydrant Flush,	50004380	371	298904	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
20-Jul-11	Hydrant Flush Comp.	50002692	379	299045	<0 02	<0 02	15.7	18 2	7.76	130 0	1 0	27	2	8 9	20.8	<0 01	<0.01	5 2	0.054	31 9	<0.001	<0.001	20 6	0.018	2.8	5 5	0 384	32.1	0.002	0 021
20-Jul-11	Hydrant Flush,	70001003	381	299046	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21-Jul-11	Hydrant Flush Comp.	50000447	389	299098	<0 02	<0 02	28.2	19 3	7.72	50.0	1 0	40	21	8 8	19.5	<0 01	<0.01	5 3	0.371	33 8	<0.001	<0.001	20 8	0.014	13.7	5 5	0 583	35.8	<0 001	<0.003
21-Jul-11	Hydrant Flush,	50002749	390	299099	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22-Jul-11	Hydrant Flush Comp.	50002783	401	299127	<0 02	<0 02	24.1	18.1	7.79	75.0	2 5	28	10	9 6	17.1	<0 01	<0.01	4.4	0.963	27.4	<0.001	<0.001	19.7	0.034	8.5	4 8	1 570	28.6	0.005	0 014
22-Jul-11	Hydrant Flush,	50002783	399	299128	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25-Jul-11	Hydrant Flush Comp.	50001919	410	299339	<0 02	<0 02	24.2	20.7	7.54	50.0	5 0	34	3	9 3	19.5	<0 01	<0.01	4 9	0.196	25 8	<0.001	<0.001	20 6	0.008	5.7	5.1	0 295	27.6	<0 001	<0.003
25-Jul-11	Hydrant Flush,	50001919	409	299340	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26-Jul-11	Hydrant Flush Comp.	50000961	420	299657	<0 02	<0 02	28.8	21 3	7.78	130 0	2 5	31	2	9 3	21.9	<0 01	<0.01	4 6	0.312	26 6	<0.001	<0.001	22 0	0.029	7.4	5.1	0 956	28.3	0.002	0 009
26-Jul-11	Hydrant Flush,	50004029	418	299658	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27-Jul-11	Hydrant Flush Comp.	50002994	430	299722	<0 02	<0 02	48.7	20 8	7 51	150 0	2 0	47	4	9 3	20.3	<0 01	<0.01	5 0	0.928	27 3	<0.001	<0.001	24.7	0.055	19 5	5 3	1 920	27.7	0.003	0 022
27-Jul-11	Hydrant Flush,	50002999	429	299723	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28-Jul-11	Hydrant Flush Comp.	50001538	440	299784	<0 02	<0 02	0.74	21 3	7 67	25.0	2 5	16	5	8 8	19.7	<0 01	<0.01	5 0	0.171	29 3	<0.001	<0.001	20 2	0.007	2.1	5 2	0 221	29.8	<0 001	0 003
28-Jul-11	Hydrant Flush,	50001086	438	299785	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29-Jul-11	Hydrant Flush Comp.	50001778	451	299828	<0 02	<0 02	23.4	18.4	7.73	50.0	2 5	26	3	9 3	20.5	<0 01	<0.01	5.1	0.554	30 0	<0.001	<0.001	20 2	0.041	7.0	5.4	1 010	30.2	0.001	0 013
29-Jul-11	Hydrant Flush,	70002588	450	299829	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aug-11	Hydrant Flush Comp.	40003282	451	300393	<0 02	<0 02	6 3	19 2	7 67	25.0	4 0	8	4	9.4	20.8	<0 01	<0.01	5 0	0.358	30.7	<0.001	<0.001	21 3	0.011	1.2	5 3	0.433	32.7	0.009	<0.003
4-Aug-11	Hydrant Flush,	40003282	450	300394	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5-Aug-11	Hydrant Flush Comp.	70023197	461	300562	<0 02	<0 02	46.6	18.1	7 96	200 0	7 5	84	<2	9 2	20.7	<0 01	<0.01	4 9	0.001	29 9	<0.001	<0.001	23 6	0.015	1.9	5.1	0 308	32.3	0.002	0 006
5-Aug-11	Hydrant Flush,	70023197	462	300563	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8-Aug-11	Hydrant Flush Comp.	50001304	507	300662	<0 02	<0 02	11.1	17 5	7.87	50.0	1 0	18	8	9.1	23.7	<0 01	<0.01	4 6	0.508	34 6	<0.001	<0.001	23 2	0.016	4.0	4 9	0 631	33.8	0.002	0 006
8-Aug-11	Hydrant Flush,	50003476	501	300663	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9-Aug-11	Hydrant Flush Comp.	40002893	500	301053	<0 02	<0 02	20.9	17 9	7.88	50.0	2 5	27	3	9 0	21.9	<0 01	<0.01	4 9	0.195	32 5	<0.001	<0.001	23 3	0.016	7.4	5 0	0 394	32.7	0.017	0 004
9-Aug-11	Hydrant Flush,	70000759	501	301054	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10-Aug-11	Hydrant Flush Comp.	40003845	511	301104	<0 02	<0 02	29.4	17.1	7.71	500 0	1 0	94	2	9 0	20.3	<0 01	<0.01	4 6	0.074	29.7	<0.001	<0.001	23 6	0.028	12 2	4 8	1 610	33.1	0.006	0 017
10-Aug-11	Hydrant Flush,	40003845	510	301105	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11-Aug-11	Hydrant Flush Comp.	40002839	519	301148	<0 02	<0 02	3 3	17.4	7.83	50.0	1 0	17	2	8 9	22.3	<0 01	<0.01	5 2	0.232	31 6	<0.001	<0.001	22 6	0.010	2.6	5 2	0.451	32.6	0.015	<0.003
11-Aug-11	Hydrant Flush,	40002839	520	301149	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12-Aug-11	Hydrant Flush Comp.	40002360	531	301322	<0 02	<0 02	11.3	18.1	7 86	25.0	2 5	10	5	8 8	21.6	<0 01	<0.01	4 6	0.134	34 2	<0.001	<0.001	21.7	0.007	3.4	5 0	0.172	35.8	0.001	<0.003
12-Aug-11	Hydrant Flush,	40002360	530	301323	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
15-Aug-11	Hydrant Flush Comp.	40001488	560	301340	<0 02	<0 02	21.5	14.1	7 82	130 0	2 5	32	2	9.7	21.8	<0 01	<0.01	5 0	0.112	33 2	<0.001	<0.001	23 9	0.015	2.8	5 3	0 601	34.1	0.004	0 009
15-Aug-11	Hydrant Flush,	40002376	561	301341	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16-Aug-11	Hydrant Flush Comp.	40002388	571	301695	<0 02	<0 02	8 8	17 0	7.86	25.0	1 0	4	3	9 8	23.3	<0 01	<0.01	5 2	0.126	34.1	<0.001	<0.001	23 6	0.004	0.6	5 8	0.146	35.0	<0 001	<0.003
16-Aug-11	Hydrant Flush,	40002388	572	301696	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17-Aug-11	Hydrant Flush Comp.	40003639	579	301744	<0 02	<0 02	3 2	17 2	7 85	25.0	2 5	<4	7	9 2	23.1	<0 01	<0.01	5 6	0.078	37.7	<0.001	<0.001	23 6	0.005	1.2	5 8	0 095	38.3	<0 001	<0.003
17-Aug-11	Hydrant Flush,	40002751	578	301745	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18-Aug-11	Hydrant Flush Comp.	70013859	588	301815	<0 02	<0 02	15.4	16 0	7 83	50.0	2 5	23	6	9 2	20.0	<0 01	<0.01	4.7	0.279	32 0	<0.001	<0.001	22 6	0.016	1.8	5 2	0.467	34.7	0.002	0 004
18-Aug-11	Hydrant Flush,	70009885	587	301816	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19-Aug-11	Hydrant Flush Comp.	70013856	596	301827	<0 02	<0 02	33.2	15 6	7 93	150 0	2 0	31	6	9 3	22.8	<0 01	<0.01	5 6	0.885	36 9	<0.001	<0.001	25 8	0.049	8.3	6.4	1 810	37.3	0.004	0 022
19-Aug-11	Hydrant Flush,	70005014	595	301828	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22-Aug-11	Hydrant Flush Comp.	50003978	609	302067	<0 02	<0 02	11.0	19 0	7 87	75.0	2 5	16	2	8.1	20.1	<0 01	<0.01	6 2	0.165	31 2	<0.001	<0.001	20 9	0.016	2.2	6 3	0.491	31.2	0.001	0 014
22-Aug-11	Hydrant Flush,	70009029	613	302068	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
23-Aug-11	Hydrant Flush Comp.	70002663	618	302466	<0 02	<0 02	30.3	16 6	7 96	150 0	2 0	53	3	9 8	24.6	<0 01	<0.01	5 6	0.864	33 5	<0.001	<0.001	25 6	0.034	3.4	6 3	1.770	34.9	0.003	0 024
23-Aug-11	Hydrant Flush,	50000834	619	302467	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24-Aug-11	Hydrant Flush Comp.	50000983	629	302514	<0 02	<0 02	5 2	19.1	7.26	25.0	2 0	10	6	8.7	17.4	<0 01	<0.01	4 6	0.255	28 8	<0.001	<0.001	18.4	0.007	1.0	4 8	0 300	29.2	<0 001	<0.003
24-Aug-11	Hydrant Flush,	50000983	630	302515	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25-Aug-11	Hydrant Flush Comp.	50000742	638	302538	<0 02	<0 02	9.4	17 3	7.54	25.0	2 5	10	3	8.7	17.5	<0 01	<0.01	4.4	0.484	27 0	<0.001	<0.001	19 0	0.019	2.6	4.4	0 677	28.2	<0 001	0 006
25-Aug-11	Hydrant Flush,	50000821	639	302539	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26-Aug-11	Hydrant Flush Comp.	70023898	606	302799	<0 02	<0 02	26.0	13.7	7.71	200 0	2 5	38	<2	9 8	19.1	<0 01	<0.01	4.7	0.011	28.4	<0.001	<0.001	20 8	0.060	4.4	5 3	0 502	28.4	0.008	0 018
26-Aug-11	Hydrant Flush,	70023898	607	302800	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29-Aug-11	Hydrant Flush Comp.	50002039	648	302817	<0 02	<0 02	8.7	19 2	7.73	50.0	2 0	12	3	8.1	16.9	<0 01	<0.01	4 0	0.180	26.1	<0.001	<0.001	17 3	0.009	1.0	4.4	0 219	26.5	0.001	<0.003
29-Aug-11	Hydrant Flush,	50001768	649	302818	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30-Aug-11	Hydrant Flush Comp.	50001548	661	303182	<0 02	<0 02	9 6	19.4	7.62	100 0	2 0	9	8	9.7	20.4	<0 01	<0.01	4 6	0.525	31 8	<0.001	<0.001	20.7	0.019	2.4	4.7	0 675	32.3	0.002	0 008
30-Aug-11	Hydrant Flush,	50001943	662	303183	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
31-Aug-11	Hydrant Flush Comp.	50003577	669	303249	<0 02	<0 02	4 3	19 3	7 63	30.0	2 0	11	10	9 0	19.3	<0 01	<0.01	5 8	0.167	35 8	<0.001	<0.001	19.1	0.008	1.2	5.7	0.193	36.7	<0 001	<0.003
31-Aug-11	Hydrant Flush,	50003577	670	303250	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Sep-11	Hydrant Flush Comp.	50001148	679	303418	<0 02	<0 02	11.5	18.1	7.70	50.0	2 0	18	4	9.1	20.9	<0 01	<0.01	5 6	0.524	33.1	<0.001	<0.001	20.7	0.021	1.8	5 6	0.727	35.1	<0 001	0 010
1-Sep-11	Hydrant Flush,	70012896	680	303419	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Sep-11	Hydrant Flush Comp.	70045953	688	303583	<0 02	<0 02	30.7	19 0	7.76	160 0	2 0	50	NR	8.7	17.1	<0 01	<0.01	5.7	0.768	35.4	<0.001	<0.001	19.4	0.047	11 8	6 3	1 900	38.2	<0 001	0 031
2-Sep-11	Hydrant Flush,	70045953	689	303584	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6-Sep-11	Hydrant Flush Comp.	50000463	727	303920	<0 02	<0 02	4 9	19 2	7.69	30.0	2 0	10	5	9 0	17.6	<0 01	<0.01	6 2	0.375	34.7	<0.001	<0.001	19.1	0.012	1.5	6 0	0.435	37.5	<0 001	0 007
6-Sep-11	Hydrant Flush,	50000463	728	303921	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7-Sep-11	Hydrant Flush Comp.	50000355	742	304004	<0 02	<0 02	10.8	19 3	7.63	30.0	2 0	10	4	8 9	20.4	<0 01	<0.01	5.7	0.140	35 5	<0.001	<0.001	20 2	0.011	3.2	5.7	0.184	35.8	0.001	0 006
7-Sep-11	Hydrant Flush,	50000374	741	304005	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9-Sep-11	Hydrant Flush Comp.	50000837	757	304053	<0 02	<0 02	1 8	18 9	7.72	16.0	1 0	<4	3	9.1	20.3	<0 01	<0.01	5 6	0.149	35 2	<0.001	<0.001	21.7	0.007	0.9	5.7	0.172	37.3	<0 001	0 004
9-Sep-11	Hydrant Flush,	70002109	758	304054	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12-Sep-11	Hydrant Flush Comp.	50001977	770	304234	<0 02	<0 02	17.5	18 3	7.76	50.0	1 0	17	5	8 9	21.1	<0 01	<0.01	5.4	0.149	35 2	<0.001	<0.001	20 9	0.009	3.6	6 3	0 204	35.7	0.003	0 004
12-Sep-11	Hydrant Flush,	50000262	769	304235	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)
13-Sep-11	Hydrant Flush Comp.	50002009	777	304624	<0 02	<0 02	168.0	18 0	7 88	250 0	1 0	100	4	NR
13-Sep-11	Hydrant Flush,	50001943	778	304625	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA
14-Sep-11	Hydrant Flush Comp.	50001565	788	304691	<0 02	<0 02	72.0	17 5	7 91	250 0	1 0	107	NR	9 2
14-Sep-11	Hydrant Flush,	50002586	789	304692	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA
16-Sep-11	Hydrant Flush Comp.	50001617	804	304728	<0 02	<0 02	37.0	15 8	7 83	150 0	1 0	39	8	9 6
16-Sep-11	Hydrant Flush,	50001622	805	304729	<0 02	<0 02	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
13-Sep-11	23.0	<0 01	<0.01	5.4	0.590	33.4	<0.001	<0.001	24.4	0.044	14 2	5 9	1 380	36.8	0.011	0 025
13-Sep-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14-Sep-11	21.7	<0 01	<0.01	5 2	0.837	32 9	<0.001	<0.001	24 6	0.046	21 6	5 9	1 860	34.0	0.013	0 026
14-Sep-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16-Sep-11	20.7	<0 01	<0.01	5.1	0.320	35 3	<0.001	<0.001	23.7	0.019	10.4	5.7	0 525	36.3	0.003	0 008
16-Sep-11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NR - No result NA - Not analyzed

NOTE: On May 30 and September 13, there was no result for dissolved oxygen due to an instrument error.
On June 29, September 2, and September 14, there was no result for BOD5 due to QC failure.
On July 7, 8 and 12 there were no results for true colour due to lab error.

Winnipeg

2012 Water Main Cleaning Program

Laboratory Analysis Report Environmental Monitoring

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
7-May-12	Hydrant Flush Comp.	60004003	30	324520	<0.02	<0.02	29.4	8.7	7.93	2.5	45	4	11.5	21.8	0.01	1.25	5.6	0.745	30.5	<0.001	0.001	21.5	0.036	6.4	5.8	1.330	30.4	0.002	0.015
7-May-12	Hydrant Flush,	60003982	29	324521	<0.02	<0.02																							
8-May-12	Hydrant Flush Comp.	60004320	36	325044	<0.02	<0.02	9.43	9.1	7.81	1.0	13	3	11.6	21.9	0.01	1.05	5.3	0.515	30.3	<0.001	0.002	22.5	0.020	2.2	5.8	0.771	30.0	<0.001	0.011
8-May-12	Hydrant Flush,	60005346	39	325045	<0.02	<0.02																							
9-May-12	Hydrant Flush Comp.	60001453	49	325097	<0.02	<0.02	11.9	10.4	7.91	1.0	19	5	11.5	21.7	<0.01	0.11	5.6	0.573	29.3	<0.001	<0.001	22.3	0.027	1.8	5.7	1.100	30.4	<0.001	0.012
9-May-12	Hydrant Flush,	70020348	50	325098	<0.02	<0.02																							
11-May-12	Hydrant Flush Comp.	60004445	63	325191	<0.02	<0.02	1.89	11.1	7.83	3.0	<4	3	11.0	20.2	0.03	0.32	5.6	0.078	30.3	<0.001	<0.001	22.1	0.045	0.7	6.4	0.093	32.1	<0.001	<0.003
11-May-12	Hydrant Flush,	60004091	62	325192	<0.02	<0.02																							
14-May-12	Hydrant Flush Comp.	70007303	96	325355	<0.02	<0.02	0.73	10.9	7.75	2.0	<4	2	11.0	20.3	<0.01	0.02	5.4	0.011	29.1	<0.001	<0.001	20.3	0.005	0.1	5.6	0.042	29.3	<0.001	<0.003
14-May-12	Hydrant Flush,	70005216	93	325356	<0.02	<0.02																							
15-May-12	Hydrant Flush Comp.	70007290	102	325399	<0.02	<0.02	14.9	10.4	7.76	2.0	18	3	11.3	18.0	<0.01	0.06	4.9	0.202	27.0	<0.001	<0.001	17.9	0.011	0.7	5.0	0.272	27.6	0.001	<0.003
15-May-12	Hydrant Flush,	70007289	103	325400	<0.02	<0.02																							
16-May-12	Hydrant Flush Comp.	60004108	113	325807	<0.02	<0.02	30.2	11.7	7.88	2.0	36	5	10.7	20.2	<0.01	0.89	5.5	0.561	29.5	<0.001	<0.001	20.7	0.017	4.2	5.7	0.911	29.8	0.004	0.008
16-May-12	Hydrant Flush,	60005328	112	325808	<0.02	<0.02																							
17-May-12	Hydrant Flush Comp.	60004203	129	325867	<0.02	<0.02	6.93	13.4	7.90	1.0	8	<2	10.5	19.0	<0.01	0.03	5.5	0.009	28.6	<0.001	<0.001	21.9	0.007	0.9	5.5	0.100	32.5	<0.001	<0.003
17-May-12	Hydrant Flush,	60004210	130	325868	<0.02	<0.02																							
18-May-12	Hydrant Flush Comp.	60005386	139	325912	<0.02	<0.02	14.4	12.7	7.75	1.5	17	4	10.4	24.4	<0.01	0.42	5.8	0.509	33.8	<0.001	<0.001	24.3	0.020	1.7	6.4	0.629	35.3	<0.001	0.029
18-May-12	Hydrant Flush,	60004160	138	325913	<0.02	<0.02																							
22-May-12	Hydrant Flush Comp.	60003604	187	326065	<0.02	<0.02	9.18	14.2	7.84	1.0	13	NR	10.2	24.2	<0.01	0.61	5.9	0.246	34.0	<0.001	<0.001	24.0	0.018	0.9	6.4	0.352	35.0	<0.001	<0.003
22-May-12	Hydrant Flush,	60001373	188	326066	<0.02	<0.02																							
23-May-12	Hydrant Flush Comp.	60003780	196	326530	<0.02	<0.02	21.4	11.7	7.88	2.0	27	NR	10.6	22.0	<0.01	0.20	5.8	0.126	31.8	<0.001	<0.001	22.4	0.046	2.1	5.9	0.657	35.3	0.001	0.019
23-May-12	Hydrant Flush,	60004791	197	326531	<0.02	<0.02																							
24-May-12	Hydrant Flush Comp.	60003768	208	326568	<0.02	<0.02	32.4	12.1	7.69	2.5	36	<2	10.5	22.8	<0.01	<0.01	5.7	0.068	31.5	<0.001	<0.001	23.0	0.003	0.1	6.3	0.211	32.3	<0.001	<0.003
24-May-12	Hydrant Flush,	60003768	209	326569	<0.02	<0.02																							
25-May-12	Hydrant Flush Comp.	70004875	222	326603	<0.02	<0.02	1.65	10.2	7.85	1.0	<4	3	11.0	17.9	<0.01	0.01	5.2	0.055	26.6	<0.001	<0.001	17.9	0.005	0.2	5.3	0.061	27.0	<0.001	<0.003
25-May-12	Hydrant Flush,	60005119	219	326604	<0.02	<0.02																							
28-May-12	Hydrant Flush Comp.	70005856	259	326808	<0.02	<0.02	17.3	11.9	7.85	2.5	35	<2	10.8	19.1	0.01	0.82	5.3	0.820	26.1	<0.001	0.003	19.5	0.038	3.0	5.3	1.360	27.6	0.001	0.021
28-May-12	Hydrant Flush,	60003484	253	326809	<0.02	<0.02																							
29-May-12	Hydrant Flush Comp.	60003578	268	326843	<0.02	<0.02	30.3	10.1	7.91	0.5	42	2	10.8	20.1	<0.01	0.17	5.8	0.427	28.7	<0.001	<0.001	21.3	0.033	2.2	5.9	0.880	29.3	0.002	0.014
29-May-12	Hydrant Flush,	60007401	265	326844	<0.02	<0.02																							
30-May-12	Hydrant Flush Comp.	70003038	282	327245	<0.02	<0.02	6.11	10.2	7.92	2.0	9	3	10.7	20.5	<0.01	0.27	5.3	0.752	30.8	<0.001	<0.001	20.4	0.031	11.5	5.3	1.190	30.9	0.002	0.014
30-May-12	Hydrant Flush,	70002454	278	327246	<0.02	<0.02																							
31-May-12	Hydrant Flush Comp.	60001574	292	327285	<0.02	<0.02	65.5	15.1	7.80	0.5	52	4	9.8	19.5	<0.01	0.07	5.5	0.702	30.7	<0.001	<0.001	19.2	0.028	2.0	5.6	0.999	30.3	<0.001	0.011
31-May-12	Hydrant Flush,	60000882	289	327286	<0.02	<0.02																							
1-Jun-12	Hydrant Flush Comp.	60000867	301	327328	<0.02	<0.02	20.6	14.5	7.70	1.0	22	7	9.9	23.7	<0.01	0.25	6.4	0.175	35.1	<0.001	<0.001	24.9	0.012	4.4	6.9	0.238	35.6	0.002	0.019
1-Jun-12	Hydrant Flush,	60000867	302	327329	<0.02	<0.02																							
4-Jun-12	Hydrant Flush Comp.	70004607	335	327518	<0.02	<0.02	13.2	NR	7.82	1.5	29	7	NR	24.0	0.01	1.16	6.2	1.140	35.1	<0.001	0.006	24.4	0.025	2.6	6.1	1.290	36.7	0.001	0.016
4-Jun-12	Hydrant Flush,	70004607	334	327519	<0.02	<0.02																							

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
5-Jun-12	Hydrant Flush Comp.	60000782	348	327932	<0.02	<0.02	19.8	15.4	7.84	1.0	33	6	10.2	24.5	<0.01	0.14	6.3	0.550	36.3	<0.001	<0.001	24.6	0.018	1.9	6.3	0.636	36.8	0.010	0.008
5-Jun-12	Hydrant Flush,	60000568	344	327933	<0.02	<0.02																							
6-Jun-12	Hydrant Flush Comp.	60000777	358	327997	<0.02	<0.02	44.4	14.5	7.79	1.5	65	7	9.9	20.6	<0.01	0.08	5.2	1.300	33.5	<0.001	<0.001	24.9	0.044	11.5	6.8	1.880	34.3	0.004	0.022
6-Jun-12	Hydrant Flush,	60001349	356	327998	<0.02	<0.02																							
7-Jun-12	Hydrant Flush Comp.	60003932	372	328075	<0.02	<0.02	24.6	14.9	7.68	1.5	22	<2	10.3	19.8	<0.01	2.11	5.5	0.326	29.6	<0.001	0.002	20.4	0.015	3.8	5.7	0.508	30.7	<0.001	0.004
7-Jun-12	Hydrant Flush,	60000760	370	328076	<0.02	<0.02																							
8-Jun-12	Hydrant Flush Comp.	60003391	381	328126	<0.02	<0.02	26.2	14.7	7.83	1.0	26	6	9.6	19.3	<0.01	0.17	5.5	0.139	29.6	<0.001	<0.001	21.5	0.009	4.0	6.0	0.208	31.6	<0.001	<0.003
8-Jun-12	Hydrant Flush,	60003391	380	328127	<0.02	<0.02																							
11-Jun-12	Hydrant Flush Comp.	60000763	419	328339	<0.02	<0.02	127	10.8	7.58	1.5	114	2	10.3	21.3	<0.01	0.61	5.7	0.382	31.1	<0.001	<0.001	24.4	0.027	8.9	6.0	1.020	32.7	0.004	0.012
11-Jun-12	Hydrant Flush,	70011266	419	328340	<0.02	<0.02																							
12-Jun-12	Hydrant Flush Comp.	60001970	424	328701	<0.02	<0.02	31.1	10.9	7.85	0.5	25	5	11.7	19.5	<0.01	0.09	5.8	0.294	29.6	<0.001	<0.001	19.6	0.011	1.4	5.9	0.398	32.9	0.001	<0.003
12-Jun-12	Hydrant Flush,	60000509	430	328702	<0.02	<0.02																							
13-Jun-12	Hydrant Flush Comp.	60000510	440	328753	<0.02	<0.02	8.92	10.3	7.70	2.0	5	9	10.5	17.5	<0.01	0.02	4.5	0.043	26.8	<0.001	<0.001	19.7	0.002	0.8	4.9	0.050	30.2	<0.001	<0.003
13-Jun-12	Hydrant Flush,	60000515	439	328754	<0.02	<0.02																							
14-Jun-12	Hydrant Flush Comp.	60006445	449	328849	<0.02	<0.02	13.9	13.8	7.83	2.5	15	5	10.0	18.8	<0.01	0.62	5.0	0.445	27.4	<0.001	<0.001	18.6	0.019	3.9	4.9	0.653	27.7	0.002	0.009
14-Jun-12	Hydrant Flush,	60006446	450	328850	<0.02	<0.02																							
15-Jun-12	Hydrant Flush Comp.	60004432	462	328869	<0.02	<0.02	204	12.1	7.89	1.0	302	14	10.8	20.3	0.07	0.58	5.4	0.140	29.0	<0.001	<0.001	20.7	0.013	3.7	5.5	0.407	29.2	0.003	0.017
15-Jun-12	Hydrant Flush,	60007470	459	328870	<0.02	<0.02																							
18-Jun-12	Hydrant Flush Comp.	70002036	493	329060	<0.02	<0.02	3.98	16.1	7.84	1.0	4	<2	9.4	18.9	<0.01	0.04	5.3	0.033	27.3	<0.001	<0.001	22.0	0.005	0.5	5.4	0.110	30.5	<0.001	<0.003
18-Jun-12	Hydrant Flush,	60005401	495	329061	<0.02	<0.02																							
19-Jun-12	Hydrant Flush Comp.	60004548	506	329111	<0.02	<0.02	9.56	11.1	7.70	1.0	10	3	10.3	19.5	<0.01	0.12	5.5	0.168	30.5	<0.001	<0.001	21.5	0.006	1.4	5.9	0.255	31.7	0.001	<0.003
19-Jun-12	Hydrant Flush,	60004549	505	329112	<0.02	<0.02																							
20-Jun-12	Hydrant Flush Comp.	60004601	517	329490	<0.02	<0.02	15.1	11.5	7.79	1.0	16	10	10.2	22.9	<0.01	0.99	5.6	0.517	34.2	<0.001	<0.001	23.6	0.014	5.2	5.7	0.749	35.2	0.002	0.004
20-Jun-12	Hydrant Flush,	60003492	518	329491	<0.02	<0.02																							
21-Jun-12	Hydrant Flush Comp.	60007194	530	329535	<0.02	<0.02	55.2	14.1	7.99	1.5	53	6	10.2	18.9	<0.01	0.06	5.0	0.719	27.0	<0.001	<0.001	21.1	0.030	12.4	5.6	1.630	29.4	0.003	0.013
21-Jun-12	Hydrant Flush,	60007194	531	329536	<0.02	<0.02																							
22-Jun-12	Hydrant Flush Comp.	60004806	538	329598	<0.02	<0.02	16.7	16.4	7.70	1.0	12	4	9.6	21.3	<0.01	1.15	5.8	0.158	32.7	<0.001	<0.001	22.0	0.005	5.2	5.9	0.217	33.1	<0.001	<0.003
22-Jun-12	Hydrant Flush,	60004806	537	329599	<0.02	<0.02																							
25-Jun-12	Hydrant Flush Comp.	70003496	564	329776	<0.02	<0.02	24.1	15.3	7.81	1.5	31	<2	9.7	22.0	<0.01	1.00	5.8	0.191	30.8	<0.001	<0.001	23.1	0.021	4.6	6.3	0.670	30.8	0.003	0.010
25-Jun-12	Hydrant Flush,	60006329	566	329777	<0.02	<0.02																							
27-Jun-12	Hydrant Flush Comp.	70004974	575	330203	<0.02	<0.02	29.6	17.7	8.01	1.0	51	10	9.3	22.9	<0.01	0.42	5.9	0.905	33.3	<0.001	<0.001	24.3	0.033	4.3	6.6	1.460	35.1	0.003	0.015
27-Jun-12	Hydrant Flush,	70004974	576	330204	<0.02	<0.02																							
28-Jun-12	Hydrant Flush Comp.	60001232	591	330254	<0.02	<0.02	22.2	17.5	7.86	1.0	33	17	9.3	20.3	<0.01	1.31	4.8	0.920	30.0	<0.001	0.002	21.6	0.023	5.2	5.5	1.100	30.1	0.003	0.010
28-Jun-12	Hydrant Flush,	60000705	589	330255	<0.02	<0.02																							
29-Jun-12	Hydrant Flush Comp.	60001143	601	330294	<0.02	<0.02	8.77	18.8	7.84	1.0	12	3	9.1	18.6	<0.01	0.30	4.7	0.475	27.0	<0.001	<0.001	19.5	0.013	2.6	5.0	0.606	27.4	0.001	0.004
29-Jun-12	Hydrant Flush,	60001143	602	330295	<0.02	<0.02																							
4-Jul-12	Hydrant Flush Comp.	70038578	661	330901	<0.02	<0.02	4.9	15.5	7.71	1.0	5	4	9.4	21.2	0.02	<0.01	5.0	0.055	28.2	<0.001	0.002	21.5	0.032	0.3	5.4	0.067	29.4	0.002	0.004
4-Jul-12	Hydrant Flush,	70025567	663	330902	<0.02	<0.02																							
5-Jul-12	Hydrant Flush Comp.	70025556	672	330948	<0.02	<0.02	1.4	19.0	7.80	1.0	<4	3	9.1	18.8	<0.01	0.06	4.7	0.297	26.5	<0.001	<0.001	18.7	0.009	0.4	4.7	0.356	26.1	<0.001	0.003
5-Jul-12	Hydrant Flush,	70025556	670	330949	<0.02	<0.02																							
6-Jul-12	Hydrant Flush Comp.	70025506	683	330993	<0.02	<0.02	2.0	17.1	7.75	0.5	4	6	9.1	18.3	<0.01	0.10	4.9	0.075	27.0	<0.001	<0.001	19.0	0.005	0.2	5.0	0.077	27.0	<0.001	<0.003
6-Jul-12	Hydrant Flush,	70025578	685	330994	<0.02	<0.02																							
9-Jul-12	Hydrant Flush Comp.	60000441	715	331175	<0.02	<0.02	4.4	21.0	7.83	1.0	6	<3	8.7	19.3	<0.01	0.13	5.4	0.269	29.0	<0.001	<0.001	19.5	0.008	1.3	5.4	0.337	29.5	<0.001	<0.003
9-Jul-12	Hydrant Flush,	70045004	721	331176	<0.02	<0.02																							
10-Jul-12	Hydrant Flush Comp.	60005397	726	331217	<0.02	<0.02	19.8	21.8	7.76	1.0	35	5	8.5	20.4	<0.01	0.10	5.3	0.297	29.3	<0.001	<0.001	21.3	0.010	1.8	6.6	0.451	29.3	0.001	0.007
10-Jul-12	Hydrant Flush,	60005397	725	331218	<0.02	<0.02																							
11-Jul-12	Hydrant Flush Comp.	60000077	735	331642	<0.02	<0.02	5.5	21.1	7.80	1.0	6	<3	8.7	20.7	<0.01	0.11	5.3	0.043	29.6	<0.001	<0.001	20.7	0.010	0.9	5.5	0.237	30.8	<0.001	<0.003

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
11-Jul-12	Hydrant Flush,	60000077	736	331643	<0.02	<0.02																							
13-Jul-12	Hydrant Flush Comp.	70011365	743	331691	<0.02	<0.02	5.6	21.9	7.71	0.5	13	4	8.3	20.2	0.01	0.65	5.4	1.110	30.4	<0.001	0.005	22.0	0.035	1.8	5.6	1.460	30.3	<0.001	0.014
13-Jul-12	Hydrant Flush,	70011365	744	331692	<0.02	<0.02																							
16-Jul-12	Hydrant Flush Comp.	60000507	780	331906	0.67	0.82	16.7	18.2	7.87	1.5	18	NR	9.1	21.3	<0.01	0.08	5.3	0.022	28.4	<0.001	<0.001	21.5	0.011	2.1	5.6	0.270	28.5	0.002	0.006
16-Jul-12	Hydrant Flush,	60004633	782	331907	0.56	0.72																							
17-Jul-12	Hydrant Flush Comp.	60000269	797	331972	<0.02	<0.02	14.4	17.2	7.80	2.5	22	3	9.2	19.6	<0.01	0.31	4.8	0.889	27.6	<0.001	<0.001	20.5	0.022	1.7	4.9	1.220	27.9	<0.001	0.010
17-Jul-12	Hydrant Flush,	60001656	798	331973	<0.02	<0.02																							
18-Jul-12	Hydrant Flush Comp.	60000633	804	332354	0.62	0.73	87.5	20.9	7.84	2.0	38	<3	8.5	20.6	<0.01	4.14	5.4	0.160	28.2	<0.001	<0.001	21.3	0.014	9.4	5.8	0.467	28.1	<0.001	<0.003
18-Jul-12	Hydrant Flush,	60000387	803	332355	0.89	0.98																							
19-Jul-12	Hydrant Flush Comp.	70000799	820	332415	<0.02	<0.02	37.2	21.7	7.96	1.0	67	<3	8.5	21.2	<0.01	0.11	6.1	0.193	28.3	<0.001	<0.001	32.7	0.021	2.5	11.9	0.922	30.0	<0.001	0.007
19-Jul-12	Hydrant Flush,	70000799	818	332416	<0.02	<0.02																							
20-Jul-12	Hydrant Flush Comp.	60000410	831	332452	<0.02	<0.02	16.8	22.0	7.87	0.5	29	<3	8.6	21.5	<0.01	0.22	5.9	0.256	29.3	<0.001	0.005	22.5	0.015	2.1	6.2	0.709	29.2	<0.001	0.004
20-Jul-12	Hydrant Flush,	60001695	829	332453	<0.02	<0.02																							
23-Jul-12	Hydrant Flush Comp.	60000203	860	332645	<0.02	<0.02	20.6	20.4	7.84	1.0	51	<3	8.6	20.7	<0.01	0.01	5.4	0.086	27.9	<0.001	<0.001	22.0	0.025	7.8	5.7	1.150	29.2	<0.001	0.013
23-Jul-12	Hydrant Flush,	60000283	863	332646	0.57	0.74																							
24-Jul-12	Hydrant Flush Comp.	60000190	876	332727	<0.02	<0.02	30.1	18.5	7.76	1.0	32	9	8.8	20.9	<0.01	1.64	5.4	0.335	33.8	<0.001	<0.001	21.3	0.007	1.8	5.5	0.358	34.2	<0.001	<0.003
24-Jul-12	Hydrant Flush,	60000170	878	332728	<0.02	<0.02																							
25-Jul-12	Hydrant Flush Comp.	60001733	888	333130	<0.02	<0.02	9.2	19.5	7.82	0.5	11	<3	8.8	20.9	<0.01	0.15	5.4	0.109	30.0	<0.001	<0.001	21.5	0.009	1.5	5.5	0.344	30.3	<0.001	<0.003
25-Jul-12	Hydrant Flush,	60001797	886	333131	<0.02	<0.02																							
26-Jul-12	Hydrant Flush Comp.	60003270	901	333169	<0.02	<0.02	3.9	20.1	7.89	1.0	5	<3	8.8	20.3	<0.01	0.15	5.1	0.046	28.6	<0.001	<0.001	20.9	0.005	0.7	5.2	0.117	29.4	<0.001	<0.003
26-Jul-12	Hydrant Flush,	60000163	904	333170	<0.02	<0.02																							
27-Jul-12	Hydrant Flush Comp.	60001758	912	333209	<0.02	<0.02	36.1	19.7	7.90	1.5	37	14	8.6	20.9	<0.01	0.20	5.4	0.699	32.1	<0.001	<0.001	22.9	0.024	5.8	6.0	0.934	33.1	<0.001	0.013
27-Jul-12	Hydrant Flush,	60001758	914	333210	<0.02	<0.02																							
30-Jul-12	Hydrant Flush Comp.	60004027	942	333373	<0.02	<0.02	10.4	18.1	7.79	1.0	12	3	9.3	21.1	<0.01	0.28	5.1	0.264	29.8	<0.001	<0.001	22.4	0.011	2.0	5.6	0.356	30.7	<0.001	0.004
30-Jul-12	Hydrant Flush,	70000093	940	333374	0.21	0.37																							
31-Jul-12	Hydrant Flush Comp.	60006219	956	333445	<0.02	<0.02	14.7	21.9	7.82	1.0	20	7	8.2	20.8	<0.01	0.01	5.3	0.343	37.3	<0.001	0.004	21.8	0.016	2.5	5.7	0.416	37.5	<0.001	0.047
31-Jul-12	Hydrant Flush,	60004806	958	333446	<0.02	<0.02																							
1-Aug-12	Hydrant Flush Comp.	60004018	968	333799	<0.02	<0.02	8.0	20.9	7.77	1.0	10	4	8.7	20.8	<0.01	0.04	5.4	0.235	30.6	<0.001	0.004	20.8	0.009	1.8	5.6	0.349	30.3	<0.001	0.004
1-Aug-12	Hydrant Flush,	60004019	967	333800	<0.02	<0.02																							
3-Aug-12	Hydrant Flush Comp.	60004765	985	333887	0.10	0.26	30.8	19.1	7.90	1.5	53	<3	8.9	21.0	<0.01	0.03	5.7	0.031	29.7	<0.001	<0.001	24.7	0.018	3.9	7.1	0.324	30.0	<0.001	0.010
3-Aug-12	Hydrant Flush,	60006235	987	333888	0.64	0.77																							

NR - No result NA - Not analyzed NS - No sample

NOTE On May 22, 23, and July 16 there were no results for BOD5 due to QC failure.
On June 4 there were no results for temperature and dissolved oxygen due to an instrument error.
On July 16 there was no BOD resu t due to QC failure.
On July 16, 18, 23, 30 and August 3 the chlorine levels were above 0.02 mg/L because the pump used for dechlorinating was intermittently malfunctionning.

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
6-May-13	Hydrant Flush Comp.	60002277	24	358920	<0.02	<0 02	237	9.7	7 59	2.0	566	>20	12.00	27.1	<0 01	0.01	5.9	0.874	30.4	<0.001	<0.001	82 8	0 032	2 90	19.1	1 060	30 9	0.004	0.035
6-May-13	Hydrant Flush,	60003157	26	358921	<0.02	<0 02																							
7-May-13	Hydrant Flush Comp.	60002287	35	358981	<0.02	<0 02	35 5	7.7	7 54	3.0	38	19	12.10	23.2	<0 01	0.11	5.8	0.487	34 2	<0.001	<0.001	24.7	0.017	1 39	6 2	0 588	35 3	0.003	0.051
7-May-13	Hydrant Flush,	60002287	36	358982	<0.02	<0 02																							
8-May-13	Hydrant Flush Comp.	60002759	47	359368	<0.02	<0 02	63 0	5.1	7 66	2.5	78	17	12.30	23.2	<0 01	0.17	5.8	0.298	32 3	<0.001	<0.001	24 9	0 013	3 54	6.1	0.414	33.7	<0 001	<0 003
8-May-13	Hydrant Flush,	60002921	45	359369	<0.02	<0 02																							
9-May-13	Hydrant Flush Comp.	60003027	56	359437	<0.02	<0 02	33 3	5.1	7 92	3.0	58	4	12.20	23.0	<0 01	0.05	5.3	1.550	32.4	<0.001	<0.001	25 9	0.063	3.73	5 6	2.470	32.4	0.002	0.016
9-May-13	Hydrant Flush,	70001225	55	359438	<0.02	<0 02																							
10-May-13	Hydrant Flush Comp.	NS	NS	359503	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10-May-13	Hydrant Flush,	60006757	64	359504	<0.02	<0 02																							
13-May-13	Hydrant Flush Comp.	60002305	91	359704	<0.02	<0 02	8 33	5 2	7 81	2.0	10	<3	12.60	26.5	<0 01	0 01	6.0	0.204	31 8	<0.001	<0.001	27 2	0 009	2.46	6 2	0 292	33 0	<0 001	<0 003
13-May-13	Hydrant Flush,	60002305	90	359705	<0.02	<0 02																							
14-May-13	Hydrant Flush Comp.	60003336	102	359749	<0.02	<0 02	22 8	7.7	7 90	1.5	26	6	11.30	23.4	<0 01	0.21	5.6	0.442	28 6	<0.001	<0.001	23 8	0.010	1 64	6.1	0 571	29.1	0.004	<0 003
14-May-13	Hydrant Flush,	60003336	104	359750	<0.02	<0 02																							
15-May-13	Hydrant Flush Comp.	70001100	112	360142	<0.02	<0 02	14.7	6 5	7 91	1.0	15	NR	11.60	22.8	<0 01	<0.01	5.4	0.312	32 0	<0.001	<0.001	25.1	0.011	2.46	5 9	0.481	31.7	0.002	0.006
15-May-13	Hydrant Flush,	60002454	116	360143	<0.02	<0 02																							
16-May-13	Hydrant Flush Comp.	70002806	124	360187	<0.02	<0 02	19.7	7.7	7 66	1.0	18	>17	11.30	24.2	<0 01	0.07	6.4	0.178	30.1	<0.001	<0.001	25 5	0.006	0 82	6 5	0 218	33 2	<0 001	<0 003
16-May-13	Hydrant Flush,	60002170	123	360188	<0.02	<0 02																							
17-May-13	Hydrant Flush Comp.	60006738	135	360230	<0.02	0 02	16 8	6 9	7 96	1.0	NR	3	11.00	23.5	<0 01	0.27	5.7	0.863	35 3	<0.001	<0.001	23 6	0.048	2 30	5 8	1 500	35.4	0.003	0.011
17-May-13	Hydrant Flush,	60002340	136	360231	<0.02	0 02																							
21-May-13	Hydrant Flush Comp.	NS	NS	360759	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
21-May-13	Hydrant Flush,	60006823	180	360760	<0.02	<0 02																							
22-May-13	Hydrant Flush Comp.	60002580	186	360804	<0.02	<0 02	20.1	9 3	7 89	1.0	25	3	11.60	22.8	<0 01	0.18	5.1	0.611	30.7	<0.001	<0.001	23 3	0.023	1 61	5 6	0 877	32 0	0.001	0.005
22-May-13	Hydrant Flush,	60002771	188	360805	<0.02	<0 02																							
23-May-13	Hydrant Flush Comp.	60003840	198	360915	<0.02	<0 02	12 9	6 9	7 90	1.0	17	9	11.50	23.8	<0 01	0.08	5.4	0.471	32 6	<0.001	<0.001	25 3	0.029	3 50	5 8	0 584	34 0	0.003	<0 003
23-May-13	Hydrant Flush,	70000261	196	360916	<0.02	<0 02																							
24-May-13	Hydrant Flush Comp.	60002778	209	361013	<0.02	<0 02	7 93	7 8	7 91	1.5	10	5	11.80	20.5	<0 01	0.07	5.5	0.162	32.7	<0.001	<0.001	23 2	0.009	2.79	5 8	0 210	35.1	0.002	<0 003
24-May-13	Hydrant Flush,	60002804	207	361014	<0.02	<0 02																							
27-May-13	Hydrant Flush Comp.	60003614	245	361250	<0.02	<0 02	13 8	7 8	7 92	1.0	18	<3	11.50	23.4	<0 01	0.05	5.6	0.295	26 6	<0.001	<0.001	24 0	0.023	2.71	5 8	0 657	29 6	0.002	0.005
27-May-13	Hydrant Flush,	60002433	241	361251	<0.02	<0 02																							
28-May-13	Hydrant Flush Comp.	60003243	251	361316	<0.02	<0 02	12.1	11.2	7 96	1.0	20	<1	10.40	20.4	<0 01	0.07	6.5	0.081	30 2	<0.001	<0.001	23.1	0.014	0 68	6 6	0 296	31 9	<0 001	<0 003
28-May-13	Hydrant Flush,	60002511	254	361317	<0.02	<0 02																							
29-May-13	Hydrant Flush Comp.	60002434	263	361754	<0.02	<0 02	18 9	9.7	7 97	1.0	18	NR	10.80	19.8	<0 01	0.22	5.3	0.423	28.7	<0.001	<0.001	20.7	0.036	2 05	5 6	1 030	35 2	0.001	0.008
29-May-13	Hydrant Flush,	60003670	265	361755	<0.02	<0 02																							
30-May-13	Hydrant Flush Comp.	70001990	274	361831	<0.02	<0 02	3 81	7 2	7 92	1.5	4	<2	11.40	24.5	<0 01	0.08	4.6	0.204	28 2	<0.001	<0.001	26 0	0.016	0 67	4.7	0 386	28 9	<0 001	<0 003
30-May-13	Hydrant Flush,	60002664	275	361832	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
31-May-13	Hydrant Flush Comp.	60003860	285	361879	<0.02	<0 02	22 0	9.4	7 93	1.0	23	NR	10.80	20.8	<0 01	0.03	4.5	0.007	24.1	<0.001	<0.001	21 6	0.019	0.78	4 6	0.126	25.4	0.001	<0 003
31-May-13	Hydrant Flush,	60003860	286	361880	<0.02	<0 02																							
3-Jun-13	Hydrant Flush Comp.	60004318	317	362115	<0.02	<0 02	21 5	8.7	7 93	1.0	23	NR	10.60	22.8	<0 01	0.04	5.0	0.233	27.1	<0.001	<0.001	23 9	0.013	1 90	5 0	0.414	28.4	<0 001	<0 003
3-Jun-13	Hydrant Flush,	60004289	320	362116	<0.02	<0 02																							
4-Jun-13	Hydrant Flush Comp.	60003294	330	362145	<0.02	<0 02	3.11	9.4	7 85	1.0	8	5	10.80	23.0	<0 01	0.01	5.0	0.078	29 3	<0.001	<0.001	25 3	0.007	0 21	5 2	0 087	29.4	<0 001	<0 003
4-Jun-13	Hydrant Flush,	60002956	332	362146	<0.02	<0 02																							
5-Jun-13	Hydrant Flush Comp.	20003064	337	362541	<0.02	<0 02	22 5	11.9	7 89	1.0	27	<3	10.30	23.4	<0 01	0.08	4.8	0.189	27.4	<0.001	<0.001	23.4	0.013	1.11	5.1	0 248	29 2	<0 001	<0 003
5-Jun-13	Hydrant Flush,	20003064	338	362542	<0.02	<0 02																							
6-Jun-13	Hydrant Flush Comp.	NS	NS	362611	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6-Jun-13	Hydrant Flush,	70004377	343	362612	<0.02	0 02																							
7-Jun-13	Hydrant Flush Comp.	70001004	348	362674	<0.02	<0 02	39.4	12.3	7 86	0.5	28	<3	10.10	19.0	<0 01	0.15	5.3	0.167	25 5	<0.001	<0.001	19 8	0.015	9.13	5 2	0 282	25 5	<0 001	<0 003
7-Jun-13	Hydrant Flush,	70001004	349	362675	<0.02	<0 02																							
10-Jun-13	Hydrant Flush Comp.	20001782	373	362867	<0.02	<0 02	10 3	11.4	7 85	1.0	10	<3	10.20	22.4	<0 01	0.04	4.8	0.098	28 8	<0.001	<0.001	23 2	0.010	1 02	5.4	0.161	29.1	<0 001	<0 003
10-Jun-13	Hydrant Flush,	20001782	372	362868	<0.02	<0 02																							
11-Jun-13	Hydrant Flush Comp.	20000849	379	362889	<0.02	<0 02	27 0	10.6	7.73	1.0	20	3	10.20	20.6	<0 01	0.11	4.7	0.129	26 9	<0.001	<0.001	22 2	0.008	1 25	4.7	0.150	27 6	0.001	<0 003
11-Jun-13	Hydrant Flush,	20000816	378	362890	<0.02	<0 02																							
12-Jun-13	Hydrant Flush Comp.	20002788	386	363327	<0.02	<0 02	25.1	12.7	7.74	1.0	24	7	9.77	20.3	<0 01	0.20	4.8	0.241	26 8	<0.001	<0.001	22 6	0.007	1 35	4 8	0 248	29 2	<0 001	<0 003
12-Jun-13	Hydrant Flush,	20002788	388	363328	<0.02	<0 02																							
13-Jun-13	Hydrant Flush Comp.	20001008	391	363404	<0.02	<0 02	61 0	12.1	7 90	1.0	45	<3	10.10	21.0	<0 01	0.25	4.6	0.436	24 9	<0.001	<0.001	22 3	0.029	6.72	4.7	0 908	25 3	0.002	<0 003
13-Jun-13	Hydrant Flush,	20000970	392	363405	<0.02	<0 02																							
14-Jun-13	Hydrant Flush Comp.	20000837	400	363444	<0.02	<0 02	39.7	11.3	7 65	1.0	32	8	9.41	21.3	<0 01	0.24	4.4	0.299	24.4	<0.001	<0.001	21 9	0.013	5 50	4 9	0 386	24.1	<0 001	<0 003
14-Jun-13	Hydrant Flush,	20000835	398	363445	<0.02	<0 02																							
17-Jun-13	Hydrant Flush Comp.	70045394	425	363646	<0.02	<0 02	39 6	13.4	7.78	1.0	35	<3	10.00	22.1	<0 01	0.09	5.0	0.241	24 5	<0.001	<0.001	22 3	0.012	2 22	5.1	0 313	25 5	<0 001	<0 003
17-Jun-13	Hydrant Flush,	70045394	424	363647	<0.02	<0 02																							
18-Jun-13	Hydrant Flush Comp.	20001003	433	363688	<0.02	<0 02	39 0	11.4	7 60	1.0	29	6	9.43	22.4	<0 01	0.21	4.7	0.231	26 2	<0.001	<0.001	25.1	0.016	10.30	4.7	0 341	27.4	<0 001	<0 003
18-Jun-13	Hydrant Flush,	20001003	434	363689	<0.02	<0 02																							
19-Jun-13	Hydrant Flush Comp.	20000986	443	364144	<0.02	<0 02	100	11.8	7.73	1.0	68	4	9 52	23.7	<0 01	0.08	6.4	0.569	33 9	<0.001	<0.001	26 6	0.044	29.80	6.7	1 020	36.1	0.003	<0 003
19-Jun-13	Hydrant Flush,	20000999	439	364145	<0.02	<0 02																							
20-Jun-13	Hydrant Flush Comp.	20001045	450	364196	<0.02	<0 02	44.4	13.2	7.76	0.5	39	5	9.43	22.0	<0 01	0.53	5.7	0.848	30.7	<0.001	<0.001	22 9	0.056	14.50	5 8	1 380	31 5	0.002	0.006
20-Jun-13	Hydrant Flush,	20001045	449	364197	<0.02	<0 02																							
21-Jun-13	Hydrant Flush Comp.	70014574	459	364237	<0.02	<0 02	39 9	11.0	7 53	1.0	38	11	9 60	23.1	<0 01	0.34	5.8	0.543	31 2	<0.001	0 003	23 0	0.027	17.70	5 9	0 686	31.7	0.001	0.003
21-Jun-13	Hydrant Flush,	70014574	460	364238	<0.02	<0 02																							
24-Jun-13	Hydrant Flush Comp.	20000897	495	364442	<0.02	<0 02	9 90	14.9	7 87	1.5	12	<1	9 61	21.8	<0 01	0.12	5.9	0.186	30 3	<0.001	<0.001	22 6	0.016	3 03	5 9	0.450	31 9	<0 001	<0 003
24-Jun-13	Hydrant Flush,	20001308	483	364443	<0.02	<0 02																							
25-Jun-13	Hydrant Flush Comp.	70002811	502	364817	<0.02	<0 02	20 2	16.6	7 85	1.0	22	<3	9.41	22.8	<0 01	0.28	6.2	0.737	33 8	<0.001	<0.001	24 9	0.057	7 57	6.4	1.750	34 8	0.003	0.013
25-Jun-13	Hydrant Flush,	20001492	500	364818	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)

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Laboratory Analysis Report Environmental Monitoring

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
26-Jun-13	Hydrant Flush Comp.	20001615	509	364897	<0.02	<0 02	13 8	14.0	7 91	1.0	12	NR	9 88	21.4	<0 01	0.05	5.6	0.030	30 9	<0.001	<0.001	21 5	0.012	2 66	5.7	0 216	31.4	0.003	<0 003
26-Jun-13	Hydrant Flush,	20003806	510	364898	<0.02	<0 02																							
27-Jun-13	Hydrant Flush Comp.	20000950	519	364970	<0.02	<0 02	25 5	15.7	7.79	0.5	28	<1	9 35	20.9	<0 01	0.16	5.6	0.220	29 9	<0.001	<0.001	20 9	0.015	2 63	5 6	0.449	29.4	0.003	<0 003
27-Jun-13	Hydrant Flush,	20001277	518	364971	<0.02	<0 02																							
28-Jun-13	Hydrant Flush Comp.	20001105	528	365005	<0.02	<0 02	16	17.2	7.78	1.0	17	<3	9 23	21.4	<0 01	0.17	5.2	0.495	26 3	<0.001	<0.001	22 8	0.035	4.42	5.4	1.160	26.7	0.010	<0 003
28-Jun-13	Hydrant Flush,	20001105	529	365006	<0.02	<0 02																							
3-Jul-13	Hydrant Flush Comp.	20001840	568	365183	<0.02	<0 02	34.1	16.0	7 84	0.5	36	NR	9 65	20.9	<0 01	0.21	5.0	0.337	25 0	<0.001	<0.001	21 2	0.017	8 39	5.1	0.461	25.4	0.004	0.021
3-Jul-13	Hydrant Flush,	20001840	569	365184	<0.02	<0 02																							
4-Jul-13	Hydrant Flush Comp.	20002045	578	365606	<0.02	<0 02	12.7	19.1	7 89	0.5	13	NR	9 06	20.6	<0 01	0.07	5.0	0.057	25 9	<0.001	<0.001	21.7	0.011	1 95	5 0	0 330	25.7	<0 001	<0 003
4-Jul-13	Hydrant Flush,	20001457	582	365607	<0.02	<0 02																							
5-Jul-13	Hydrant Flush Comp.	20001440	590	365705	<0.02	<0 02	30 6	14.3	7 33	1.0	27	NR	9.76	22.3	<0 01	0.26	4.7	0.076	25 0	<0.001	0 031	22 3	0.014	9 98	4.7	0.194	26.1	<0 001	0.031
5-Jul-13	Hydrant Flush,	20001440	589	365706	<0.02	<0 02																							
8-Jul-13	Hydrant Flush Comp.	20001523	611	365868	0 55	0.72	15 6	15.9	8 00	1.0	16	NR	9 50	21.7	<0 01	0.10	4.6	0.034	25 6	<0.001	<0.001	22 0	0.028	2 96	5 0	0 512	25 5	<0 001	<0 003
8-Jul-13	Hydrant Flush,	20001523	610	365869	0 08	0.19																							
9-Jul-13	Hydrant Flush Comp.	20001630	620	365918	<0.02	<0 02	15 6	12.9	7 89	1.0	13	NR	10.00	20.8	<0 01	0.29	4.2	0.055	24 8	<0.001	<0.001	21 8	0.015	3 39	4.7	0 322	26.7	<0 001	<0 003
9-Jul-13	Hydrant Flush,	20001630	619	365919	<0.02	<0 02																							
10-Jul-13	Hydrant Flush Comp.	20001662	629	366334	<0.02	<0 02	26 2	16.2	7 92	0.5	28	NR	9.17	21.0	<0 01	0.57	4.5	0.171	23 0	<0.001	<0.001	21 2	0.025	4 54	4 6	0.799	24 0	<0 001	0.005
10-Jul-13	Hydrant Flush,	2002406	630	366335	<0.02	<0 02																							
11-Jul-13	Hydrant Flush Comp.	20002407	639	366385	<0.02	<0 02	102	11.5	7.76	0.5	130	NR	9 66	22.9	<0 01	0.55	4.5	1.750	22 5	<0.001	<0.001	23.4	0.091	34.20	4 5	3 820	23 8	<0 001	0.033
11-Jul-13	Hydrant Flush,	20001716	640	366386	0.11	0 23																							
12-Jul-13	Hydrant Flush Comp.	20002232	649	366428	<0.02	<0 02	33 3	17.3	7.79	0.5	46	14	9.16	22.0	<0 01	0.57	4.3	1.100	24 0	<0.001	<0.001	22 3	0.056	5 06	4.4	2 330	24.4	<0 001	0.016
12-Jul-13	Hydrant Flush,	20002232	650	366429	<0.02	<0 02																							
15-Jul-13	Hydrant Flush Comp.	20000735	679	366612	<0.02	<0 02	30 3	15.1	7 81	1.0	29	NR	9 60	19.8	<0 01	0.15	5.0	0.168	27 5	<0.001	0 002	20 8	0.013	7 04	5.1	0 273	28.1	0.035	0.004
15-Jul-13	Hydrant Flush,	20000726	681	366613	<0.02	<0 02																							
16-Jul-13	Hydrant Flush Comp.	20000244	691	366661	<0.02	<0 02	38 6	15.1	7 83	1.0	32	NR	9.49	20.3	0.02	2.78	4.4	1.090	24.7	0 007	0 006	22.7	0.044	9.48	5.1	1 550	25 3	0.020	0.014
16-Jul-13	Hydrant Flush,	20000244	690	366662	<0.02	<0 02																							
19-Jul-13	Hydrant Flush Comp.	20000361	709	367220	<0.02	<0 02	33 8	20.3	7 90	0.5	25	8	8 80	21.0	<0 01	1.24	5.9	0.344	29 2	<0.001	<0.001	21 2	0.019	5 22	6 0	0.450	29.7	0.003	<0 003
19-Jul-13	Hydrant Flush,	20000361	711	367221	<0.02	<0 02																							
22-Jul-13	Hydrant Flush Comp.	20000711	736	367431	<0.02	<0 02	105	18.0	7 80	1.5	74	4	9.16	22.7	<0 01	0.31	6.1	0.353	30 9	<0.001	<0.001	25.4	0.035	28.40	6.4	0.791	31.1	0.002	0.007
22-Jul-13	Hydrant Flush,	20000354	738	367432	<0.02	<0 02																							
23-Jul-13	Hydrant Flush Comp.	70001216	748	367457	<0.02	<0 02	234	15.1	7 82	1.0	348	NR	9 38	22.5	<0 01	4.98	5.9	0.310	25 3	<0.001	<0.001	31.4	0.026	34.50	8 9	0 608	30.1	0.001	0.010
23-Jul-13	Hydrant Flush,	20000268	747	367458	<0.02	<0 02																							
24-Jul-13	Hydrant Flush Comp.	20000382	756	367863	<0.02	<0 02	54 6	18.2	7 85	1.0	58	NR	9.10	22.9	0.02	2.35	5.7	0.839	29 8	<0.001	0 002	23 9	0.077	18.20	6.7	2.470	31 0	0.011	0.032
24-Jul-13	Hydrant Flush,	20000459	759	367864	<0.02	<0 02																							
25-Jul-13	Hydrant Flush Comp.	20000450	767	367905	<0.02	<0 02	39 8	17.1	7 94	2.5	54	7	0 38	23.0	<0 01	0.55	6.0	0.163	30 5	<0.001	<0.001	29 9	0.031	9 01	7 9	0 836	31 3	0.001	0.011
25-Jul-13	Hydrant Flush,	20000450	770	367906	<0.02	<0 02																							

2013 Water Main Cleaning Program

Laboratory Analysis Report Environmental Monitoring

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
26-Jul-13	Hydrant Flush Comp.	20000434	776	367943	<0.02	<0 02	65 6	18.1	7 85	1.0	140	<3	9.16	27.6	0.01	0.95	7.6	0.487	27 5	<0.001	0 002	41 3	0.167	14.10	12.8	3 360	28 5	0.006	0.082
26-Jul-13	Hydrant Flush,	20000744	778	367944	<0.02	<0 02																							
29-Jul-13	Hydrant Flush Comp.	20000579	807	368138	<0.02	<0 02	44.7	17.9	7 97	1.0	45	NR	9.14	21.0	0.03	1.96	5.2	1.530	27 8	<0.001	0 012	22 3	0.116	10.10	5.7	4 310	28.7	<0 001	0.047
29-Jul-13	Hydrant Flush,	20000637	809	368139	<0.02	<0 02																							
30-Jul-13	Hydrant Flush Comp.	20001121	817	368166	0.16	0 33	26 5	19.2	7 89	1.5	35	NR	9 00	19.3	0.05	3.26	5.5	1.150	24 9	<0.001	0 015	23.4	0.110	8 94	5.7	1.780	29 9	<0 001	0.036
30-Jul-13	Hydrant Flush,	70001466	819	368167	0 68	0 81																							
31-Jul-13	Hydrant Flush Comp.	20002036	828	368553	<0.02	<0 02	24 8	15.0	7 85	1.0	21	NR	9.75	22.5	<0 01	0.51	5.0	0.530	27 8	<0.001	<0.001	23 6	0.042	4 51	5.1	1 340	29 8	<0 001	0.014
31-Jul-13	Hydrant Flush,	20001851	827	368554	<0.02	<0 02																							
1-Aug-13	Hydrant Flush Comp.	20002400	837	368591	<0.02	<0 02	6.94	19.4	7 83	0.5	10	NR	9 08	21.5	0.01	0.51	5.2	0.443	28 0	<0.001	<0.001	21 5	0.031	2 00	5 5	1 010	30.1	<0 001	0.015
1-Aug-13	Hydrant Flush,	70001987	839	368592	<0.02	<0 02																							
2-Aug-13	Hydrant Flush Comp.	20001122	850	368639	<0.02	<0 02	11 2	17.9	7 80	0.5	12	NR	9 35	20.5	<0 01	0.27	4.8	0.103	25 8	<0.001	<0.001	21 3	0.009	3.12	5 0	0.176	26.7	0.001	<0 003
2-Aug-13	Hydrant Flush,	20001121	852	368640	<0.02	<0 02																							
6-Aug-13	Hydrant Flush Comp.	20000522	890	368818	<0.02	<0 02	75 9	15.8	7 82	1.0	230	NR	9 52	19.7	<0 01	0.25	5.2	0.442	26 5	<0.001	<0.001	55 2	0.035	7.10	18.5	0 858	29 3	0.006	0.035
6-Aug-13	Hydrant Flush,	20000522	892	368819	<0.02	<0 02																							
7-Aug-13	Hydrant Flush Comp.	20000216	901	369274	<0.02	<0 02	22 5	14.9	7.72	1.0	22	6	9.79	19.0	0.03	3.27	4.7	1.260	27 0	0 001	0 005	21 0	0.037	4 97	4.7	1 300	27 2	0.003	0.008
7-Aug-13	Hydrant Flush,	70026700	900	369275	<0.02	<0 02																							
8-Aug-13	Hydrant Flush Comp.	70020190	911	369325	<0.02	<0 02	23 3	14.6	7 91	1.0	35	<1	9 83	21.5	<0 01	0.81	4.8	0.405	26 5	<0.001	<0.001	24.1	0.018	1 60	5 3	0 539	27.1	0.002	<0 003
8-Aug-13	Hydrant Flush,	20000264	910	369326	<0.02	<0 02																							
9-Aug-13	Hydrant Flush Comp.	70019419	920	369360	<0.02	<0 02	6.11	13.3	7.77	1.0	13	<3	10.10	19.2	<0 01	0.02	4.9	0.114	27 9	<0.001	<0.001	23 5	0.007	0.46	5.7	0.144	28 0	<0 001	<0 003
9-Aug-13	Hydrant Flush,	70019345	922	369361	<0.02	<0 02																							

NOTE: On May 10, 21, and June 6 there was no sample due to valve issues while attempting to sample the hydrant.
On May 17 there was no result for TSS due to technician error.
On May 15, June 26, July 3-11, 15, 16, and August 2 there was no result for BOD due to technician error.
On May 29, 31, June 3, July 23, 24, 29-31, August 1 and 6 there was no result for BOD due to QC failure.
On July 8, 11, and 30, the chlorine was high because the flushing crew were unable to add enough dechlorination chemical during the flush.

2014 Water Main Cleaning Program

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
08-Jul-14	Hydrant Flush Comp.	60002113	25	401400	<0.02	<0 02	3.89	18.3	7.72	2.0	<3	5	9.10	17.3	0.0041	0.094	4.68	0.1462	24.0	<0.0004	0.0033	18.9	0.0087	1.02	4.78	0.1777	25.1	<0.0004	0 0052
08-Jul-14	Hydrant Flush,	60002113	24	401401	<0.02	<0 02																							
09-Jul-14	Hydrant Flush Comp.	70014677	23	402033	<0.02	<0 02	8.90	19.3	7.63	1.0	7	6	9.06	18.1	0.0021	0.105	4.79	0.0746	23.7	<0.0004	0.0057	18.3	0.0061	1.37	4.82	0.0816	24.3	0.0006	0 0063
09-Jul-14	Hydrant Flush,	60005058	30	402034	<0.02	<0 02																							
10-Jul-14	Hydrant Flush Comp.	60002870	41	402055	<0.02	<0 02	66.4	18.2	7.73	2.5	89	7	9.26	20.5	0.0054	0.466	5.28	1.423	27.3	0.0005	0.0058	20.8	0.0708	15.8	5.33	1 981	28.3	0.0161	0 0234
10-Jul-14	Hydrant Flush,	60002101	42	402056	<0.02	<0 02																							
11-Jul-14	Hydrant Flush Comp.	6113	43	402120	<0.02	<0 02	173	16.4	7.87	2.5	167	<3	9.65	23.2	0.0080	2.77	5.47	0.2563	26.2	0.0011	0.0067	24.4	0.0708	36 0	6.76	1 559	29.0	0.0104	0 0353
11-Jul-14	Hydrant Flush,	8369	44	402121	<0.02	<0 02																							
11-Jul-14	Hydrant Flush Comp.	70002009	52	402131	<0.02	<0 02	31.8	19.5	7.74	2.0	17	6	8.70	23.4	0.0051	0.691	5.32	0.5993	29.0	0.0005	0.0059	24.0	0.0385	18.0	5.56	1.138	29.1	0.0059	0 0219
11-Jul-14	Hydrant Flush,	60002047	50	402132	0.83	1.04																							
14-Jul-14	Hydrant Flush Comp.	60001700	65	402347	<0.02	<0 02	53.0	16.5	7.49	1.0	57	>8	9.42	23.1	0.0226	1.82	5.24	1 033	27.6	0.0018	0.0083	23.4	0.1191	22.4	5.40	1 393	28.4	0.0130	0 0296
14-Jul-14	Hydrant Flush,	60003306	64	402348	<0.02	0.02																							
14-Jul-14	Hydrant Flush Comp.	7765	128	402358	<0.02	<0 02	125	18.1	7.56	0.5	96	>8	9.04	23.6	0.0067	0.487	5.47	1 296	29.0	<0.0004	0.0106	25.4	0.1388	39.8	5.68	2.075	29.5	0.0112	0.1036
14-Jul-14	Hydrant Flush,	7769	127	402359	<0.02	<0 02																							
15-Jul-14	Hydrant Flush Comp.	60001620	74	402380	<0.02	<0 02	68.0	17.5	7.95	2.5	60	9	9.20	24.6	0.0034	0.230	5.61	1 568	27.8	0.0015	0.0088	25.2	0.0922	20.4	5.65	2.754	28.1	0.1243	0 0463
15-Jul-14	Hydrant Flush,	60000975	73	402381	<0.02	<0 02																							
15-Jul-14	Hydrant Flush Comp.	70015634	135	402393	<0.02	<0 02	525	18.4	7.54	2.0	270	>11	8.97	22.3	0.0021	0.667	5.10	2 360	27.1	0.0026	0.0064	26.1	0.1305	59.0	5.68	4 271	28.6	0.2165	0 0886
15-Jul-14	Hydrant Flush,	10501	137	402394	<0.02	<0 02																							
16-Jul-14	Hydrant Flush Comp.	10100	144	402838	<0.02	<0 02	82.5	16.2	7.55	2.0	46	<3	9.54	22.3	0.0033	0.249	4.96	0.3335	26.1	0.0006	0.0054	22.8	0.0837	13.3	5.12	1.438	26.6	0.0288	0 0702
16-Jul-14	Hydrant Flush,	10111	145	402839	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
16-Jul-14	Hydrant Flush Comp.	60006909	81	402850	<0.02	<0 02	67.5	17.4	7.68	2.5	52	6	9.39	22.7	0.0044	0.230	5.14	1 213	26.5	<0.0004	0.0081	23.4	0.0587	21.1	5.19	1 819	26.9	0.0080	0 0250
16-Jul-14	Hydrant Flush,	70002737	80	402851	<0.02	<0 02																							
17-Jul-14	Hydrant Flush Comp.	60005258	88	402894	<0.02	<0 02	7.23	17.0	7.84	0.5	7	3	9.54	22.4	0.0023	0.096	4.99	0.2395	26.1	<0.0004	0.0028	22.5	0.0101	2.15	5.10	0.3388	26.3	0.0006	0 0058
17-Jul-14	Hydrant Flush,	60005205	90	402895	<0.02	<0 02																							
17-Jul-14	Hydrant Flush Comp.	10641	157	402905	<0.02	<0 02	184	17.5	7.65	2.5	84	10	9.32	23.1	0.0024	0.255	5.26	1 035	26.3	0.0009	0.0059	23.8	0.0909	18.0	5.60	1 389	27.1	0.0581	0 0950
17-Jul-14	Hydrant Flush,	70021413	158	402906	<0.02	<0 02																							
18-Jul-14	Hydrant Flush Comp.	60005690	95	402951	<0.02	<0 02	18.2	20.7	7.76	1.0	18	5	9.23	20.0	0.0095	0.382	4.98	1 234	27.0	<0.0004	0.0055	21.0	0.0518	5.74	5.02	1 583	28.0	0.0022	0 0157
18-Jul-14	Hydrant Flush,	60004721	93	402952	<0.02	<0 02																							
18-Jul-14	Hydrant Flush Comp.	7399	164	402963	<0.02	<0 02	48.8	17.5	7.28	2.0	23	<3	9.40	21.1	0.0021	0.390	5.77	0.2237	27.8	<0.0004	0.0026	22.2	0.0182	7.53	5.77	0.2607	30.1	0.0017	0 0130
18-Jul-14	Hydrant Flush,	7354	167	402964	<0.02	<0 02																							
21-Jul-14	Hydrant Flush Comp.	60004993	121	403155	<0.02	<0 02	25.7	20.6	7.86	2.0	26	10	8.63	19.8	0.0109	1.35	4.95	0.8378	25.1	0.0008	0.0060	20.0	0.0326	7.88	5.31	0.9814	25.5	0.0046	0 0149
21-Jul-14	Hydrant Flush,	60004993	120	403156	<0.02	<0 02																							
21-Jul-14	Hydrant Flush Comp.	10479	196	403166	<0.02	<0 02	8.06	19.2	7.81	2.0	6	4	8.89	20.9	0.0088	0.700	5.15	0.3453	26.8	0.0006	0.0043	21.3	0.0175	2.09	5.31	0.3931	27.0	0.0013	0 0061
21-Jul-14	Hydrant Flush,	7390	198	403167	<0.02	<0 02																							
22-Jul-14	Hydrant Flush Comp.	8659	206	403196	0.76	0 87	152	18.6	8.00	2.5	164	<3	9.09	20.7	0.0142	1.50	5.11	0.2935	26.1	0.0012	0.0052	22.7	0.0969	18.9	6.24	1 831	26.7	0.0106	0 0368
22-Jul-14	Hydrant Flush,	70003271	210	403197	0.21	0 32																							
22-Jul-14	Hydrant Flush Comp.	60004455	132	403207	<0.02	<0 02	84.6	19.4	7.89	2.0	63	6	8.83	20.8	0.0533	7.86	4.94	0.8522	25.8	0.0057	0.0119	21.8	0.1422	26.7	5.04	1.137	26.5	0.0170	0 0291
22-Jul-14	Hydrant Flush,	70000602	130	403208	<0.02	<0 02																							
23-Jul-14	Hydrant Flush Comp.	70003368	141	403620	<0.02	<0 02	79.6	17.5	7.62	1.0	52	>18	9.38	21.1	0.0039	0.239	4.70	1 006	26.6	<0.0004	0.0013	21.5	0.0410	21.4	4.99	1.405	27.3	0.0019	0 0147
23-Jul-14	Hydrant Flush,	60006923	142	403621	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
23-Jul-14	Hydrant Flush Comp.	7408	217	403631	<0.02	<0 02	52.2	18.3	7.84	1.5	44	<3	9.56	20.1	0.0070	2.71	4.73	0.3150	25.3	<0.0004	0.0030	21.1	0.0247	18.1	4.86	0.5287	26.1	0.0048	0 0079
23-Jul-14	Hydrant Flush,	3033	219	403632	<0.02	<0 02																							
24-Jul-14	Hydrant Flush Comp.	5901	227	403695	<0.02	<0 02	40.6	18.8	7.78	2.0	46	5	9.04	21.2	0.0038	0.103	4.83	0.7443	25.8	<0.0004	0.0009	21.8	0.0400	7.74	5.21	1.039	26.2	0.0030	0 0147
24-Jul-14	Hydrant Flush,	8303	229	403696	<0.02	<0 02																							
24-Jul-14	Hydrant Flush Comp.	70010429	152	403706	<0.02	<0 02	104	17.3	7.89	1.5	53	3	9.14	21.6	0.0400	5.77	4.96	1.603	26.4	0.0383	0.0248	21.9	0.0952	15.8	5.03	2 396	26.8	0.1008	0 0654
24-Jul-14	Hydrant Flush,	60004721	154	403707	<0.02	<0 02																							
25-Jul-14	Hydrant Flush Comp.	70029810	165	403893	<0.02	<0 02	101	17.5	7.71	1.0	92	4	9.15	21.3	0.0026	0.166	4.82	0.7574	26.4	<0.0004	0.0015	22.5	0.0515	27.7	5.12	1.662	26.6	0.0019	0 0209
25-Jul-14	Hydrant Flush,	60005749	162	403894	<0.02	<0 02																							
25-Jul-14	Hydrant Flush Comp.	10199	237	403904	<0.02	<0 02	68.4	19.1	7.39	1.5	79	13	8.65	21.6	0.0152	1.62	4.80	1 863	25.4	0.0008	0.0067	22.4	0.0923	19.1	5.56	2.324	26.5	0.0053	0 0355
25-Jul-14	Hydrant Flush,	10199	239	403905	<0.02	<0 02																							
28-Jul-14	Hydrant Flush Comp.	60003960	197	403974	0.96	1.13	49.8	21.1	7.97	1.0	31	<3	9.03	21.3	0.0074	0.249	4.87	0.1280	25.4	<0.0004	0.0046	22.6	0.1735	10.1	5.15	1.238	27.0	0.0062	0 0913
28-Jul-14	Hydrant Flush,	60003962	198	403975	<0.02	<0 02																							
28-Jul-14	Hydrant Flush Comp.	5491	265	403985	<0.02	<0 02	56.2	17.7	7.70	1.0	40	<3	9.30	21.3	0.0026	0.166	4.81	0.2064	25.5	<0.0004	0.0016	22.1	0.0396	17.1	4.95	0.8333	26.9	0.0045	0 0115
28-Jul-14	Hydrant Flush,	10341	268	403986	<0.02	<0 02																							
29-Jul-14	Hydrant Flush Comp.	60005159	208	404016	<0.02	<0 02	4.88	20.0	7.75	0.5	7	4	8.84	20.7	0.0090	0.140	4.80	1 326	26.0	<0.0004	0.0021	21.5	0.0513	2.07	4.92	1.661	26.5	0.0010	0 0130
29-Jul-14	Hydrant Flush,	60005159	207	404017	<0.02	<0 02																							
29-Jul-14	Hydrant Flush Comp.	10619	276	404028	<0.02	<0 02	34.8	17.7	7.71	0.5	25	4	9.28	20.9	0.0278	2.09	4.95	1.794	25.5	0.0019	0.0075	21.3	0.0720	7.05	5.11	2.240	25.9	0.0056	0 0190
29-Jul-14	Hydrant Flush,	6539	277	404029	<0.02	<0 02																							
30-Jul-14	Hydrant Flush Comp.	70001693	221	404476	<0.02	<0 02	54.4	18.2	7.85	1.5	31	3	8.98	20.7	0.0070	0.393	5.03	0.8780	26.0	0.0027	0.0042	21.6	0.0439	8.52	5.11	1 273	26.1	0.0472	0 0187
30-Jul-14	Hydrant Flush,	60004413	220	404477	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)	TSS (mg/L)	BOD_5 (mg/L)	DO (mg/L)	Soluble Calcium (mg/L)	Soluble Copper (mg/L)	Soluble Iron (mg/L)	Soluble Magnesium (mg/L)	Soluble Manganese (mg/L)	Soluble Sodium (mg/L)	Soluble Lead (mg/L)	Soluble Zinc (mg/L)	Total Calcium (mg/L)	Total Copper (mg/L)	Total Iron (mg/L)	Total Magnesium (mg/L)	Total Manganese (mg/L)	Total Sodium (mg/L)	Total Lead (mg/L)	Total Zinc (mg/L)
30-Jul-14	Hydrant Flush Comp.	10421	285	404491	<0.02	<0 02	65.6	17.0	7.68	2.0	88	9	9.24	21.4	0.0162	2.11	4.85	1 936	26.0	0.0012	0.0062	23.0	0.1332	34 8	5.20	2.952	26.1	0.0153	0 0547
30-Jul-14	Hydrant Flush,	6680	286	404492	<0.02	<0 02																							
31-Jul-14	Hydrant Flush Comp.	8254	292	404538	<0.02	<0 02	55.6	17.3	7.69	1.5	33	6	9.26	20.4	0.0029	0.195	4.78	0.4435	25.5	<0.0004	0.0027	21.6	0.0258	10.4	4.86	0.5969	25.7	0.0055	0 0068
31-Jul-14	Hydrant Flush,	3259	293	404539	<0.02	<0 02																							
31-Jul-14	Hydrant Flush Comp.	60006554	231	404549	<0.02	<0 02	11.6	19.0	7.82	1.0	37	<3	8.80	20.2	0.0068	0.280	4.57	0.7202	25.3	<0.0004	0.0022	24.0	0.0369	5.13	6.15	1.114	26.2	0.0027	0 0120
31-Jul-14	Hydrant Flush,	60006554	232	404550	<0.02	<0 02																							
01-Aug-14	Hydrant Flush Comp.	60005848	244	404634	<0.02	<0 02	141	19.2	7.62	2.5	86	4	8.85	20.2	0.0034	0.191	5.12	1 871	27.0	<0.0004	0.0045	21.8	0.1578	36.5	5.27	4 212	27.0	0.0098	0 0875
01-Aug-14	Hydrant Flush,	60004525	243	404635	<0.02	<0 02																							
01-Aug-14	Hydrant Flush Comp.	70008574	297	404645	<0.02	<0 02	482	16.2	7.49	2.5	132	7	9.33	20.3	0.0022	0.276	5.01	2 536	25.3	<0.0004	0.0011	24.1	0.1352	79.9	5.50	6 358	25.6	0.0100	0 0582
01-Aug-14	Hydrant Flush,	5448	298	404646	<0.02	<0 02																							
05-Aug-14	Hydrant Flush Comp.	60006072	289	404861	<0.02	0 02	40.0	18.8	7.41	0.5	38	8	8.87	20.9	0.0061	0.288	5.13	1 033	27.3	<0.0004	0.0054	21.5	0.0828	16.9	5.19	1 324	28.6	0.0037	0 0457
05-Aug-14	Hydrant Flush,	60005992	291	404862	<0.02	<0 02																							
05-Aug-14	Hydrant Flush Comp.	3657	341	404872	<0.02	<0 02	47.0	18.8	7.52	1.5	30	6	NR	20.4	0.0042	0.340	4.91	0.7003	26.4	<0.0004	0.0021	20.5	0.0459	8.97	4.99	0.8904	26.4	0.0050	0 0100
05-Aug-14	Hydrant Flush,	2392	343	404873	<0.02	<0 02																							
06-Aug-14	Hydrant Flush Comp.	78208	351	405296	<0.02	<0 02	56.8	17.1	7.72	4.0	44	5	9.32	21.5	0.0109	1.04	4.67	1.792	27.0	0.0008	0.0043	22.2	0.0676	12 9	4.84	2.735	27.1	0.0067	0 0201
06-Aug-14	Hydrant Flush,	804	354	405297	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
06-Aug-14	Hydrant Flush Comp.	60004898	300	405312	<0.02	<0 02	39.6	17.7	7.67	2.5	53	<3	9.49	20.5	0.0014	0.076	4.85	0.1175	26.4	<0.0004	0.0008	23.4	0.0165	11.3	5.82	0.2907	26.9	0.0034	0 0074
06-Aug-14	Hydrant Flush,	60004904	299	405313	<0.02	<0 02																							
07-Aug-14	Hydrant Flush Comp.	60007466	306	405366	<0.02	<0.02	58.2	17.2	7.66	1.0	43	4	9.24	20.6	0.0126	2.04	4.88	0.2681	25.6	0.0016	0.0164	21.1	0.0448	9.76	5.05	0.3176	27.0	0.0074	0 0414
07-Aug-14	Hydrant Flush,	60007466	307	405367	<0.02	<0 02																							
07-Aug-14	Hydrant Flush Comp.	3102	366	405386	<0.02	<0.02	48.6	17.9	7.81	1.5	38	11	9.08	21.4	0.0254	3.13	4.86	1 557	26.5	0.0015	0.0132	22.0	0.0717	10.4	4.87	2 240	26.8	0.0044	0 0374
07-Aug-14	Hydrant Flush,	10431	368	405387	<0.02	<0 02																							
08-Aug-14	Hydrant Flush Comp.	5538	377	405415	<0.02	<0 02	8.03	16.1	7.60	2.5	12	5	9.20	21.3	0.0122	0.754	4.85	0.5910	26.9	0.0005	0.0045	21.6	0.0208	1.55	5.14	0.6501	27.6	0.0011	0 0076
08-Aug-14	Hydrant Flush,	5478	383	405416	<0.02	<0 02																							
08-Aug-14	Hydrant Flush Comp.	70002134	315	405433	0.03	0 04	83.2	17.4	7.73	3.0	47	6	9.03	20.5	0.0677	5.99	4.72	2.109	25.1	0.0059	0.0495	20.5	0.1682	18.0	5.02	2.674	26.0	0.0170	0.1575
08-Aug-14	Hydrant Flush,	60006485	320	405434	<0.02	<0 02																							
11-Aug-14	Hydrant Flush Comp.	60003548	349	405593	0.02	0 02	32.6	14.5	7.61	1.0	30	13	9.75	20.7	0.0014	0.265	4.69	0.1639	26.4	<0.0004	0.0037	20.8	0.0143	13.0	4.70	0.2395	26.8	0.0037	0 0065
11-Aug-14	Hydrant Flush,	60003548	348	405594	<0.02	<0 02																							
11-Aug-14	Hydrant Flush Comp.	809	406	405604	<0.02	<0 02	63.8	15.9	7.75	0.5	51	5	9.74	19.4	0.0181	1.83	4.96	1.777	25.8	0.0013	0.0200	21.5	0.1204	16 0	5.09	2.650	27.1	0.0118	0 0882
11-Aug-14	Hydrant Flush,	10471	408	405605	<0.02	<0 02																							
12-Aug-14	Hydrant Flush Comp.	60004530	365	405668	<0.02	<0 02	33.5	17.9	7.22	0.5	41	10	9.24	19.6	0.0070	4.02	4.89	0.3361	26.0	0.0032	0.0040	20.8	0.0273	20.9	4.92	0.4223	26.6	0.0150	0 0076
12-Aug-14	Hydrant Flush,	60004568	364	405669	<0.02	<0 02																							
13-Aug-14	Hydrant Flush Comp.	60003557	371	406131	<0.02	<0.02	60.6	16.1	7 36	0.5	32	>17	8.81	20.2	0.0028	1.85	4.62	0.2325	26.3	0.0025	0.0064	20.3	0.0169	11.6	4.73	0.2966	26.7	0.0116	0 0136
13-Aug-14	Hydrant Flush,	60003531	370	406132	<0.02	<0 02																							
14-Aug-14	Hydrant Flush Comp.	60003663	383	406224	<0.02	<0 02	29.5	17.7	7.60	2.0	13	11	9.02	21.2	0.0009	0.217	5.93	0.0926	31.9	<0.0004	0.0024	21.3	0.0073	5.89	6.23	0.1185	32.8	0.0021	0 0047
14-Aug-14	Hydrant Flush,	60004793	382	406225	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
15-Aug-14	Hydrant Flush Comp.	6219	414	405630	<0.02	<0 02	143	19.0	7.74	1.0	74	3	9.11	21.5	0.0050	1.05	5.90	0.8711	31.4	0.0022	0.0101	21.9	0.0930	22 9	6.11	1.666	31.6	0.0478	0 0458
15-Aug-14	Hydrant Flush,	6229	415	405631	<0.02	<0 02																							
15-Aug-14	Hydrant Flush Comp.	60004877	399	406271	<0.02	<0 02	2.62	20.7	7.70	1.5	<3	6	8.90	22.1	0.0016	0.124	6.11	0.0387	31.2	<0.0004	0.0046	22.5	0.0024	0.315	6.22	0.0410	32.3	<0.0004	0 0057
15-Aug-14	Hydrant Flush,	60004877	398	406272	<0.02	<0 02																							
18-Aug-14	Hydrant Flush Comp.	6237	441	406296	0.04	0 04	8.35	19.3	7.67	2.0	10	8	8.61	23.3	0.0046	0.271	6.07	0.5252	32.0	<0.0004	0.0050	23.7	0.0179	2.76	6.47	0.6013	32.8	0.0012	0 0089
18-Aug-14	Hydrant Flush,	6237	440	406297	<0.02	<0 02																							
18-Aug-14	Hydrant Flush Comp.	70004608	438	406486	<0.02	0 02	52.6	19.7	7.62	2.0	24	11	8.69	21.5	0.0022	0.467	5.94	0.4955	31.1	0.0004	0.0055	21.9	0.0222	8.99	5.98	0.6983	31.5	0.0117	0 0200
18-Aug-14	Hydrant Flush,	60006068	435	406487	<0.02	<0 02																							
19-Aug-14	Hydrant Flush Comp.	4116	449	406497	<0.02	<0 02	57.4	18.2	7.66	1.5	43	<3	9.14	21.7	0.0019	0.636	5.82	0.0995	30.9	<0.0004	0.0033	22.1	0.0100	7.74	5.95	0.2407	31.4	0.0008	0 0056
19-Aug-14	Hydrant Flush,	10314	450	406498	<0.02	<0 02																							
19-Aug-14	Hydrant Flush Comp.	60007043	444	406532	<0.02	<0 02	336	18.4	7.91	0.5	114	5	8.80	21.9	0.0010	0.443	6.03	0.7422	31.4	<0.0004	0.0027	24.8	0.0452	36.2	6.92	1 275	31.5	0.0085	0 0425
19-Aug-14	Hydrant Flush,	60007121	447	406533	<0.02	<0 02																							
20-Aug-14	Hydrant Flush Comp.	10317	459	406918	<0.02	<0 02	27.2	17.7	7.51	1.0	21	6	9.03	22.2	0.0064	1.05	5.85	0.4910	30.8	0.0006	0.0033	22.4	0.0174	4.74	5.89	0.5783	31.5	0.0022	0 0071
20-Aug-14	Hydrant Flush,	10317	460	406919	<0.02	<0 02																							
20-Aug-14	Hydrant Flush Comp.	70003167	464	406929	<0.02	<0 02	4.58	20.7	7.62	2.5	3	8	8.80	22.3	0.0030	0.295	5.85	0.0896	30.5	0.0005	0.0126	22.5	0.0073	0.975	5.97	0.0974	31.0	0.0014	0 0094
20-Aug-14	Hydrant Flush,	60007076	460	406930	<0.02	<0 02																							
21-Aug-14	Hydrant Flush Comp.	6544	466	407006	<0.02	<0 02	140	17.0	7.53	1.0	111	<3	9.06	23.7	0.0086	1.59	5.98	1.654	31.0	0.0005	0.0126	26.4	0.1013	35.1	6.46	3 951	32.8	0.0067	0 0601
21-Aug-14	Hydrant Flush,	4163	468	407007	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
21-Aug-14	Hydrant Flush Comp.	60007102	470	407017	<0.02	<0 02	3.48	18.8	7.92	1.0	<3	4	8.86	23.2	0.0037	0.170	5.86	0.0344	31.1	<0.0004	0.0028	23.4	0.0079	0.822	6.01	0.0975	31.6	<0.0004	0 0035
21-Aug-14	Hydrant Flush,	60007142	475	407018	<0.02	<0 02																							
22-Aug-14	Hydrant Flush Comp.	60001494	482	407115	<0.02	<0 02	19.5	20.2	7.51	0.5	20	12	8.36	22.5	0.0044	0.142	5.92	0.8759	31.0	<0.0004	0.0042	22.8	0.0386	7.67	5.98	1 011	31.2	0.0044	0 0140
22-Aug-14	Hydrant Flush,	60001514	485	407116	<0.02	<0 02																							
22-Aug-14	Hydrant Flush Comp.	4120	474	407126	<0.02	<0.02	76.8	15.8	7.24	1.0	61	11	9.05	18.9	0.0012	0.162	5.22	0.4852	28.0	<0.0004	0.0060	19.9	0.0215	19.7	5.37	0.6189	28.7	0.0011	0 0116
22-Aug-14	Hydrant Flush,	4104	475	407127	<0.02	<0 02																							
25-Aug-14	Hydrant Flush Comp.	862	492	407262	<0.02	<0 02	318	16.0	7.67	2.0	143	NR	8.85	19.0	0.0017	0.213	5.17	0.5061	28.2	<0.0004	0.0066	21.7	0.1301	45.9	6.27	1.806	28.6	0.0126	0.1337
25-Aug-14	Hydrant Flush,	793	496	407263	<0.02	<0 02																							
25-Aug-14	Hydrant Flush Comp.	60000954	511	407289	0.05	0.11	87.6	18.5	7.82	2.0	38	NR	8.73	19.6	0.0016	0.108	5.36	0.2618	27.8	<0.0004	0.0061	19.9	0.0414	24.7	5.48	0.8714	29.2	0.0056	0 0475
25-Aug-14	Hydrant Flush,	60000970	509	407290	<0.02	<0 02																							
26-Aug-14	Hydrant Flush Comp.	1001	503	407311	<0.02	0 02	82.2	15.7	7.84	1.0	80	8	9.36	20.1	0.0056	0.305	5.20	2 343	28.6	<0.0004	0.0071	21.8	0.1630	23.1	5.74	5 851	28.7	0.0059	0 0976
26-Aug-14	Hydrant Flush,	10257	505	407312	<0.02	<0 02																							
26-Aug-14	Hydrant Flush Comp.	60000980	515	407323	<0.02	<0 02	64.4	17.9	7.69	0.5	45	6	8.94	18.9	0.0012	0.112	5.19	0.7364	28.4	<0.0004	0.0036	20.7	0.0549	18.3	5.46	1 089	28.4	0.0139	0 0558
26-Aug-14	Hydrant Flush,	60000934	514	407324	<0.02	<0 02																							
27-Aug-14	Hydrant Flush Comp.	60005426	528	407677	<0.02	<0 02	499	18.9	7.54	1.0	200	7	8.80	19.2	0.0281	2.92	5.15	0.9995	28.3	0.0159	0.0100	19.8	0.2509	27.7	5.26	1.418	28.6	0.1788	0 0652
27-Aug-14	Hydrant Flush,	60005438	530	407678	<0.02	<0 02																							
27-Aug-14	Hydrant Flush Comp.	70004715	509	407689	<0.02	0 02	7.97	16.7	7.71	0.5	16	3	9.00	20.5	0.0065	0.679	5.01	0.3978	27.0	0.0007	0.0047	20.9	0.0147	2.14	5.09	0.4602	27.6	0.0021	0 0082
27-Aug-14	Hydrant Flush,	70004715	510	407690	<0.02	<0 02																							
28-Aug-14	Hydrant Flush Comp.	70003476	519	407774	<0.02	<0 02	65.0	17.0	7.70	2.0	32	<3	9.03	19.9	0.0030	0.560	4.88	0.1581	26.9	<0.0004	0.0036	20.3	0.0276	13.7	5.02	0.6343	27.2	0.0025	0 0154
28-Aug-14	Hydrant Flush,	70003476	520	407775	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
28-Aug-14	Hydrant Flush Comp.	60001368	540	407787	<0.02	<0.02	15.6	18.1	7 58	0.5	9	12	8.88	18.6	0.0081	2.61	5.34	0.2521	26.6	0.0011	0.0048	19.7	0.0113	4.69	5.38	0.2813	27.3	0.0059	0 0055
28-Aug-14	Hydrant Flush,	70000584	542	407788	<0.02	<0 02																							
4-Sep-14	Hydrant Flush Comp.	10405	592	408498	<0.02	<0.02	67.6	15.7	7.53	2.5	39	NR	9.23	19.0	0.0032	0.357	5.13	0.7046	27.2	<0.0004	0.0021	20.0	0.0307	18.1	5.44	1 267	27.1	0.0043	0 0158
4-Sep-14	Hydrant Flush,	1513	591	408499	<0.02	<0 02																							
11-Sep-14	Hydrant Flush Comp.	6637	662	409171	<0.02	<0.02	12.8	14.5	7.73	7.5	9	<3	9.68	20.7	0.0048	0.372	5.60	0.3916	30.4	<0.0004	0.0034	20.8	0.0201	3.86	5.67	0.6163	30.9	0.0007	0 0087
11-Sep-14	Hydrant Flush,	6636	663	409172	<0.02	<0 02																							
12-Sep-14	Hydrant Flush Comp.	3680	675	409246	<0.02	<0 02	101	NA	7.80	13.0	68	<3	9.70	21.3	0.0291	4.35	5.97	1.456	32.0	0.0018	0.0143	22.2	0.0597	8.45	6.27	2.131	32.8	0.0039	0 0315
12-Sep-14	Hydrant Flush,	645	674	409247	<0.02	<0 02																							
15-Sep-14	Hydrant Flush Comp.	5840	700	409400	<0.02	<0 02	8.90	15.0	7.80	6.0	8	<3	9.49	22.2	0.0043	0.427	5.80	0.1549	30.2	0.0005	0.0018	22.6	0.0119	2.38	5.82	0.2049	30.3	0.0017	0 0038
15-Sep-14	Hydrant Flush,	70020753	701	409401	<0.02	<0 02																							
16-Sep-14	Hydrant Flush Comp.	3677	709	409424	<0.02	<0.02	63.4	16.1	7.80	2.5	44	4	9.48	22.0	0.0044	1.16	5.78	0.4935	30.0	<0.0004	0.0017	23.1	0.0287	20.8	6.12	0.8584	30.5	0.0028	0 0141
16-Sep-14	Hydrant Flush,	5192	710	409425	<0.02	<0 02																							
18-Sep-14	Hydrant Flush Comp.	7003297	724	409888	<0.02	<0 02	56.0	13.9	7.71	4.0	35	<3	9.97	22.7	0.0107	5.53	5.79	0.4564	30.8	0.0012	0.0078	23.3	0.0241	12.1	6.25	0.6901	30.7	0.0027	0 0106
18-Sep-14	Hydrant Flush,	5233	725	409889	<0.02	<0 02																							
19-Sep-14	Hydrant Flush Comp.	10637	731	409974	<0.02	<0 02	44.4	15.0	7.62	6.0	31	7	9.66	22.8	0.0083	2.64	5.85	0.5427	30.3	<0.0004	0.0051	23.3	0.0263	15.3	6.06	0.7501	31.1	0.0007	0 0113
19-Sep-14	Hydrant Flush,	NS	NS	409975	NS	NS																							
22-Sep-14	Hydrant Flush Comp.	50002944	77	410168	<0.02	<0 02	15.6	15.4	7.75	11.0	16	<3	10.1	21.6	0.0055	0.202	5.61	0.9343	28.2	<0.0004	0.0029	22.0	0.0369	6.46	5.78	1 258	30.3	0.0023	0 0122
22-Sep-14	Hydrant Flush,	5002651	79	410169	<0.02	<0 02																							

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Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD_5	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
23-Sep-14	Hydrant Flush Comp.	50002664	88	410207	<0.02	<0 02	41.6	15.4	7.79	2.5	47	<3	9.90	21.1	0.0040	0.576	5.60	0.4952	28.1	0.0023	0.0021	21.4	0.0343	22.2	5.79	0.7083	29.1	0.0288	0 0127
23-Sep-14	Hydrant Flush,	50000853	92	410208	<0.02	<0 02																							
25-Sep-14	Hydrant Flush Comp.	70015457	108	410657	<0.02	<0 02	7.39	15.9	7.83	10.0	12	3	9.71	23.2	0.0092	0.441	5.91	0.7792	28.8	0.0005	0.0042	23.3	0.0339	3.94	5.92	1.065	29.5	0.0030	0 0150
25-Sep-14	Hydrant Flush,	50003686	109	410658	<0.02	<0 02																							
30-Sep-14	Hydrant Flush Comp.	70001814	162	410934	<0.02	<0 02	2.56	14.1	7.71	6.0	<3	7	9.95	21.6	0.0039	0.045	5.77	0.2465	29.9	<0.0004	0.0018	23.6	0.0091	0.932	6.17	0.2631	33.0	0.0004	0 0034
30-Sep-14	Hydrant Flush,	70001814	161	410935	<0.02	<0 02																							
2-Oct-14	Hydrant Flush Comp.	50002349	188	411450	<0.02	<0 02	28.1	15.0	7.75	2.0	20	<3	9.72	22.7	0.0044	0.346	5.96	0.3736	32.2	<0.0004	0.0021	23.3	0.0183	3.75	6.04	0.5107	32.7	0.0021	0 0070
2-Oct-14	Hydrant Flush,	50005013	186	411451	<0.02	<0 02																							
3-Oct-14	Hydrant Flush Comp.	70001292	203	411513	<0.02	<0 02	8.87	12.0	7.63	5.0	10	<3	9.78	24.8	0.0092	0.240	6.57	0.9877	34.8	0.0004	0.0030	25.1	0.0430	2.39	6.81	1 248	36.1	0.0057	0 0155
3-Oct-14	Hydrant Flush,	50001667	201	411514	<0.02	<0 02																							
6-Oct-14	Hydrant Flush Comp.	50000108	237	411698	<0.02	<0 02	113	12.9	7.74	4.0	80	7	10.2	22.2	0.0099	1.89	5.10	1.442	28.4	<0.0004	0.0106	23.0	0.0701	28.5	5.36	2.191	31.0	0.0036	0 0640
6-Oct-14	Hydrant Flush,	50000792	235	411699	<0.02	<0 02																							
7-Oct-14	Hydrant Flush Comp.	50002902	249	411731	<0.02	<0 02	17.4	12.4	7.81	5.0	16	3	10.2	22.3	0.0133	0.979	5.34	0.7397	29.8	0.0006	0.0071	22.3	0.0322	3.15	5.35	0.9172	31.0	0.0018	0 0107
7-Oct-14	Hydrant Flush,	70020852	247	411732	<0.02	<0 02																							
9-Oct-14	Hydrant Flush Comp.	70011580	278	412011	<0.02	0 02	15.7	12.1	7.73	2.0	7	5	10.5	20.4	0.0035	0.068	5.05	0.3168	28.7	<0.0004	0.0041	21.6	0.0143	2.43	5.26	0.4188	29.4	0.0012	0 0073
9-Oct-14	Hydrant Flush,	50000317	281	412012	<0.02	0.02																							
10-Oct-14	Hydrant Flush Comp.	50002058	293	412074	<0.02	<0 02	62.2	12.2	7.62	3.0	51	6	10.8	23.1	0.0019	0.266	5.39	0.4704	30.4	<0.0004	0.0042	24.2	0.0218	7.39	6.08	0.6771	30.7	0.0009	0 0258
10-Oct-14	Hydrant Flush,	50002162	295	412075	<0.02	<0 02																							
14-Oct-14	Hydrant Flush Comp.	4851	843	412273	<0.02	<0 02	6.13	11.8	7.98	0.5	8	5	10.4	22.0	0.0027	0.266	5.54	0.0922	29.4	<0.0004	0.0375	22.8	0.0044	1.07	5.98	0.1004	30.2	0.0009	0 0490
14-Oct-14	Hydrant Flush,	10662	845	412274	<0.02	<0 02																							

2014 Water Main Cleaning Program

Laboratory Analysis Report Environmental Monitoring

Date Sampled	Sample Location	Hydrant Number	Sequence Number	Sample Number	Free Chlorine	Total Chlorine	Turbidity	Temperature	pH	True Colour	TSS	BOD$_5$	DO	Soluble Calcium	Soluble Copper	Soluble Iron	Soluble Magnesium	Soluble Manganese	Soluble Sodium	Soluble Lead	Soluble Zinc	Total Calcium	Total Copper	Total Iron	Total Magnesium	Total Manganese	Total Sodium	Total Lead	Total Zinc
					(mg/L)	(mg/L)	(ntu)	(°C)	(units)	(tcu)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
16-Oct-14	Hydrant Flush Comp.	70013554	866	412806	<0.02	<0 02	5.81	13.0	7.86	5.0	3	NR	10.0	20.6	0.0036	0.068	5.05	0.1820	29.7	<0.0004	0.0046	20.7	0.0113	1.41	5.31	0.2279	30.1	0.0015	0 0130
16-Oct-14	Hydrant Flush,	10403	866	412807	<0.02	<0 02																							
17-Oct-14	Hydrant Flush Comp.	532	871	412887	<0.02	<0 02	127	11.8	7.77	2.0	93	12	10.7	20.6	0.0034	0.141	5.20	1 248	29.0	0.0005	0.0037	23.6	0.0918	21 9	6.58	2.038	29.1	0.1112	0 0799
17-Oct-14	Hydrant Flush,	402	868	412888	<0.02	<0 02																							
21-Oct-14	Hydrant Flush Comp.	10507	917	413089	<0.02	<0 02	127	11.8	7.95	2.0	80	4	10.7	22.5	0.0055	0.329	5.30	1 508	27.3	<0.0004	0.0025	25.2	0.1179	12.0	6.30	3.682	27.9	0.0042	0 0994
21-Oct-14	Hydrant Flush,	10203	918	413090	<0.02	<0 02																							
21-Oct-14	Hydrant Flush Comp.	NR	570	413100	<0.02	<0 02	4.45	12.4	7.92	0.5	4	3	10.4	22.4	0.0220	0.290	5.29	0.6057	27.9	0.0011	0.0053	23.1	0.0505	0.986	5.33	0.7232	27.9	0.0041	0 0129
21-Oct-14	Hydrant Flush,	70029277	569	413101	<0.02	<0 02																							
22-Oct-14	Hydrant Flush Comp.	303	931	413525	<0.02	<0 02	17.4	11.7	7.78	5.0	20	5	10.5	22.8	0.0055	0.332	5.38	0.4109	27.5	<0.0004	0.0023	23.7	0.0174	4.28	5.62	0.5052	28.7	0.0016	0 0104
22-Oct-14	Hydrant Flush,	309	932	413526	<0.02	<0 02																							

NOTE: On July 11, 14, 22, and 28, and August 5, 8, 11, 18, 25, 26, and 27, the chlorine was high because the flushing crew were unable to add enough dechlorination chemical during the flush.
On August 5, there was no result for DO due to instrument malfunction.
On August 25 and September 4, there were no results for BOD5 due to QC failure.
On September 12, temperature was not analysed due to technician error.
On September 19, a hydrant flush sample was not taken due to technician error.
On October 16, there was no result for BOD$_5$ due to technician error.
On October 21, there was no number for the hydrant because it has not been assigned.

E4c Household Monitoring Reports 2011-2014

2011 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
26-May-11		1	293007	0.29	0.45	<1	<1	<10	0.16	10.3	7.78	13.0	3.0
26-May-11		1	293008	0.60	0.75	<1	<1	<10	0.57	12.1	7.84	18.0	6.0
26-May-11		1	293009	0.66	0 84	<1	<1	<10	0.25	10.2	7.85	18 0	7.0
26-May-11		1	293010	0.63	0.77	<1	<1	<10	0.72	12 2	7.83	21 0	10.0
26-May-11		2	293011	0.91	1 03	<1	<1	<10	0.39	7.1	7.79	18 0	7.5
26-May-11		2	293012	0.89	1 02	<1	<1	<10	0.71	8.3	7.81	20.0	10.0
26-May-11		2	293013	0.85	0 96	<1	<1	<10	0.19	12.3	7.83	18 0	11.0
26-May-11		2	293014	0.79	0 93	<1	<1	<10	0.73	10.4	7.79	20.0	10.0
27-May-11		9	293332	0.88	1 20	<1	<1	<10	0.20	12 0	7.31	7.5	2.0
27-May-11		9	293333	0.88	1.14	<1	<1	<10	0.24	11.9	7.36	8.0	3.0
27-May-11		9	293336	0.99	1 26	<1	<1	<10	0.47	10.8	7.38	15 0	5.0
27-May-11		9	293337	0.75	1 03	<1	<1	<10	0.22	11.1	7.38	13.0	3.0
27-May-11		10	293338	1.02	1.18	<1	<1	<10	0.16	6.3	7.43	13 0	3.5
27-May-11		10	293339	0.85	1 09	<1	<1	<10	0.27	9.2	7.41	15.0	5.0
27-May-11		10	293340	0.54	0.77	<1	<1	<10	0.50	6.3	7.42	16 0	5.0
27-May-11		10	293341	0.59	0.79	<1	<1	80	0.34	6.3	7.40	16 0	6.0
30-May-11		40	293320	0.62	0.77	<1	<1	<10	1.24	11.5	7.52	18 0	2.5
30-May-11		40	293312	0.63	0 81	<1	<1	<10	7.72	11.5	7.33	20.0	3.0
31-May-11		40	293868	0.65	0 84	NA	NA	NA	0.27	11.0	NA	NA	NA
30-May-11		40	293319	0.65	0.78	<1	<1	<10	1.38	11.8	7.45	15 0	2.0
30-May-11		40	293325	0.65	0 88	<1	<1	<10	2.06	11.2	7.44	22.0	3.0
31-May-11		40	293869	0.70	0 84	NA	NA	NA	0.32	8.6	NA	NA	NA
30-May-11		41	293323	0.69	0 87	<1	<1	<10	0.26	9.7	7.43	13 0	0.5
30-May-11		41	293321	0.70	0 83	<1	<1	<10	0.21	10.6	7.38	18 0	3.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
30-May-11		41	293324	0.58	0.72	<1	<1	<10	0.21	10.1	7.39	15 0	0.5
30-May-11		41	293322	0.82	0 92	<1	<1	<10	0.25	11.0	7.52	16 0	2.5
31-May-11		47	293388	0.68	0 81	<1	<1	10	0.30	9.7	7.74	2.5	0.5
31-May-11		47	293387	0.64	0 82	<1	<1	<10	0.41	12 2	7.73	0.5	0.5
31-May-11		47	293391	0.78	0 93	<1	<1	<10	0.20	10.5	7.79	2.5	0.5
31-May-11		47	293392	0.73	0 83	<1	<1	<10	0.27	12.9	7.79	2.5	0.5
31-May-11		48	293394	0.61	0.74	<1	<1	10	0.30	10.5	7.79	1.0	0.5
31-May-11		48	293393	0.71	0 85	<1	<1	<10	0.22	11 5	7.78	2.5	0.5
31-May-11		48	293395	0.61	0 81	<1	<1	<10	0.23	10 5	7.77	3.5	0.5
31-May-11		48	293396	0.72	0 88	<1	<1	<10	0.35	11.1	7.81	5.0	1.0
1-Jun-11		55	293852	0.39	0 61	<1	<1	<10	0.71	12.7	7.59	13 0	0.5
1-Jun-11		55	293848	0.50	0 68	<1	<1	<10	0.24	12.7	7.42	15 0	3.0
1-Jun-11		60	293849	0.37	0 69	<1	<1	20	0.94	11 6	7.54	18 0	5.0
2-Jun-11		60	293933	0.55	0 69	<1	<1	<10	0.79	12.1	7.49	13 0	2.5
1-Jun-11		55	293856	0.47	0 68	<1	<1	<10	0.39	11 6	7.58	5.0	0.5
1-Jun-11		55	293854	0.45	0.70	<1	<1	<10	1.94	11.7	7.49	13 0	0.5
2-Jun-11		55	293934	0.39	0 56	NA	NA	NA	0.40	10.5	NA	NA	NA
1-Jun-11		60	293855	0.67	0 92	1	<1	<10	1.95	11.5	7.55	17 0	0.5
2-Jun-11		60	293859	0.54	0.78	<1	<1	<10	0.67	12.2	7.46	13 0	2.5
2-Jun-11		63	293898	0.51	0.72	4	<1	<10	0.28	8.5	7.50	15 0	2.5
2-Jun-11		63	293897	0.53	0 68	<1	<1	<10	0.56	8.3	7.44	15 0	0.5
2-Jun-11		63	293901	0.42	0.69	3	<1	<10	0.28	10.1	7.49	13 0	2.5
2-Jun-11		63	293902	0.40	0 62	<1	<1	<10	0.76	9.8	7.54	13 0	2.5
2-Jun-11		64	293904	0.42	0 65	<1	<1	<10	0.28	8.4	7.46	13 0	2.5
2-Jun-11		64	293903	0.47	0.61	<1	<1	<10	0.45	8.6	7.45	13 0	2.5
2-Jun-11		64	293905	0.37	0.66	<1	<1	<10	0.26	9.5	7.51	13 0	2.5
2-Jun-11		64	293906	0.39	0.67	<1	<1	<10	0.37	9.3	7.41	13 0	0.5
3-Jun-11		73	294152	0.59	0 86	<1	<1	<10	0.77	12.7	7.45	13 0	2.5
3-Jun-11		73	294151	0.54	0.77	1	<1	<10	1.77	12.7	7.51	15 0	2.5
6-Jun-11		73	294177	NA	NA	<1	<1	<10	0.30	14.1	NA	NA	NA

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
3-Jun-11		73	294155	0.51	0.76	<1	<1	<10	1.52	9.6	7.43	15 0	0.5
3-Jun-11		73	294156	0.49	0.71	<1	<1	<10	1.67	10.1	7.48	18 0	2.5
6-Jun-11		73	294178	NA	NA	NA	NA	NA	0.24	NA	NA	NA	NA
3-Jun-11		74	294158	0.58	0.79	<1	<1	40	0.40	8.6	7.35	13 0	2.0
3-Jun-11		74	294157	0.41	0.70	<1	<1	170	1.30	8.5	7.44	18.0	2.5
6-Jun-11		74	294179	NA	NA	NA	NA	NA	0.26	NA	NA	NA	NA
3-Jun-11		74	294159	0.74	1 02	<1	<1	<10	0.53	9.3	7.42	13 0	2.5
3-Jun-11		74	294160	0.69	0 99	5	<1	<10	0.43	10.1	7.51	15.0	5.0
6-Jun-11		74	294206	0.48	0.76	<1	<1	<10	0.25	10.1	NA	NA	NA
6-Jun-11		94	294166	0.58	0.78	<1	<1	<10	0.72	11.7	7.40	7.5	0.5
6-Jun-11		94	294167	0.79	0 95	<1	<1	<10	0.26	11.5	7.30	10 0	0.5
6-Jun-11		94	294170	0.61	0 85	<1	<1	10	0.18	12.7	7.43	11 0	2.0
6-Jun-11		94	294171	0.80	0 97	<1	<1	<10	0.23	12.4	7.35	10 0	2.5
6-Jun-11		95	294172	0.48	0 63	<1	<1	<10	0.78	10.4	7.42	15 0	2.5
6-Jun-11		95	294173	0.50	0.73	<1	<1	<10	0.25	10.4	7.39	10.0	2.5
6-Jun-11		95	294174	0.47	0 62	<1	<1	20	0.79	10.3	7.50	5.0	0.5
6-Jun-11		95	294175	0.53	0.77	<1	<1	<10	0.31	10.2	7.42	13.0	4.0
7-Jun-11		106	294590	0.57	0 69	2	<1	30	0.30	10.4	7.55	13 0	2.0
7-Jun-11		106	294584	0.88	1 01	<1	<1	40	2.08	10.3	7.58	75 0	10.0
9-Jun-11		106	294744	NA	NA	NA	NA	NA	0.27	NA	NA	NA	NA
7-Jun-11		106	294591	0.36	0 53	<1	<1	<10	0.33	8.6	7.63	10 0	2.5
7-Jun-11		106	294585	0.42	0 66	<1	<1	<10	0.46	9.9	7.64	10.0	2.5
7-Jun-11		105	294592	0.43	0 59	<1	<1	<10	0.26	11.2	7.56	15 0	4.0
7-Jun-11		105	294588	0.40	0 57	<1	<1	<10	0.45	10.3	7.62	15.0	2.5
7-Jun-11		105	294593	0.29	0 50	<1	<1	<10	0.27	9.7	7.53	15 0	5.0
7-Jun-11		105	294589	0.59	0.75	<1	<1	<10	0.46	10.2	7.70	15.0	4.0
8-Jun-11		116	294635	0.48	0 67	<1	<1	<10	0.22	11 0	7.49	5.0	2.5
9-Jun-11		116	294629	0.65	0 80	<1	<1	<10	0.30	11.2	7.71	2.5	0.5
8-Jun-11		116	294636	0.60	0.71	<1	<1	<10	0.20	11.1	7.47	7.5	2.5
9-Jun-11		116	294630	0.70	0 82	<1	<1	<10	0.31	11.6	7.75	2.5	0.5

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
8-Jun-11		117	294637	0.55	0 69	<1	<1	<10	0.24	9.8	7.41	10 0	5.0
9-Jun-11		117	294633	0.61	0.74	<1	<1	<10	0.27	10.9	7.81	2.5	1.0
8-Jun-11		117	294638	0.60	0.75	<1	<1	<10	0.22	8.6	7.43	7.5	2.5
9-Jun-11		117	294634	0.40	0 54	<1	<1	<10	0.29	8.8	7.79	2.5	0.5
9-Jun-11		122	294651	0.63	0.76	<1	<1	<10	0.33	11.5	7.91	15 0	2.5
9-Jun-11		122	294645	0.29	0 56	<1	<1	<10	0.53	10.7	7.81	13.0	3.0
9-Jun-11		122	294652	0.50	0 65	<1	<1	<10	0.27	11.1	7.76	15 0	5.0
9-Jun-11		122	294646	0.45	0 58	<1	<1	<10	0.36	10.8	7.79	18.0	5.0
9-Jun-11		123	294653	0.50	0 66	<1	<1	<10	0.23	10.8	7.78	15 0	5.0
9-Jun-11		123	294649	0.62	0.72	<1	<1	<10	0.30	11.8	7.69	15.0	4.0
9-Jun-11		123	294654	0.59	0.77	<1	<1	<10	0.26	12.7	7.76	15 0	5.0
9-Jun-11		123	294650	0.49	0.75	<1	<1	<10	0.61	10.9	7.73	18.0	5.0
10-Jun-11		130	294776	0.29	0.45	<1	<1	<10	0.38	9.6	7.55	15 0	5.0
10-Jun-11		130	294770	0.39	0 54	<1	<1	<10	0.33	10.3	7.56	15.0	7.0
10-Jun-11		130	294777	0.34	0.49	<1	<1	<10	0.33	10.1	7.51	15 0	5.0
10-Jun-11		130	294771	0.42	0 60	<1	<1	<10	0.30	10.7	7.48	15.0	7.0
10-Jun-11		131	294778	0.39	0 61	<1	<1	<10	0.28	8.3	7.43	15 0	4.0
10-Jun-11		131	294774	0.49	0 64	<1	<1	<10	0.32	8.9	7.42	13.0	3.0
10-Jun-11		131	294779	0.40	0 57	<1	<1	<10	0.28	9.9	7.44	16 0	5.0
10-Jun-11		131	294775	0.52	0.70	<1	<1	<10	0.34	10.9	7.49	15.0	4.0
13-Jun-11		78	294994	0.23	0 50	<1	<1	<10	0.29	11 3	7.60	11 0	5.0
14-Jun-11		78	294988	0.22	0.47	<1	<1	<10	0.20	12.6	7.39	13 0	6.0
13-Jun-11		78	294995	0.53	0.77	<1	<1	<10	0.16	10.7	7.51	7.0	4.0
14-Jun-11		78	294989	0.51	0 69	<1	<1	<10	0.15	10.9	7.34	10 0	7.5
13-Jun-11		79	294996	0.47	0 69	<1	<1	<10	0.25	10.7	7.50	6.0	2.5
14-Jun-11		79	294992	0.44	0 68	<1	<1	<10	0.20	10 5	7.36	13 0	4.0
13-Jun-11		79	294997	0.40	0 56	<1	<1	<10	0.24	11 3	7.59	8.0	5.0
14-Jun-11		79	294993	0.47	0 69	<1	<1	<10	0.24	10 9	7.48	13 0	7.5
14-Jun-11		156	295330	0.47	0 61	<1	<1	<10	0.39	12.1	7.34	11 0	7.5
14-Jun-11		156	295324	0.58	0.72	<1	<1	<10	0.39	13.9	7.33	13 0	5.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100m L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
14-Jun-11		156	295331	0.35	0 57	<1	<1	<10	0.20	11.8	7.47	15 0	2.5
14-Jun-11		156	295325	0.47	0 61	<1	<1	<10	0.97	12.9	7.37	15.0	5.0
14-Jun-11		157	295332	0.40	0 58	<1	<1	<10	0.19	14.6	7.44	13 0	7.5
14-Jun-11		157	295328	0.57	0.74	<1	<1	<10	0.41	13.6	7.28	13.0	4.0
14-Jun-11		157	295333	0.38	0 52	<1	<1	<10	0.45	13.1	7.47	13 0	2.5
14-Jun-11		157	295329	0.62	0.74	<1	<1	<10	0.39	12.5	7.37	10.0	5.0
15-Jun-11		163	295381	0.43	0 65	<1	<1	<10	0.22	9.2	7.71	15 0	7.5
16-Jun-11		163	295375	0.47	0 68	<1	<1	<10	0.24	9.5	7.47	13 0	5.0
15-Jun-11		163	295382	0.45	0 67	<1	<1	<10	0.19	11 2	7.65	5.0	7.5
16-Jun-11		163	295376	0.67	0 80	<1	<1	<10	0.21	11.3	7.45	15 0	2.5
15-Jun-11		164	295383	0.60	0 88	<1	<1	<10	0.19	9.5	7.65	15 0	10.0
16-Jun-11		164	295379	0.74	0 91	<1	<1	<10	0.21	9.9	7.43	13 0	0.5
15-Jun-11		164	295384	0.50	0.71	<1	<1	10	0.19	9.0	7.67	13 0	10.0
16-Jun-11		164	295380	0.62	0.77	<1	<1	<10	0.21	9.2	7.42	15 0	2.5
16-Jun-11		173	295443	0.46	0 69	<1	<1	<10	0.19	9.2	7.26	13 0	5.0
17-Jun-11		173	295437	0.53	0.73	<1	<1	<10	0.18	10.5	7.43	13.0	5.0
16-Jun-11		173	295444	0.49	0.73	<1	<1	10	0.20	10.5	7.37	14 0	0.5
17-Jun-11		173	295438	0.43	0 66	<1	<1	<10	0.26	9.1	7.06	15.0	6.0
16-Jun-11		174	295445	0.53	0 69	<1	<1	<10	0.23	8.3	7.33	13 0	2.5
17-Jun-11		174	295441	0.71	1.12	<1	<1	<10	0.43	8.9	7.42	10.0	2.5
16-Jun-11		174	295446	0.41	0.74	<1	<1	<10	0.18	9.0	7.38	50 0	10.0
17-Jun-11		174	295442	0.69	1 03	<1	<1	<10	0.16	9.3	7.31	13 0	5.0
17-Jun-11		184	295514	0.40	0 63	<1	<1	20	0.28	10.3	7.46	15 0	5.0
20-Jun-11		184	295508	0.50	0 62	<1	<1	70	0.24	11.5	7.43	13 0	2.5
17-Jun-11		184	295515	0.20	0 25	<1	<1	<10	0.62	10 5	7.80	13 0	4.0
20-Jun-11		184	295509	0.20	0 34	1	<1	20	0.20	12.3	7.46	13 0	3.0
23-Jun-11		184	296153	0.16	0.24	<1	<1	<10	0.29	NA	NA	NA	NA
24-Jun-11		184	296335	0.38	0 55	<1	<1	<10	0.23	NA	NA	NA	NA
17-Jun-11		179	295516	0.23	0.45	<1	1	40	0.30	8.6	7.43	13 0	5.0
17-Jun-11		179	295512	0.30	0 60	<1	<1	10	0.20	8.1	7.44	13.0	5.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
17-Jun-11		179	295517	0.73	0 87	<1	<1	10	0.24	12.2	7.50	10 0	5.0
17-Jun-11		179	295513	0.73	0 87	<1	<1	<10	0.29	12.2	7.43	13.0	5.0
20-Jun-11		143	295685	0.64	0 80	<1	<1	<10	0.21	13.3	7.42	13 0	0.5
20-Jun-11		143	295679	0.28	0.48	<1	<1	<10	0.26	12.7	7.41	10.0	2.5
20-Jun-11		143	295686	0.50	0 66	<1	<1	<10	0.23	11.9	7.47	10 0	0.5
20-Jun-11		143	295680	0.65	0 83	<1	<1	20	0.23	13.3	7.48	10 0	2.0
20-Jun-11		145	295687	0.47	0 60	<1	<1	10	0.29	10.9	7.44	13 0	2.5
20-Jun-11		145	295683	0.59	0.74	<1	<1	<10	0.28	12.5	7.42	13.0	2.5
20-Jun-11		145	295688	0.20	0 32	<1	<1	<10	0.80	11.7	7.46	10 0	2.5
20-Jun-11		145	295684	0.48	0 64	<1	<1	<10	0.27	12.3	7.38	11.0	2.5
21-Jun-11		154	296044	0.39	0 62	<1	<1	<10	0.26	12.9	7.62	7.5	5.0
21-Jun-11		154	296038	0.39	0 50	<1	<1	<10	0.81	12.7	7.53	16 0	5.0
21-Jun-11		154	296045	0.29	0 53	<1	<1	<10	1.23	13.1	7.54	16 0	5.0
21-Jun-11		154	296039	0.43	0 57	<1	<1	<10	0.59	13.0	7.48	13 0	5.0
21-Jun-11		155	296046	0.23	0 37	<1	<1	<10	0.28	13.0	7.55	15 0	5.0
21-Jun-11		155	296042	0.64	0 81	<1	<1	<10	2.90	12.0	7.53	25.0	5.0
22-Jun-11		155	296089	NA	NA	NA	NA	NA	0.33	NA	NA	NA	NA
21-Jun-11		155	296047	0.25	0 39	<1	<1	<10	0.87	10.1	7.60	10 0	5.0
21-Jun-11		155	296043	0.51	0 65	<1	<1	<10	1.87	12.5	7.38	18.0	5.0
22-Jun-11		155	296088	NA	NA	NA	NA	NA	0.28	NA	NA	NA	NA
22-Jun-11		228	296077	0.52	0 62	<1	<1	<10	0.17	11.9	7.30	10.0	2.5
22-Jun-11		228	296071	0.60	0.73	<1	<1	<10	0.18	12.7	7.36	10 0	4.0
22-Jun-11		228	296078	0.60	0.75	<1	<1	20	0.19	11.4	7.32	10 0	5.0
22-Jun-11		228	296072	0.66	0 81	<1	<1	<10	0.16	12.1	7.36	10 0	2.5
22-Jun-11		229	296079	0.57	0.77	20	<1	50	0.24	15.3	7.39	10.0	2.5
22-Jun-11		229	296075	0.64	0 85	<1	<1	<10	0.16	15.4	7.41	5.0	2.0
22-Jun-11		229	296080	0.50	0 69	<1	<1	<10	0.22	11.1	7.26	10 0	2.5
22-Jun-11		229	296076	0.50	0.72	<1	<1	<10	0.16	11.5	7.43	7.5	2.5
23-Jun-11		238	296145	0.42	0 63	<1	<1	<10	0.43	9.6	7.46	13.0	3.0
23-Jun-11		238	296139	0.39	0 57	<1	<1	<10	0.23	11.9	7.36	13 0	2.5

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
23-Jun-11		238	296146	0.30	0 52	<1	<1	<10	0.68	9.9	7.60	13 0	2.5
24-Jun-11		238	296140	0.42	0 66	<1	<1	<10	0.21	12.5	7.57	13.0	5.0
23-Jun-11		239	296147	0.38	0.48	<1	<1	<10	0.37	10.2	7.47	13.0	2.5
24-Jun-11		239	296143	0.38	0 60	<1	<1	<10	0.31	12.3	7.53	13.0	2.5
23-Jun-11		239	296148	0.37	0 53	<1	<1	<10	0.65	10.0	7.58	15.0	2.5
23-Jun-11		239	296144	0.39	0 61	<1	<1	<10	0.30	14.1	7.42	15.0	2.0
24-Jun-11		184	296330	0.34	0.45	<1	<1	<10	0.24	11.4	7.22	10.0	5.0
24-Jun-11		184	296324	0.38	0 56	<1	<1	<10	0.21	12.9	7.43	15 0	7.5
24-Jun-11		184	296331	0.37	0 54	<1	<1	<10	0.26	12.1	7.45	13 0	5.0
24-Jun-11		184	296325	0.40	0 55	<1	<1	10	0.23	13.3	7.56	15.0	5.0
24-Jun-11		185	296332	0.50	0 65	<1	<1	<10	5.59	13 3	7.40	130.0	7.5
24-Jun-11		185	296328	0.33	0 57	<1	<1	10	0.30	14.0	7.47	10.0	7.5
24-Jun-11		185	296333	0.63	0 86	<1	<1	<10	0.25	11 8	7.48	25 0	7.5
24-Jun-11		185	296329	0.40	0 62	<1	<1	<10	0.24	12.3	7.50	10.0	5.0
27-Jun-11		194	296375	0.59	0 81	<1	<1	<10	0.14	11 2	7.54	16 0	10.0
28-Jun-11		194	296369	0.37	0.56	<1	<1	<10	0.15	11.7	7.40	15 0	7.5
27-Jun-11		194	296376	0.51	0.73	1	1	40	0.21	13 3	7.45	16 0	10.0
27-Jun-11		194	296370	0.44	0 67	<1	<1	30	0.24	13.5	7.41	16 0	10.0
27-Jun-11		195	296377	0.55	0.78	<1	<1	20	0.15	12 2	7.44	14 0	10.0
27-Jun-11		195	296373	0.48	0.73	<1	<1	<10	0.23	13.8	7.44	15 0	10.0
27-Jun-11		195	296378	0.49	0 67	<1	<1	10	0.16	13.1	7.45	15 0	13.0
27-Jun-11		195	296374	0.46	0 62	<1	<1	20	0.20	13.5	7.29	13 0	7.5
28-Jun-11		206	296768	0.49	0.71	<1	<1	<10	0.28	13 3	7.52	13 0	5.0
28-Jun-11		206	296762	0.48	0.73	<1	<1	<10	0.17	12.7	7.40	15 0	7.5
28-Jun-11		206	296769	0.38	0 66	<1	<1	<10	0.26	9.8	7.45	15 0	7.5
28-Jun-11		206	296763	0.41	0 56	<1	<1	<10	0.15	9.9	7.36	15 0	5.0
28-Jun-11		205	296770	0.47	0 63	<1	<1	<10	0.21	10.1	7.50	15 0	5.0
28-Jun-11		205	296766	0.39	0 58	<1	<1	<10	0.15	9.8	7.44	15.0	10.0

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28-Jun-11		205	296771	0.44	0 60	<1	<1	<10	0.19	10.5	7.48	15 0	7.5
28-Jun-11		205	296767	0.47	0 57	<1	<1	<10	0.15	10.7	7.42	15.0	7.5
29-Jun-11		220	296816	0.40	0 61	<1	<1	60	0.28	10.1	7.50	18 0	7.5
29-Jun-11		220	296810	0.43	0 66	<1	<1	<10	0.18	9.9	7.49	15.0	5.0
29-Jun-11		220	296817	0.25	0.48	<1	<1	<10	0.36	11.0	7.46	18 0	7.5
29-Jun-11		220	296811	0.23	0.44	<1	<1	<10	0.17	11.6	7.47	13.0	7.5
29-Jun-11		221	296818	0.33	0 54	<1	<1	<10	0.19	11.3	7.45	16 0	7.5
29-Jun-11		221	296814	0.30	0 54	<1	<1	50	0.47	11.5	7.70	13 0	7.5
29-Jun-11		221	296819	0.29	0 50	<1	<1	430	0.22	12.7	7.48	16 0	10.0
30-Jun-11		221	296815	0.53	0.71	<1	<1	<10	0.17	13.3	7.39	10.0	2.5
30-Jun-11		230	296859	0.31	0.43	<1	<1	<10	0.29	14.5	7.49	13.0	2.5
30-Jun-11		230	296855	0.65	0 80	<1	<1	<10	0.22	15.7	7.46	13.0	5.0
30-Jun-11		230	296860	0.25	0.40	<1	<1	<10	0.39	14.9	7.41	15.0	2.0
30-Jun-11		230	296856	0.63	0.77	<1	<1	<10	0.28	16.4	7.47	10.0	5.0
30-Jun-11		231	296857	0.26	0 38	<1	<1	<10	0.38	13.5	7.48	13.0	3.0
30-Jun-11		231	296851	0.62	0 85	<1	<1	<10	0.50	16.2	7.51	13.0	5.0
30-Jun-11		231	296858	0.29	0.43	<1	<1	<10	0.20	13.7	7.40	15.0	2.5
30-Jun-11		231	296852	0.55	0.77	<1	<1	<10	0.48	15.5	7.36	13.0	5.0
4-Jul-11		247	297088	0.18	0 34	<1	<1	<10	0.34	12.8	7.44	10 0	1.0
5-Jul-11		247	297084	0.32	0 50	<1	<1	<10	0.24	13.5	7.44	7.5	2.5
4-Jul-11		246	297087	0.28	0.42	<1	<1	<10	0.19	11.8	7.44	15 0	2.0
5-Jul-11		246	297081	0.37	0.49	<1	<1	<10	0.24	13.1	7.41	7.5	0.5
4-Jul-11		247	297089	0.37	0.44	<1	<1	<10	0.32	11 5	7.47	7.5	2.5
5-Jul-11		247	297085	0.23	0.46	<1	<1	<10	0.26	10.8	7.53	7.5	0.5
4-Jul-11		246	297086	0.30	0.45	<1	<1	<10	0.74	12 0	7.39	10 0	0.5
5-Jul-11		246	297080	0.33	0.49	<1	<1	<10	0.29	13.3	7.44	10.0	1.0
5-Jul-11		333	297450	0.32	0 51	<1	<1	<10	0.19	14.4	7.39	10 0	0.5
5-Jul-11		333	297444	0.68	0.79	<1	<1	<10	0.30	15.1	7.37	10.0	0.5
5-Jul-11		333	297449	0.34	0 52	<1	<1	<10	0.20	14.1	7.41	5.0	0.5
5-Jul-11		333	297443	0.59	0.76	<1	<1	<10	0.18	16.0	7.44	5.0	0.5

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5-Jul-11		332	297451	0.41	0 57	<1	<1	<10	0.17	13.6	7.39	5.0	0.5
5-Jul-11		332	297447	0.71	0 88	<1	<1	<10	0.68	14.4	7.43	15 0	0.5
5-Jul-11		332	297452	0.32	0.42	<1	<1	140	0.18	14.1	7.47	3.0	0.5
5-Jul-11		332	297448	0.72	0 85	<1	<1	<10	0.42	13 9	7.42	7.5	0.5
6-Jul-11		262	297514	0.17	0 26	<1	<1	<10	0.34	12.8	7.36	10 0	0.5
6-Jul-11		262	297510	0.26	0 38	<1	<1	<10	0.42	13.4	7.37	5.0	0.5
6-Jul-11		262	297515	0.18	0 29	<1	<1	<10	0.39	13.3	7.49	10 0	2.0
6-Jul-11		262	297511	0.29	0 38	<1	<1	<10	0.34	12.9	7.52	7.5	2.0
6-Jul-11		261	297513	0.40	0.49	<1	<1	<10	0.18	15.1	7.35	7.5	2.5
6-Jul-11		261	297507	0.12	0 31	<1	<1	<10	0.54	15.4	7.46	10.0	1.0
6-Jul-11		261	297512	0.30	0 52	<1	<1	<10	0.18	15.0	7.31	5.0	0.5
7-Jul-11		261	297506	0.39	0 63	<1	<1	<10	0.48	15.1	7.30	13.0	NA[2]
7-Jul-11		275	297584	0.21	0 29	<1	<1	<10	0.25	11.8	7.45	7.5	NA[2]
8-Jul-11		275	297580	0.31	0.47	<1	<1	<10	0.30	13.1	7.40	5.0	NA[2]
7-Jul-11		275	297585	0.16	0 29	<1	<1	<10	0.23	11.5	7.42	10 0	NA[2]
8-Jul-11		275	297581	0.25	0 38	<1	<1	<10	0.20	12.8	7.41	10 0	NA[2]
7-Jul-11		272	297582	0.16	0 29	<1	<1	<10	0.23	13.1	7.47	10 0	NA[2]
8-Jul-11		272	297576	0.32	0.49	<1	<1	<10	0.32	14.9	7.41	7.5	NA[2]
7-Jul-11		272	297583	0.12	0 27	<1	<1	<10	0.29	12.6	7.41	5.0	NA[2]
8-Jul-11		272	297577	0.35	0.45	<1	<1	<10	0.34	15.1	7.40	10 0	NA[2]
8-Jul-11		280	297652	0.31	0 39	<1	<1	<10	0.27	10.8	7.42	10 0	NA[2]
11-Jul-11		280	297648	0.35	0 57	<1	<1	<10	0.23	12.2	7.58	5.0	NA[2]
8-Jul-11		280	297653	0.34	0.42	<1	<1	20	0.22	12.2	7.39	10.0	NA[2]
11-Jul-11		280	297649	0.40	0 66	<1	<1	<10	0.25	12.5	7.47	5.0	NA[2]
8-Jul-11		281	297650	0.24	0 37	<1	<1	<10	0.24	12.5	7.40	10 0	NA[2]
11-Jul-11		281	297644	0.43	0 55	<1	<1	<10	0.21	12.8	7.33	5.0	NA[2]
8-Jul-11		281	297651	0.30	0.44	<1	<1	<10	0.26	12.1	7.47	7.5	NA[2]
11-Jul-11		281	297645	0.33	0 52	<1	<1	<10	0.23	12.6	7.55	5.0	NA[2]

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12-Jul-11		300	298176	0.41	0 63	<1	<1	<10	0.29	10.7	7.44	5.0	NA[2]
12-Jul-11		300	298170	0.46	0 64	<1	<1	<10	0.27	10.9	7.61	5.0	NA[2]
12-Jul-11		300	298177	0.38	0 60	<1	<1	250	0.22	10.3	7.48	5.0	NA[2]
12-Jul-11		300	298171	0.34	0 55	<1	<1	<10	0.28	11.5	7.56	5.0	NA[2]
12-Jul-11		301	298179	0.55	0 83	<1	<1	20	0.23	10.8	7.50	5.0	NA[2]
13-Jul-11		301	298175	0.62	0.78	<1	<1	<10	0.34	10.5	7.39	5.0	NA[2]
12-Jul-11		301	298178	0.23	0.40	<1	<1	<10	0.24	11.2	7.52	5.0	NA[2]
13-Jul-11		301	298174	0.25	0.40	<1	<1	<10	0.23	11.4	7.43	6.0	NA[2]
13-Jul-11		309	298204	0.62	0 88	<1	<1	<10	0.45	10.7	7.34	7.5	2.5
13-Jul-11		309	298198	0.65	0 90	<1	<1	<10	0.54	10.5	7.31	15.0	4.0
13-Jul-11		309	298205	0.71	0 89	<1	<1	<10	0.25	10.9	7.36	5.0	2.5
13-Jul-11		309	298199	0.74	0 93	<1	<1	<10	0.66	10.9	7.32	15.0	5.0
13-Jul-11		310	298207	0.47	0 56	<1	<1	<10	0.34	11.7	7.75	5.0	2.5
13-Jul-11		310	298203	0.43	0 58	<1	<1	<10	0.84	11.5	7.28	15.0	2.5
13-Jul-11		310	298206	0.34	0 58	<1	<1	<10	0.21	11 3	7.01	6.0	2.5
13-Jul-11		310	298202	0.31	0 50	<1	<1	<10	0.89	11.6	7.35	15.0	5.0
14-Jul-11		320	298257	0.56	0.77	<1	<1	<10	0.20	10 9	7.39	13 0	2.5
14-Jul-11		320	298251	0.48	0.78	<1	<1	<10	0.36	11.2	7.47	10 0	2.5
14-Jul-11		320	298256	0.69	0 85	<1	<1	<10	0.20	10.7	7.35	15 0	2.5
14-Jul-11		320	298250	0.65	0 87	<1	<1	<10	0.51	10.9	7.58	7.5	2.5
14-Jul-11		321	298258	0.38	0 56	<1	<1	<10	0.26	9.8	7.27	13 0	1.0
14-Jul-11		321	298254	0.37	0 53	<1	<1	<10	0.76	11.9	7.40	13.0	2.5
14-Jul-11		321	298259	0.33	0 50	<1	<1	<10	0.25	9.3	7.40	7.5	1.0
14-Jul-11		321	298255	0.28	0.47	<1	<1	<10	1.35	11.2	7.44	13.0	2.5
15-Jul-11		321	298353	NA	NA	NA	NA	NA	0.33	NA	NA	NA	NA
15-Jul-11		330	298350	0.70	0 88	<1	<1	<10	0.22	11.7	7.32	10 0	2.5
15-Jul-11		330	298346	0.73	0 89	<1	<1	<10	0.22	12.3	7.39	10 0	2.5
15-Jul-11		330	298351	0.70	0 93	<1	<1	<10	0.21	13.9	7.33	10 0	5.0
15-Jul-11		330	298347	0.66	0 84	<1	<1	<10	0.20	13.8	7.46	10 0	5.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
15-Jul-11		329	298349	0.63	0 86	<1	<1	<10	0.31	12.5	7.43	7.5	2.5
15-Jul-11		329	298343	0.68	0 82	<1	<1	10	0.32	12 9	7.39	10 0	2.5
15-Jul-11		329	298348	0.61	0 85	<1	<1	<10	0.19	11.8	7.38	10 0	2.5
15-Jul-11		329	298342	0.58	0 83	<1	<1	<10	0.44	12.7	7.31	15 0	5.0
18-Jul-11		360	298536	0.51	0 68	<1	<1	<10	0.28	15.1	7.54	5.0	0.5
18-Jul-11		360	298530	0.54	0.79	<1	<1	<10	0.52	19.6	7.64	16.0	2.5
18-Jul-11		360	298537	0.51	0 65	<1	<1	<10	0.24	18.0	7.46	7.5	2.5
18-Jul-11		360	298531	0.63	0.71	<1	<1	<10	0.37	20.2	7.45	18.0	5.0
18-Jul-11		361	298538	0.39	0 55	<1	<1	10	0.26	13.5	7.45	5.0	0.5
18-Jul-11		361	298534	0.61	0 81	<1	<1	<10	0.54	17.7	7.48	15 0	2.5
18-Jul-11		363	298539	0.24	0 39	<1	<1	<10	1.65	13 0	7.53	25 0	2.5
18-Jul-11		363	298535	0.30	0.46	<1	<1	<10	7.90	15.0	7.40	50.0	0.5
19-Jul-11		363	298912	NA	NA	NA	NA	NA	0.45	NA	NA	NA	NA
19-Jul-11		369	298907	0.54	0.72	<1	<1	<10	0.28	17.4	7.39	10.0	1.0
19-Jul-11		369	298901	0.81	0 91	<1	<1	<10	0.37	19.2	7.30	13.0	1.0
19-Jul-11		369	298908	0.53	0.72	<1	<1	<10	0.32	17.3	7.36	5.0	0.5
19-Jul-11		369	298902	0.74	0 88	<1	<1	<10	0.36	18.7	7.28	13.0	1.0
19-Jul-11		370	298909	0.66	0 88	<1	<1	<10	0.28	19.9	7.36	10.0	0.5
19-Jul-11		370	298905	0.65	0 83	<1	<1	<10	0.37	18.4	7.38	13 0	1.0
19-Jul-11		370	298906	0.70	0 86	<1	<1	<10	0.40	20.2	7.45	13 0	2.5
19-Jul-11		370	298910	0.66	0 81	<1	<1	<10	0.31	18.4	7.25	7.5	0.5
20-Jul-11		380	299052	0.61	0 81	<1	<1	<10	0.18	15.7	7.37	7.5	2.5
20-Jul-11		380	299048	0.43	0 69	<1	<1	<10	0.57	19.5	7.43	15.0	2.5
20-Jul-11		379	299049	0.68	0 88	<1	<1	<10	0.19	15.0	7.45	10.0	1.0
20-Jul-11		379	299043	0.53	0 69	<1	<1	<10	0.43	18.1	7.49	13 0	1.0
20-Jul-11		379	299050	0.54	0 84	<1	<1	<10	0.24	14.0	7.35	5.0	0.5
20-Jul-11		379	299044	0.65	0 82	<1	<1	<10	0.38	17.4	7.35	15 0	2.5
20-Jul-11		380	299051	0.54	0 83	<1	<1	<10	0.20	16.2	7.45	7.5	0.5
20-Jul-11		380	299047	0.52	0.71	<1	<1	<10	0.24	19.2	7.43	7.5	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
21-Jul-11		388	299102	0.26	0.41	<1	<1	<10	0.26	16.1	7.41	5.0	0.5
21-Jul-11		388	299096	0.27	0.43	<1	<1	<10	0.40	17.4	7.26	10.0	0.5
21-Jul-11		388	299103	0.31	0.44	<1	<1	<10	1.11	15.7	7.36	15.0	2.5
21-Jul-11		388	299097	0.22	0 39	<1	<1	<10	0.83	16.5	7.28	13.0	1.0
21-Jul-11		389	299104	0.35	0.48	<1	<1	<10	1.20	17.3	7.43	7.5	1.0
22-Jul-11		389	299100	0.40	0.73	<1	<1	<10	0.41	15.2	7.45	7.5	1.0
21-Jul-11		389	299105	0.37	0 50	<1	<1	<10	1.22	17.2	7.32	7.5	2.5
22-Jul-11		389	299101	0.38	0 56	<1	<1	<10	0.19	13.7	7.46	5.0	1.0
22-Jul-11		400	299131	0.30	0.46	<1	<1	<10	0.34	13.7	7.46	7.5	1.0
25-Jul-11		400	299125	0.31	0 52	<1	<1	<10	0.19	13.5	7.47	6.0	1.0
22-Jul-11		400	299132	0.26	0 36	<1	<1	<10	0.43	13.1	7.48	10 0	2.5
25-Jul-11		400	299126	0.31	0.48	<1	<1	<10	0.24	13.8	7.58	5.0	1.0
22-Jul-11		402	299134	0.35	0 50	<1	<1	<10	0.29	12.4	7.47	5.0	1.0
25-Jul-11		402	299130	0.47	0 66	<1	<1	10	0.52	12.6	7.07	6.0	1.0
22-Jul-11		402	299133	0.20	0 35	<1	<1	<10	0.47	12.7	7.53	5.0	0.5
25-Jul-11		402	299129	0.36	0 54	<1	<1	30	0.42	13.2	7.67	5.0	2.0
25-Jul-11		411	299345	0.63	0 97	<1	<1	<10	0.24	16.8	7.38	5.0	2.5
25-Jul-11		411	299341	0.67	1 03	<1	<1	<10	0.18	16.9	7.51	6.0	1.0
25-Jul-11		410	299344	0.73	1 00	1	<1	<10	0.57	14.7	7.36	5.0	2.0
25-Jul-11		410	299338	0.69	0 92	<1	<1	<10	0.37	15.3	7.41	5.0	1.0
25-Jul-11		410	299343	0.40	0 63	<1	<1	<10	0.29	14.5	7.30	5.0	2.5
25-Jul-11		410	299337	0.53	0 69	<1	<1	50	0.27	15.5	7.53	5.0	2.5
25-Jul-11		411	299346	0.55	0.75	<1	<1	<10	0.23	16.6	7.35	5.0	1.0
25-Jul-11		411	299342	0.60	0 81	<1	<1	<10	0.30	17.1	7.44	5.0	1.0
26-Jul-11		420	299664	0.58	0 83	<1	<1	<10	2.83	18.3	7.34	25.0	2.5
26-Jul-11		420	299660	0.64	0 87	<1	<1	<10	0.50	18.3	7.40	5.0	2.5
26-Jul-11		420	299663	0.30	0.47	<1	<1	<10	0.10	17.8	7.27	2.5	2.0
26-Jul-11		420	299659	0.31	0 55	<1	<1	<10	0.18	17.7	7.38	5.0	2.5
26-Jul-11		419	299661	0.36	0 55	<1	<1	<10	0.98	13.6	7.25	7.5	2.0
26-Jul-11		419	299655	0.42	0 60	<1	<1	<10	0.66	14.0	7.11	5.0	2.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
26-Jul-11	[redacted]	419	299662	0.44	0.79	<1	<1	<10	1.89	13.3	7.37	18.0	2.0
26-Jul-11	[redacted]	419	299656	0.48	0 82	<1	<1	<10	0.28	13.5	7.37	6.0	2.0
27-Jul-11	[redacted]	430	299726	0.30	0.45	<1	<1	<10	0.34	14.7	7.60	2.5	1.0
27-Jul-11	[redacted]	430	299720	0.28	0.47	1	<1	10	0.22	14.4	7.62	2.5	1.0
29-Jul-11	[redacted]	430	299838	0.45	0.68	<1	<1	20	0.28	15.1	NA	NA	NA
27-Jul-11	[redacted]	431	299728	0.15	0 27	<1	<1	<10	0.27	16.5	7.65	2.5	1.0
27-Jul-11	[redacted]	431	299724	0.16	0 32	<1	<1	10	0.29	16.7	7.61	2.5	1.0
27-Jul-11	[redacted]	431	299725	0.34	0.49	<1	<1	<10	0.61	17 2	7.52	2.5	1.0
27-Jul-11	[redacted]	431	299729	0.20	0 38	<1	<1	<10	0.40	16.7	7.50	2.5	1.0
27-Jul-11	[redacted]	430	299727	0.25	0.41	<1	<1	140	0.35	14.3	7.60	5.0	1.0
27-Jul-11	[redacted]	430	299721	0.22	0 36	<1	<1	340	0.24	14.3	7.53	2.5	1.0
28-Jul-11	[redacted]	441	299789	0.20	0.45	<1	<1	90	0.29	17 2	7.39	5.0	1.0
28-Jul-11	[redacted]	441	299783	0.22	0.43	<1	<1	<10	0.30	17.8	7.54	5.0	1.0
28-Jul-11	[redacted]	442	299791	0.44	0.71	<1	<1	<10	0.23	16.9	7.38	5.0	1.0
28-Jul-11	[redacted]	442	299787	0.56	0.78	<1	<1	30	0.38	17.2	7.30	5.0	1.0
28-Jul-11	[redacted]	442	299790	0.30	0 56	<1	<1	60	0.40	18.1	7.31	5.0	1.0
28-Jul-11	[redacted]	442	299786	0.32	0 61	<1	<1	20	0.74	18.7	7.41	5.0	2.5
28-Jul-11	[redacted]	441	299788	0.32	0.76	<1	<1	1400	0.63	18 9	7.37	2.5	1.0
28-Jul-11	[redacted]	441	299782	0.25	0 66	<1	<1	<10	0.73	19.1	7.19	5.0	1.0
2-Aug-11	[redacted]	441	300281	0.15	0 23	<1	<1	<10	0.40	19.7	NA	NA	NA
29-Jul-11	[redacted]	452	299834	0.49	0.73	<1	<1	<10	2.61	15.5	7.42	16 0	1.0
29-Jul-11	[redacted]	452	299830	0.43	0 69	<1	<1	<10	0.63	16.9	7.36	5.0	1.0
29-Jul-11	[redacted]	452	299835	0.23	0.41	<1	<1	<10	2.45	15.3	7.41	25 0	1.0
29-Jul-11	[redacted]	452	299831	0.25	0.44	<1	<1	<10	0.20	16.7	7.43	5.0	1.0
29-Jul-11	[redacted]	451	299832	0.42	0 68	<1	<1	<10	0.31	16.2	7.36	5.0	1.0
29-Jul-11	[redacted]	451	299826	0.49	0.73	<1	<1	<10	0.49	16.8	7.34	5.0	1.0
29-Jul-11	[redacted]	451	299833	0.27	0.43	<1	<1	<10	0.29	14.6	7.38	2.5	1.0
29-Jul-11	[redacted]	451	299827	0.35	0.46	<1	<1	<10	0.50	16.1	7.41	5.0	1.0
4-Aug-11	[redacted]	449	300397	0.40	0 55	<1	<1	<10	0.17	15.2	7.45	7.5	2.5
4-Aug-11	[redacted]	449	300391	0.41	0 54	<1	<1	<10	0.46	17.0	7.43	16.0	2.5

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4-Aug-11		449	300398	0.39	0 51	<1	<1	<10	0.21	17.5	7.50	5.0	1.0
4-Aug-11		449	300392	0.35	0 51	<1	<1	<10	0.62	19.1	7.49	15 0	2.5
4-Aug-11		450	300399	0.32	0 53	<1	<1	<10	0.25	15.7	7.57	7.5	2.5
4-Aug-11		450	300395	0.40	0 51	<1	<1	<10	0.41	18.6	7.54	13 0	2.5
4-Aug-11		450	300400	0.29	0 38	<1	<1	<10	0.25	15 3	7.53	7.5	2.0
4-Aug-11		450	300396	0.40	0 51	<1	<1	<10	0.49	18.0	7.56	10 0	2.5
5-Aug-11		460	300566	0.48	0 59	<1	<1	<10	0.18	15.4	7.60	10 0	1.0
5-Aug-11		460	300560	0.33	0 53	<1	<1	<10	0.37	16.5	7.58	15 0	2.5
5-Aug-11		460	300567	0.28	0.42	<1	<1	<10	0.17	17 2	7.56	13 0	2.0
5-Aug-11		460	300561	0.37	0 59	<1	<1	<10	0.40	17.0	7.61	15 0	2.5
5-Aug-11		461	300568	0.30	0.48	<1	<1	<10	0.21	17.1	7.53	13 0	2.5
5-Aug-11		461	300564	0.47	0.71	<1	<1	<10	0.44	16.9	7.51	16 0	5.0
5-Aug-11		461	300569	0.29	0.41	<1	<1	<10	0.24	16 5	7.71	13 0	0.5
5-Aug-11		461	300565	0.65	0.75	<1	<1	<10	0.45	18.3	7.65	16 0	2.5
8-Aug-11		500	300666	0.48	0 62	<1	<1	<10	0.18	16 6	7.55	5.0	1.0
9-Aug-11		500	300660	0.58	0.73	<1	<1	<10	0.34	17 2	7.46	5.0	1.0
8-Aug-11		500	300667	0.56	0 67	<1	<1	<10	0.20	17 3	7.74	5.0	1.0
9-Aug-11		500	300661	0.60	0.75	<1	<1	<10	0.59	17.7	7.68	5.0	2.5
8-Aug-11		501	300668	0.38	0 59	<1	<1	<10	0.22	18.6	7.70	5.0	2.0
9-Aug-11		501	300664	0.42	0 62	<1	<1	<10	0.33	18.0	7.59	5.0	2.0
8-Aug-11		501	300669	0.48	0 69	<1	<1	<10	0.19	17.9	7.48	5.0	2.5
9-Aug-11		501	300665	0.50	0.72	<1	<1	<10	0.44	17.6	7.52	5.0	1.0
9-Aug-11		500	301058	0.29	0 39	<1	<1	<10	0.24	17.4	7.64	6.0	2.5
10-Aug-11		500	301052	0.39	0 52	<1	<1	260	0.28	17 5	7.45	5.0	2.0
9-Aug-11		500	301057	0.24	0 36	<1	<1	<10	0.25	15.5	7.46	5.0	2.0
10-Aug-11		500	301051	0.32	0 51	<1	<1	<10	0.21	17.4	7.60	5.0	1.0
9-Aug-11		501	301059	0.45	0 58	<1	<1	<10	0.20	15.4	7.51	5.0	2.0
10-Aug-11		501	301055	0.43	0 63	1	<1	<10	0.22	16.6	7.53	5.0	2.0
15-Aug-11		501	301349	0.50	0.66	<1	<1	<10	NA	15.1	NA	NA	NA

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9-Aug-11		501	301060	0.48	0 61	<1	<1	10	0.21	15.0	7.46	4.0	1.0
10-Aug-11		501	301056	0.55	0 67	<1	<1	10	0.23	16.3	7.47	5.0	2.0
10-Aug-11		511	301108	0.11	0 22	<1	<1	<10	0.30	15 5	7.46	5.0	1.0
11-Aug-11		511	301102	0.05	0.19	<1	<1	<10	0.35	14.4	7.49	5.0	1.0
10-Aug-11		511	301109	0.12	0 22	<1	<1	<10	0.30	15 6	7.42	5.0	1.0
11-Aug-11		511	301103	0.06	0 20	<1	<1	<10	0.35	13.6	7.50	5.0	1.0
10-Aug-11		512	301111	0.15	0 21	<1	<1	<10	0.49	15.2	7.42	5.0	1.0
11-Aug-11		512	301107	0.10	0 20	<1	<1	10	0.41	14.3	7.43	5.0	2.0
10-Aug-11		512	301110	0.12	0 21	<1	<1	<10	0.30	14.4	7.45	5.0	1.0
11-Aug-11		512	301106	0.08	0.18	<1	<1	10	0.36	14.5	7.58	5.0	2.0
11-Aug-11		518	301153	0.10	0 21	<1	<1	<10	0.41	15 9	7.58	5.0	1.0
11-Aug-11		518	301147	0.09	0 24	<1	<1	<10	0.42	18.1	7.59	5.0	1.0
11-Aug-11		518	301152	0.11	0 22	1	<1	190	0.34	16 2	7.52	5.0	2.0
11-Aug-11		518	301146	0.08	0 26	<1	<1	<10	0.40	18 3	7.69	5.0	1.0
11-Aug-11		519	301154	0.08	0 25	<1	<1	<10	0.40	15 5	7.50	5.0	1.0
11-Aug-11		519	301150	0.12	0 26	<1	<1	10	0.39	17.3	7.60	5.0	1.0
11-Aug-11		519	301155	0.09	0 21	<1	<1	<10	0.39	15.7	7.50	5.0	1.0
11-Aug-11		519	301151	0.15	0 32	<1	<1	<10	0.37	18.0	7.68	5.0	2.0
12-Aug-11		530	301326	0.15	0 24	<1	<1	10	0.30	14 2	7.53	5.0	2.0
12-Aug-11		530	301320	0.14	0 24	<1	<1	<10	0.46	15.7	7.56	5.0	1.0
12-Aug-11		530	301327	0.12	0 24	<1	<1	<10	0.29	14 0	7.57	5.0	2.5
12-Aug-11		530	301321	0.11	0 21	<1	<1	20	0.61	15.3	7.49	5.0	2.0
12-Aug-11		531	301328	0.14	0 27	<1	<1	<10	0.30	16.1	7.78	5.0	2.0
12-Aug-11		531	301324	0.11	0 20	<1	<1	<10	0.56	15 9	7.77	5.0	2.0
12-Aug-11		531	301329	0.18	0 28	<1	<1	40	0.28	16 3	7.58	5.0	2.5
12-Aug-11		531	301325	0.15	0 25	<1	<1	<10	0.45	16.4	7.53	5.0	2.0
15-Aug-11		560	301344	0.35	0.50	<1	<1	<10	0.34	15 3	7.71	5.0	1.0
16-Aug-11		560	301338	0.31	0 52	<1	<1	<10	0.25	16.4	7.57	5.0	1.0
15-Aug-11		560	301345	0.39	0.57	<1	<1	<10	0.69	16.1	7.56	10 0	2.0
16-Aug-11		560	301339	0.30	0.48	<1	<1	<10	0.26	16 2	7.57	5.0	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
15-Aug-11		561	301346	0.48	0 59	<1	<1	50	0.30	15.9	7.53	5.0	2.5
16-Aug-11		561	301342	0.35	0 55	<1	<1	<10	0.23	16.4	7.58	5.0	2.0
15-Aug-11		561	301347	0.48	0 62	<1	<1	<10	0.33	16.1	7.57	5.0	2.0
16-Aug-11		561	301343	0.33	0 54	66	<1	2100	0.25	16.0	7.45	5.0	1.0
19-Aug-11		561	301858	0.32	0.44	<1	<1	<10	0.31	16.7	NA	NA	NA
16-Aug-11		572	301702	0.23	0 36	<1	<1	<10	0.24	14.4	7.64	6.0	2.0
17-Aug-11		572	301698	0.36	0 50	<1	<1	<10	0.20	14.7	7.62	5.0	2.5
16-Aug-11		572	301701	0.23	0.40	<1	<1	30	0.34	14.3	7.64	6.0	1.0
17-Aug-11		572	301697	0.35	0 52	<1	<1	<10	0.31	15.0	7.58	5.0	2.0
16-Aug-11		571	301699	0.29	0 38	4	<1	140	0.24	14.0	7.65	5.0	1.0
17-Aug-11		571	301693	0.24	0 36	<1	<1	<10	0.24	15.2	7.76	5.0	2.5
16-Aug-11		571	301700	0.18	0 29	<1	<1	<10	0.20	13 2	7.66	5.0	1.0
17-Aug-11		571	301694	0.32	0.44	<1	<1	<10	0.22	14.9	7.74	5.0	2.5
17-Aug-11		578	301748	0.10	0 21	<1	<1	<10	0.42	15 0	7.62	5.0	2.0
17-Aug-11		578	301742	0.11	0 27	<1	<1	<10	0.40	13.2	7.53	7.5	2.5
17-Aug-11		578	301749	0.11	0 22	<1	<1	<10	0.27	16.2	7.61	5.0	2.5
17-Aug-11		578	301743	0.13	0 24	<1	<1	<10	0.32	14.6	7.55	5.0	2.5
17-Aug-11		579	301750	0.13	0 23	<1	<1	<10	0.26	15.5	7.62	5.0	2.5
17-Aug-11		579	301746	0.18	0 26	<1	<1	<10	0.70	14.7	7.67	15.0	2.5
17-Aug-11		579	301751	0.12	0 25	<1	<1	<10	0.27	16.0	7.53	5.0	2.5
17-Aug-11		579	301747	0.14	0 28	<1	<1	<10	0.35	15.0	7.43	5.0	2.5
18-Aug-11		588	301819	0.10	0 23	<1	<1	<10	0.29	14 6	7.67	5.0	2.0
19-Aug-11		588	301813	0.18	0 32	<1	<1	<10	0.30	15.0	7.81	5.0	1.0
18-Aug-11		588	301820	0.14	0 20	<1	<1	<10	0.28	13 6	7.63	5.0	2.5
19-Aug-11		588	301814	0.16	0 31	<1	<1	<10	0.31	14.0	7.73	5.0	2.0
18-Aug-11		589	301821	0.11	0.18	<1	<1	<10	0.33	14 6	7.71	5.0	2.5
19-Aug-11		589	301817	0.12	0 22	<1	<1	<10	0.40	14.6	7.77	5.0	1.0
18-Aug-11		589	301822	0.12	0 20	2	<1	<10	0.33	15.5	7.63	5.0	2.5
19-Aug-11		589	301818	0.13	0 22	<1	<1	<10	0.39	14.7	7.74	5.0	1.0

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19-Aug-11		595	301831	0.11	0 22	<1	<1	<10	0.34	14.2	7.61	7.5	1.0
19-Aug-11		595	301825	0.11	0.19	<1	<1	<10	0.30	13.8	7.61	5.0	1.0
19-Aug-11		595	301832	0.11	0 23	<1	<1	<10	0.30	14.4	7.64	5.0	1.0
19-Aug-11		595	301826	0.11	0 23	<1	<1	<10	0.45	14.4	7.62	7.5	1.0
19-Aug-11		596	301834	0.12	0 21	<1	<1	<10	0.32	14.4	7.54	5.0	1.0
19-Aug-11		596	301830	0.10	0 22	<1	<1	<10	0.31	15.0	7.56	5.0	1.0
19-Aug-11		596	301833	0.12	0 20	<1	<1	<10	0.31	14 8	7.70	5.0	1.0
19-Aug-11		596	301829	0.12	0 24	<1	<1	<10	0.32	14.5	7.61	5.0	1.0
22-Aug-11		609	302072	0.55	0.73	<1	<1	<10	2.71	20.5	7.55	18.0	2.0
23-Aug-11		609	302066	0.39	0 64	<1	<1	<10	0.18	20.5	7.43	5.0	2.0
22-Aug-11		609	302071	0.61	0.79	<1	<1	<10	0.26	20.6	7.41	5.0	1.0
23-Aug-11		609	302065	0.50	0.72	<1	<1	<10	0.21	19.4	7.35	5.0	2.0
22-Aug-11		613	302074	0.45	0 67	<1	<1	40	0.21	20.9	7.52	7.5	2.0
23-Aug-11		613	302070	0.49	0 63	<1	<1	<10	0.19	21.0	7.46	5.0	1.0
22-Aug-11		613	302073	0.49	0 65	<1	<1	20	0.66	22 2	7.48	10 0	2.0
23-Aug-11		613	302069	0.45	0 67	<1	<1	<10	0.18	20.2	7.43	5.0	2.0
23-Aug-11		619	302471	0.53	0.76	118	<1	<10	0.45	18.1	7.49	7.5	2.0
24-Aug-11		619	302465	0.59	0.74	<1	<1	<10	0.17	17.5	7.06	5.0	2.0
23-Aug-11		619	302470	0.46	0 86	<1	<1	20	0.20	17.5	7.52	5.0	2.0
24-Aug-11		619	302464	0.62	0.76	<1	<1	<10	0.19	17.3	7.00	5.0	1.0
23-Aug-11		621	302472	0.47	0 60	<1	<1	<10	0.17	18.3	7.54	5.0	1.0
24-Aug-11		621	302468	0.45	0 65	<1	<1	<10	0.24	18.0	7.01	5.0	1.0
23-Aug-11		621	302473	0.44	0 61	1	<1	390	0.18	18.0	7.55	5.0	2.0
24-Aug-11		621	302469	0.49	0 66	<1	<1	<10	0.25	17.3	7.06	5.0	1.0
24-Aug-11		631	302518	0.37	0 54	<1	<1	<10	0.15	17.4	7.05	5.0	1.0
25-Aug-11		631	302512	0.35	0 58	<1	<1	<10	0.21	15.7	7.41	5.0	2.0
24-Aug-11		631	302519	0.45	0 60	<1	<1	10	0.15	16.7	7.10	5.0	1.0
25-Aug-11		631	302513	0.41	0 61	<1	<1	<10	0.17	16.2	7.38	5.0	1.0
24-Aug-11		632	302520	0.31	0.49	<1	<1	<10	0.15	16.6	7.03	5.0	2.0
25-Aug-11		632	302516	0.36	0 52	<1	<1	<10	0.21	15.9	7.23	6.0	2.0

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24-Aug-11		632	302521	0.38	0 57	<1	<1	<10	0.15	17.4	7.01	6.0	2.0
25-Aug-11		632	302517	0.40	0 58	<1	<1	<10	0.30	16.3	7.28	5.0	1.0
25-Aug-11		638	302542	0.72	0 91	<1	<1	<10	0.16	18 3	7.27	5.0	1.0
26-Aug-11		638	302536	0.68	0 85	<1	<1	<10	0.17	16.8	7.47	7.5	2.5
25-Aug-11		638	302543	0.82	0 97	<1	<1	<10	0.19	18 5	7.28	6.0	2.0
26-Aug-11		638	302537	0.73	0 89	<1	<1	<10	0.19	17.4	7.41	7.5	2.0
25-Aug-11		639	302544	0.49	0 68	<1	<1	<10	0.20	19.1	7.32	5.0	1.0
26-Aug-11		639	302540	0.51	0 68	<1	<1	<10	0.18	18.3	7.54	7.5	2.5
25-Aug-11		639	302545	0.49	0 69	<1	<1	<10	0.26	18 8	7.38	6.0	1.0
26-Aug-11		639	302541	0.62	0.76	<1	<1	<10	0.20	18.8	7.39	6.0	2.5
26-Aug-11		606	302803	0.11	0.17	<1	<1	1600	0.28	13.7	7.48	6.0	2.5
29-Aug-11		606	302797	0.04	0.16	<1	<1	100	0.30	13.7	7.32	5.0	1.0
26-Aug-11		606	302804	0.08	0.16	<1	<1	<10	0.27	13.3	7.47	7.5	2.5
29-Aug-11		606	302798	<0.02	0.12	<1	<1	470	0.27	13.4	7.49	5.0	1.0
26-Aug-11		607	302805	0.05	0.17	<1	<1	10	0.29	13.3	7.45	6.0	2.5
29-Aug-11		607	302801	<0.02	0.14	<1	<1	10	0.26	13.2	7.46	6.0	1.0
26-Aug-11		607	302806	0.07	0.18	<1	<1	<10	0.24	13.2	7.34	6.0	2.5
29-Aug-11		607	302802	0.02	0.10	<1	<1	<10	0.28	13.0	7.47	6.0	1.0
29-Aug-11		647	302821	0.62	0.76	<1	<1	<10	0.41	17.7	7.54	6.0	1.0
30-Aug-11		647	302815	0.82	0 96	<1	<1	<10	0.20	18.5	7.17	6.0	2.0
29-Aug-11		647	302822	0.52	0 65	<1	<1	30	0.30	17.5	7.51	6.0	1.0
30-Aug-11		647	302816	0.76	0 89	<1	<1	<10	0.23	18.0	7.26	6.0	2.0
29-Aug-11		648	302823	0.48	0.71	<1	<1	<10	0.28	17.8	7.54	5.0	1.0
30-Aug-11		648	302819	0.72	0 86	<1	<1	<10	0.23	18.1	7.30	6.0	1.0
29-Aug-11		648	302824	0.50	0 69	<1	<1	<10	0.36	17.6	7.48	5.0	1.0
30-Aug-11		648	302820	0.70	0 83	<1	<1	<10	0.25	18.3	7.30	6.0	1.0
30-Aug-11		661	303186	0.56	0.74	<1	<1	<10	0.24	17.6	7.38	7.5	2.0
31-Aug-11		661	303180	0.24	0.48	<1	<1	<10	0.22	18.5	7.32	7.5	1.5

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30-Aug-11		661	303187	0.59	0.75	<1	<1	<10	0.36	17.8	7.39	7.5	2.0
31-Aug-11		661	303181	0.18	0.46	<1	<1	<10	0.23	18.3	7.37	8.0	1.5
30-Aug-11		663	303188	0.54	0.76	<1	<1	<10	0.24	18 3	7.36	6.0	2.0
31-Aug-11		663	303184	0.68	0 88	<1	<1	<10	0.19	19.1	7.35	7.5	2.0
30-Aug-11		663	303189	0.50	0.72	<1	<1	<10	0.21	18 5	7.51	6.0	2.0
31-Aug-11		663	303185	0.69	0 90	<1	<1	<10	0.20	19 0	7.51	7.5	2.5
31-Aug-11		670	303253	0.79	0 93	<1	<1	<10	0.49	17.8	7.38	7.5	2.0
1-Sep-11		670	303247	0.81	0 96	<1	<1	<10	0.20	18 8	7.17	5.0	1.0
31-Aug-11		670	303254	0.76	0.91	<1	<1	10	0.45	17 3	7.42	10 0	2.5
1-Sep-11		670	303248	0.82	0 99	<1	<1	<10	0.16	18 6	7.35	5.0	1.0
31-Aug-11		671	303255	0.53	0 67	<1	<1	20	0.41	18.8	7.44	8.5	1.5
1-Sep-11		671	303251	0.72	0 86	<1	<1	<10	0.22	18 3	7.48	5.0	1.0
31-Aug-11		671	303256	0.50	0 65	<1	<1	<10	0.42	18.9	7.42	10 0	2.0
1-Sep-11		671	303252	0.65	0.79	<1	<1	<10	0.21	18 6	7.40	5.0	1.0
01-Sep-11		680	303422	0.42	0.55	<1	<1	<10	0.29	17.1	7.54	6.0	1.0
02-Sep-11		680	303416	0.46	0 60	<1	<1	70	0.21	17 3	7.26	5.0	1.0
01-Sep-11		680	303423	0.44	0.59	<1	<1	<10	0.21	16 8	7.57	5.0	1.0
02-Sep-11		680	303417	0.45	0 67	<1	<1	<10	0.21	16 9	7.41	6.0	1.0
01-Sep-11		681	303424	0.47	0 63	<1	<1	<10	0.30	16.7	7.55	5.0	1.0
02-Sep-11		681	303420	0.42	0 64	<1	<1	<10	0.41	16.7	7.45	5.0	1.0
01-Sep-11		681	303425	0.44	0 61	<1	<1	<10	0.28	16 9	7.57	7.5	1.0
02-Sep-11		681	303421	0.44	0 64	<1	<1	<10	0.39	16 6	7.40	6.0	1.0
02-Sep-11		690	303587	0.63	0.77	<1	<1	<10	0.17	19.1	7.36	6.0	1.0
06-Sep-11		690	303581	0.73	1 03	<1	<1	<10	0.17	18.3	7.32	6.0	1.0
02-Sep-11		690	303588	0.69	0 88	<1	<1	<10	0.17	19.3	7.39	5.0	1.0
06-Sep-11		690	303582	0.70	1 02	<1	<1	10	0.17	18 6	7.39	6.0	2.0
02-Sep-11		691	303589	0.62	0 83	<1	<1	<10	0.19	18.3	7.40	5.0	1.0
07-Sep-11		691	303585	0.77	0 90	<1	<1	<10	0.19	19.0	7.31	5.0	1.0
02-Sep-11		691	303590	0.79	0 94	<1	<1	10	0.19	18.0	7.41	5.0	1.0
07-Sep-11		691	303586	0.73	0 85	<1	<1	<10	0.20	19.1	7.34	5.0	1.0

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06-Sep-11		728	303924	0.43	0 62	<1	<1	10	0.21	17.8	7.45	5.0	1.0
07-Sep-11		728	303918	0.63	0 80	<1	<1	<10	0.26	17.4	7.48	5.0	1.0
06-Sep-11		728	303925	0.59	0.77	<1	<1	<10	0.23	18.0	7.45	5.0	1.0
07-Sep-11		728	303919	0.56	0.73	<1	<1	<10	0.26	17.9	7.35	5.0	1.0
06-Sep-11		729	303926	0.32	0 54	<1	<1	<10	0.21	17.9	7.42	5.0	2.0
07-Sep-11		729	303922	0.57	0.78	<1	<1	<10	0.23	18.0	7.31	6.0	2.0
06-Sep-11		729	303927	0.36	0 59	<1	<1	<10	0.17	18.2	7.45	5.0	2.0
07-Sep-11		729	303923	0.70	0 92	<1	<1	<10	0.24	17.6	7.31	6.0	2.0
07-Sep-11		742	304008	0.49	0 65	<1	<1	<10	0.24	18.0	7.44	5.0	1.0
09-Sep-11		742	304002	0.68	0 93	<1	<1	<10	0.18	18.7	7.46	5.0	1.0
07-Sep-11		742	304009	0.57	0.72	<1	<1	<10	0.29	17.7	7.30	6.0	2.0
09-Sep-11		742	304003	0.71	0 91	<1	<1	<10	0.22	17.6	7.38	5.0	1.0
07-Sep-11		743	304010	0.68	0 87	<1	<1	<10	0.25	17.1	7.29	5.0	1.0
09-Sep-11		743	304006	0.68	0 95	<1	<1	<10	0.18	18.0	7.54	5.0	1.0
07-Sep-11		743	304011	0.70	0 95	<1	<1	10	0.21	17.3	7.32	5.0	1.0
09-Sep-11		743	304007	0.70	0 93	<1	<1	<10	0.20	17.7	7.52	5.0	1.0
09-Sep-11		758	304057	0.69	0 91	<1	<1	<10	0.23	17.4	7.43	5.0	1.0
12-Sep-11		758	304051	0.61	0.74	<1	<1	<10	0.21	17.2	7.34	5.0	1.0
09-Sep-11		758	304058	0.65	0 87	<1	<1	<10	0.20	17.9	7.49	5.0	1.0
12-Sep-11		758	304052	0.64	0.79	<1	<1	<10	0.22	16.8	7.39	5.0	1.0
09-Sep-11		759	304059	0.78	0 91	<1	<1	<10	0.17	16 5	7.45	5.0	1.0
12-Sep-11		759	304055	0.45	0 60	<1	<1	<10	0.21	16.9	7.48	8.0	1.0
09-Sep-11		759	304060	0.72	0 88	<1	<1	<10	0.30	16 6	7.48	6.0	1.0
12-Sep-11		759	304056	0.42	0 61	<1	<1	<10	0.23	17.5	7.57	10 0	1.0
12-Sep-11		768	304238	0.72	0 91	<1	<1	<10	0.22	17.7	7.59	5.0	1.0
13-Sep-11		768	304232	0.56	0.73	<1	<1	40	0.19	17.2	7.36	5.0	1.0
12-Sep-11		768	304239	0.76	0 98	<1	<1	<10	0.25	17 9	7.52	5.0	1.0
13-Sep-11		768	304233	0.58	0.76	<1	<1	<10	0.21	16 5	7.42	5.0	1.0
12-Sep-11		770	304240	0.61	0.79	<1	<1	<10	0.17	17 3	7.47	7.5	1.0
13-Sep-11		770	304236	0.77	0 93	<1	<1	<10	0.19	18.2	7.56	5.0	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
12-Sep-11		770	304241	0.61	0.78	<1	<1	<10	0.17	17.4	7.59	6.0	1.0
13-Sep-11		770	304237	0.75	0 92	<1	<1	<10	0.23	18.0	7.60	6.0	1.0
13-Sep-11		777	304628	0.46	0 63	<1	<1	<10	0.26	17 9	7.49	5.0	1.0
14-Sep-11		777	304622	0.61	0.77	<1	<1	<10	0.25	18.0	7.47	5.0	1.0
13-Sep-11		777	304629	0.30	0.49	<1	<1	10	0.26	17.6	7.54	5.0	1.0
14-Sep-11		777	304623	0.48	0 65	<1	<1	<10	0.28	17.9	7.43	6.0	1.0
13-Sep-11		778	304630	0.64	0 86	<1	<1	<10	0.22	17.9	7.47	5.0	1.0
16-Sep-11		778	304626	0.68	0 92	<1	<1	<10	0.34	18.2	7.46	5.0	1.0
13-Sep-11		778	304631	0.70	0 89	<1	<1	<10	0.18	17.8	7.55	5.0	1.0
16-Sep-11		778	304627	0.70	0 95	<1	<1	<10	0.29	18.0	7.51	5.0	1.0
14-Sep-11		788	304695	0.69	0 93	<1	<1	<10	0.37	18.0	7.53	7.5	1.0
19-Sep-11		788	304689	0.65	0 86	<1	<1	<10	0.20	18.4	7.52	5.0	1.0
14-Sep-11		788	304696	0.77	0 98	<1	<1	<10	0.23	18.2	7.42	6.0	1.0
19-Sep-11		788	304690	0.69	0 88	<1	<1	<10	0.21	18.2	7.52	5.0	1.0
14-Sep-11		794	304697	0.69	0 85	<1	<1	<10	0.32	18 5	7.44	7.5	1.0
16-Sep-11		794	304693	0.71	0 86	<1	<1	10	0.21	18.1	7.52	5.0	1.0
14-Sep-11		794	304698	0.72	0 88	<1	<1	<10	1.07	18 3	7.44	7.5	1.0
16-Sep-11		794	304694	0.69	0 85	<1	<1	<10	0.24	17.7	7.45	5.0	1.0
16-Sep-11		804	304732	0.62	0 84	<1	<1	20	0.24	17 2	7.56	6.0	1.0
19-Sep-11		804	304726	0.77	0 92	<1	<1	<10	0.21	16 5	7.52	5.0	1.0
16-Sep-11		804	304733	0.58	0 81	<1	<1	<10	0.27	17.5	7.50	5.0	1.0
19-Sep-11		804	304727	0.73	0 89	<1	<1	10	0.25	17.0	7.60	5.0	1.0
16-Sep-11		805	304734	0.44	0 58	<1	<1	<10	0.25	17 2	7.55	5.0	1.0
19-Sep-11		805	304730	0.56	0.75	<1	<1	<10	0.22	17.5	7.52	5.0	1.0
16-Sep-11		805	304735	0.47	0 63	<1	<1	<10	2.34	17.4	7.54	25 0	1.0
19-Sep-11		805	304731	0.53	0.72	<1	<1	<10	0.24	17.9	7.48	5.0	1.0
28-Sep-11		547	305567	0.13	0 26	<1	<1	10	0.21	14.5	7.71	5.0	1.0
28-Sep-11		547	305596	0.52	0 67	<1	<1	10	0.31	13.8	7.61	6.0	1.0
28-Sep-11		548	305568	0.54	0.71	<1	<1	<10	0.53	13.4	7.50	10.0	1.0
28-Sep-11		548	305570	0.26	0.41	<1	<1	<10	0.27	11.7	7.26	5.0	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	Apparent Colour (acu)	True Colour (tcu)
28-Sep-11		548	305569	0.36	0 52	<1	<1	<10	0.33	13.5	7.66	5.0	1.0
28-Sep-11		548	305571	0.31	0.46	<1	<1	<10	0.31	13 9	7.54	5.0	1.0
28-Sep-11		548	305597	0.31	0.45	<1	<1	<10	0.22	14 3	7.64	5.0	1.0
28-Sep-11		548	305598	0.33	0 55	<1	<1	<10	0.35	13.7	7.53	5.0	1.0

NR - No result NA - Not analyzed

Comments:

1 - After 'A few days Post Flush' sampling was completed at 531 Almey it was determined that the home has a water filtration system, so an alternative sample was taken at 385 Almey on June 24.

2 - True color not analysed due to lab error.

3 - Locations sampled as part of the ongoing investigation for NE09 Kildare Ave. and McMeans St. The chlorine set point was increased and additional testing was conducted in the immediate area . The free chlorine levels in the surrounding areas increased and continued to meet the compliance limit. A few closed and broken valves were found which may have contributed to the low chlorine results.

No re-sample collected when a pre-flush sample test positive for bacti and the post-flush is negative.

2012 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
7-May-12		31	324524	0.51	0 69	<1	<1	<10	0.22	7.5	7.82	1.0
8-May-12		31	324518	0.54	0.70	<1	<1	<10	0.17	8.5	7.42	1.5
7-May-12		31	324525	0.56	0.79	<1	<1	<10	1.22	7.7	7.54	2.0
8-May-12		31	324519	0.70	0 94	<1	<1	<10	0.20	9.2	7.47	2.0
7-May-12		32	324527	0.43	0.57	<1	<1	<10	0.26	7.9	7.72	1.0
8-May-12		32	324523	0.64	0 86	<1	<1	<10	0.23	8.8	7.48	2.0
7-May-12		32	324526	0.37	0.58	<1	<1	<10	0.27	7.8	7.83	1.0
8-May-12		32	324522	0.73	0 89	<1	<1	<10	0.27	8.9	7.45	2.0
8-May-12		40	325049	0.68	0 91	<1	<1	<10	0.16	10.0	7.46	1.0
9-May-12		40	325043	0.57	0.71	<1	<1	<10	0.20	9.1	7.45	1.0
8-May-12		40	325048	0.50	0.72	<1	<1	<10	0.15	10.5	7.47	1.5
9-May-12		40	325042	0.53	0 68	<1	<1	<10	0.22	9.0	7.42	1.0
8-May-12		41	325050	0.86	1 01	<1	<1	<10	0.19	8.7	7.47	1.5
9-May-12		41	325046	0.80	0 98	<1	<1	<10	0.39	8.8	7.46	1.0
8-May-12		41	325051	0.84	0 98	<1	<1	<10	0.28	9.4	7.47	1.0
9-May-12		41	325047	0.64	0 82	<1	<1	<10	0.25	8.9	7.58	1.0
9-May-12		48	325101	0.77	0 94	<1	<1	<10	0.60	10.1	7 54	1.0
10-May-12		48	325095	0.83	1 01	<1	<1	<10	0.16	10.2	7 33	1.0
9-May-12		48	325102	0.74	0 91	<1	<1	<10	0.28	10.3	7 53	1.0
10-May-12		48	325096	0.84	0 98	<1	<1	<10	0 22	10.6	7.48	1.0
9-May-12		49	325104	0.92	1.11	<1	<1	<10	0.16	11.2	7.73	1.0
10-May-12		49	325100	0.94	1.10	<1	<1	<10	0.18	12.1	7 52	2.0
9-May-12		49	325103	0.84	1 06	<1	<1	<10	0.17	11.4	7 54	1.0
10-May-12		49	325099	0.94	1 08	<1	<1	<10	0.27	11.9	7.42	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
10-May-12		56	325141	0.52	0.73	<1	<1	<10	0.18	9.4	7.42	1.0
11-May-12		56	325135	0.75	0 92	<1	<1	<10	0.20	6.9	7.42	1.5
10-May-12		56	325140	0.73	0 90	<1	<1	<10	0.13	6.9	7.39	1.0
11-May-12		56	325134	0.53	0 66	<1	<1	<10	0.18	8.7	7.45	2.0
10-May-12		59	325143	0.92	1.10	<1	<1	<10	0.17	9.9	7.55	2.0
14-May-12		59	325139	1.03	1.15	<1	<1	<10	0.99	9.8	7.46	2.0
10-May-12		59	325142	0.87	1 02	<1	<1	<10	0.19	10.4	7.52	1.0
14-May-12		59	325138	1.09	1 28	<1	<1	<10	0.42	9.8	7.47	1.0
11-May-12		64	325195	0.79	1 06	<1	<1	<10	0.17	8.9	7.44	1.0
14-May-12		64	325189	1.02	1.19	<1	<1	<10	0.44	9.1	7 38	1.0
11-May-12		64	325196	0.77	1 01	<1	<1	<10	0.16	8.5	7.42	2.0
14-May-12		64	325190	1.03	1.19	<1	<1	<10	0.26	8.8	7 39	1.0
11-May-12		65	325197	0.70	0 92	<1	<1	<10	0.15	6.5	7.39	1.0
14-May-12		65	325193	1.05	1 22	<1	<1	<10	0.74	8.8	7 37	1.0
11-May-12		65	325198	0.82	0 97	<1	<1	<10	0.29	7.3	7.36	1.0
14-May-12		65	325194	1.14	1 27	<1	<1	<10	0.34	9.0	7.41	2.0
14-May-12		94	325359	0.89	1 00	<1	<1	<10	0.20	7.9	7.42	1.0
15-May-12		94	325353	0.70	0 91	<1	<1	<10	0.22	8.3	7.44	1.5
14-May-12		94	325360	0.87	0 99	<1	<1	<10	0.24	7.8	7.46	1.0
15-May-12		94	325354	0.73	0 92	<1	<1	<10	0.19	8.1	7.49	1.0
14-May-12		95	325361	0.81	0 97	<1	<1	<10	0.36	7.8	7.41	1.0
15-May-12		95	325357	0.83	0 97	<1	<1	<10	0.21	9.0	7 56	1.0
14-May-12		95	325362	0.89	1 02	<1	<1	<10	0.15	8.7	7.56	1.0
15-May-12		95	325358	0.85	0 98	<1	<1	<10	0.16	8.8	7 58	1.5
15-May-12		101	325403	0.75	0 97	<1	<1	<10	0.27	7.8	7.45	2.5
16-May-12		101	325397	0.74	0 92	<1	<1	<10	0.21	8.9	7.33	2.0
15-May-12		101	325404	0.85	0.97	<1	<1	<10	0.19	7.3	7.51	2.0
16-May-12		101	325398	0.78	0 98	<1	<1	<10	0.19	8.8	7.43	1.0
15-May-12		102	325405	0.71	0.85	<1	<1	<10	1.07	9.8	7.61	2.0
16-May-12		102	325401	0.75	0 94	<1	<1	<10	0.20	9.1	7 51	2.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
15-May-12		102	325406	0.76	0 90	<1	<1	<10	0.84	9.2	7.62	2.5
16-May-12		102	325402	0.76	0 92	<1	<1	<10	0.22	9.2	7.55	2.0
16-May-12		113	325812	0.96	1.12	<1	<1	<10	0.22	8.8	7 67	1.0
17-May-12		113	325806	0.92	1 07	<1	<1	10	0.19	9.4	7.54	1.5
16-May-12		113	325811	0.95	1 09	<1	<1	<10	0.22	8.9	7.53	1.0
17-May-12		113	325805	0.90	1 08	<1	<1	<10	0.24	9.5	7.39	2.0
16-May-12		114	325814	0.91	1 06	<1	<1	<10	0.18	9.4	7 69	1.0
17-May-12		114	325810	0.84	0 97	<1	<1	20	0.23	10.5	7.60	1.0
16-May-12		114	325813	0.88	1 03	<1	<1	<10	0.21	9.6	7 62	1.0
17-May-12		114	325809	0.87	1 01	<1	<1	<10	0.23	10.2	7.50	1.0
17-May-12		130	325872	0.67	0 92	<1	<1	<10	0.22	9.0	7.52	1.0
18-May-12		130	325866	0.67	0 80	<1	<1	<10	0.17	10.0	7.42	1.0
17-May-12		130	325871	0.73	0 94	<1	<1	10	0.22	9.2	7 56	1.0
18-May-12		130	325865	0.69	0 89	<1	<1	<10	0.17	10.4	7 38	1.0
17-May-12		131	325873	0.68	0 84	<1	<1	<10	0.24	8.9	7 52	1.0
18-May-12		131	325869	0.90	1.11	<1	<1	<10	0.19	9.9	7.37	1.0
17-May-12		131	325874	0.80	1.03	<1	<1	30	0.14	9.1	7.50	1.5
18-May-12		131	325870	1.01	1.14	<1	<1	30	0.20	10.3	7.39	1.0
18-May-12		139	325916	0.70	0 84	NA	NA	NA	0.15	9.0	7.37	1.0
22-May-12		139	325910	0.80	1 03	<1	<1	<10	0.17	11.0	7.22	1.0
18-May-12		139	325917	0.66	0 89	NA	NA	NA	0.15	8.8	7.34	1.0
22-May-12		139	325911	0.90	1 06	<1	<1	<10	0.15	11.0	7.24	1.0
18-May-12		140	325918	0.49	0 68	NA	NA	NA	0.16	8.2	7.42	1.0
22-May-12		140	325914	0.87	1 04	<1	<1	<10	0.15	11.1	7.33	1.5
18-May-12		140	325919	0.64	0.78	NA	NA	NA	0.19	8.7	7 36	1.0
22-May-12		140	325915	0.94	1.11	<1	<1	<10	0.16	10.8	7.32	1.0
22-May-12		186	326070	0.19	0.31	<1	<1	10	1.97	8.7	7.31	1.0
23-May-12		186	326064	0.57	0.75	<1	<1	10	0.55	8.7	7.54	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
22-May-12		186	326069	0.77	0 94	<1	<1	70	0.17	12.7	7.36	1.5
23-May-12		186	326063	0.70	0 88	<1	<1	20	0.16	9.1	7.44	1.0
22-May-12		188	326072	0.71	0 84	<1	<1	<10	0.16	11.1	7.47	1.0
23-May-12		188	326068	0.79	0 86	<1	<1	<10	0.18	11.0	7 55	1.0
22-May-12		188	326071	0.67	0 85	<1	<1	<10	0.17	10.1	7.44	1.0
23-May-12		188	326067	0.75	0.91	<1	<1	70	0.17	11.5	7.51	1.0
23-May-12		198	326534	0.61	0.77	<1	<1	<10	0.20	9.3	7.68	1.0
24-May-12		198	326528	0.59	0.73	<1	<1	NR	0.19	9.7	7.32	1.0
23-May-12		198	326535	0.58	0.77	<1	<1	<10	0.19	9.1	7.66	1.0
24-May-12		198	326529	0.57	0.80	<1	<1	NR	0.19	9.4	7.34	1.0
23-May-12		199	326536	0.65	0.79	<1	<1	<10	0.17	9.4	7.77	1.0
24-May-12		199	326532	0.55	0.74	<1	<1	NR	0.18	10.2	7.41	1.0
23-May-12		199	326537	0.58	0.72	<1	<1	<10	0.19	9.2	7.78	1.0
24-May-12		199	326533	0.60	0.74	<1	<1	NR	0.17	10.1	7.39	1.0
24-May-12		208	326573	0.61	0.74	<1	<1	NR	0.16	10.2	7.27	1.0
25-May-12		208	326567	0.64	0.84	<1	<1	<10	0.22	11.9	7.52	1.0
24-May-12		208	326572	0.44	0.59	<1	<1	NR	0.17	9.8	7.34	1.0
25-May-12		208	326566	0.38	0.53	<1	<1	<10	0.18	10.1	7.52	1.0
24-May-12		209	326575	0.51	0.66	<1	<1	NR	0.17	8.2	7.31	1.0
28-May-12		209	326571	0.75	0.90	<1	<1	30	0.21	8.4	7.45	1.0
24-May-12		209	326574	0.52	0.74	<1	<1	NR	0.26	9.2	7.24	1.0
28-May-12		209	326570	0.67	0.86	<1	<1	<10	0.20	10.1	7.48	1.0
25-May-12		223	326608	0.77	0 89	<1	<1	1180	0.23	8.2	7.38	1.5
28-May-12		223	326602	0.63	0.82	<1	<1	10	0.17	9.7	7.52	1.0
25-May-12		223	326607	0.66	0.81	<1	<1	<10	0.21	8.6	7.42	1.0
28-May-12		223	326601	0.53	0.70	<1	<1	<10	0.16	10.3	7.57	1.0
25-May-12		225	326610	0.66	0.75	<1	<1	<10	0.20	9.0	7.32	1.0
28-May-12		225	326606	0.45	0.77	<1	<1	10	0.14	9.5	7.48	1.0
25-May-12		225	326609	0.64	0.77	<1	<1	<10	0.21	9.2	7.39	1.0
28-May-12		225	326605	0.63	0.82	<1	<1	10	0.16	10.1	7.59	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
28-May-12		256	326813	0.49	0 67	<1	<1	<10	0.32	7.4	7.36	1.0
1-Jun-12		256	326807	0.56	0 68	<1	<1	<10	0.26	7.4	7 52	1.0
28-May-12		256	326812	0.60	0.74	<1	<1	<10	0.40	9.1	7.28	1.0
1-Jun-12		256	326806	0.53	0 67	<1	<1	<10	0.27	8.3	7.46	0.5
28-May-12		258	326815	0.61	0.73	<1	<1	<10	0.18	9.2	7.41	1.0
1-Jun-12		258	326811	0.62	0.73	<1	<1	<10	0.15	8.8	7.56	0.5
28-May-12		258	326814	0.70	0 85	<1	<1	10	0.16	9.3	7.46	1.0
1-Jun-12		258	326810	0.53	0.73	<1	<1	<10	0.15	9.7	7.54	1.0
29-May-12		270	326847	0.75	0 91	NA	NA	NA	0.41	8.7	7.35	0.5
30-May-12		270	326841	0.54	0.76	<1	<1	<10	0.19	9.1	7.42	1.0
29-May-12		270	326848	0.72	0 80	NA	NA	NA	0.34	8.6	7.40	0.5
30-May-12		270	326842	0.57	0.80	<1	<1	<10	0.19	9.3	7.46	1.0
29-May-12		272	326849	0.70	0 83	NA	NA	NA	0.33	9.0	7.40	0.5
30-May-12		272	326845	0.53	0 66	<1	<1	<10	0.20	9.4	7.42	1.0
29-May-12		272	326850	0.69	0.79	NA	NA	NA	0.24	9.7	7.55	1.0
30-May-12		272	326846	0.70	0 83	<1	<1	<10	0.18	9.6	7.54	1.0
30-May-12		281	327249	0.62	0 80	NA	NA	NA	0.08	9.4	7.49	1.0
31-May-12		281	327243	0.74	0 90	<1	<1	<10	0.07	10.0	7.84	1.0
30-May-12		281	327250	0.69	0 84	NA	NA	NA	0.20	9.4	7.48	1.0
31-May-12		281	327244	0.80	0 91	<1	<1	40	0.17	10.0	7.80	1.0
30-May-12		283	327251	0.67	0 80	NA	NA	NA	0.17	10.0	7 55	1.0
31-May-12		283	327247	0.55	0.76	<1	<1	<10	0.16	10.3	7.81	0.5
30-May-12		283	327252	0.56	0.75	NA	NA	NA	0.20	9.0	7 52	1.0
31-May-12		283	327248	0.54	0 67	<1	<1	<10	0.17	8.5	7.80	1.0
31-May-12		295	327289	0.45	0.90	<1	<1	10	0.17	10.3	7.75	1.0
1-Jun-12		295	327283	0.40	0 61	<1	<1	<10	0.24	9.7	7.49	1.0
31-May-12		295	327290	0.78	0 95	<1	<1	<10	0.16	11.8	7.75	1.0
1-Jun-12		295	327284	0.46	0 58	<1	<1	10	0.21	8.6	7.49	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
31-May-12		296	327292	0.65	0 83	<1	<1	<10	0.16	10.9	7.77	0.5
1-Jun-12		296	327288	0.64	0 80	<1	<1	<10	0.43	10.1	7.51	1.0
31-May-12		296	327291	0.77	0 92	3	<1	30	0.16	12.2	7.81	1.0
1-Jun-12		296	327287	0.51	0 64	<1	<1	<10	0.25	9.0	7.47	1.0
1-Jun-12		304	327333	0.50	0 60	<1	<1	<10	0.18	13.2	7.59	1.0
4-Jun-12		304	327327	0.52	0 66	<1	<1	10	0.15	13.2	7 50	1.0
1-Jun-12		304	327332	0.62	0.85	<1	<1	<10	0.12	11.2	7.58	1.0
4-Jun-12		304	327326	0.55	0.75	<1	<1	<10	0.19	11.9	7 37	1.0
1-Jun-12		306	327335	0.85	1 05	<1	<1	<10	0.69	13.1	7.56	1.0
4-Jun-12		306	327331	0.64	0.84	<1	<1	10	0.16	11.5	7.54	1.0
1-Jun-12		306	327334	0.87	1.02	<1	<1	<10	0.73	12.8	7.55	1.0
4-Jun-12		306	327330	0.66	0 87	<1	<1	<10	0.14	11.8	7 52	1.5
4-Jun-12		337	327523	0.74	0.88	101	<1	<10	0.15	10.7	7.44	1.5
5-Jun-12		337	327517	0.70	0 85	41	<1	10	0.25	11.4	7.50	1.0
7-Jun-12		337	328099	0.84	0.99	200	<1	10	0.20	11.7	NA	NA
7-Jun-12		337	328100	0.84	1.03	<1	<1	<10	0.21	11.6	NA	NA
7-Jun-12		337	328101	0.82	0.97	<1	<1	<10	0.19	11.4	NA	NA
11-Jun-12		337	328309	0.70	0.91	<1	<1	30	0.19	12.7	NA	NA
11-Jun-12		337	328310	NA	NA	<1	<1	<10	NA	NA	NA	NA
11-Jun-12		337	328311	0.73	0.89	<1	<1	<10	0.15	12.6	NA	NA
11-Jun-12		337	328313	0.73	0.92	<1	<1	<10	0.22	12.9	NA	NA
4-Jun-12		337	327522	0.57	0.79	<1	<1	<10	0.17	10.8	7.44	1.0
5-Jun-12		337	327516	0.70	0.87	<1	<1	<10	0.21	11.0	7.51	0.5
4-Jun-12		338	327524	0.71	0.88	<1	<1	10	0.13	13.3	7.53	1.0
5-Jun-12		338	327520	0.73	0.85	<1	<1	<10	0.25	11.5	7.54	1.0
4-Jun-12		338	327525	0.82	0.93	<1	<1	<10	0.13	13.8	7.48	1.0
5-Jun-12		338	327521	0.92	1.03	<1	<1	<10	0.16	13.1	7.41	1.0
5-Jun-12		348	327936	0.74	0.91	1	<1	<10	0.20	12.4	7.48	1.0
6-Jun-12		348	327930	0.76	0.89	<1	<1	<10	0.13	11.2	7.28	1.0
5-Jun-12		348	327937	0.71	0.97	<1	<1	<10	0.19	12.5	7.54	1.0
6-Jun-12		348	327931	0.82	0.97	<1	<1	<10	0.13	11.6	7.32	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
5-Jun-12		349	327939	0.79	0 91	<1	<1	<10	0.21	11.7	7.59	0.5
6-Jun-12		349	327935	0.86	1 00	<1	<1	<10	0.16	13.3	7 33	1.5
5-Jun-12		349	327938	0.85	0 99	<1	<1	10	0.22	13.4	7.50	1.0
6-Jun-12		349	327934	0.83	1 05	<1	<1	<10	0.18	14.9	7.45	1.0
6-Jun-12		360	328002	0.88	1 08	<1	<1	<10	0.83	14.0	7.49	0.5
7-Jun-12		360	327996	0.85	1 00	<1	<1	<10	0.25	13.4	7.37	1.0
6-Jun-12		360	328001	0.70	0 84	<1	<1	<10	0.39	10.6	7.51	1.0
7-Jun-12		360	327995	0.83	0.98	<1	<1	<10	0.34	10.7	7.31	0.5
6-Jun-12		361	328004	0.37	0.49	<1	<1	<10	0.44	9.2	7.49	1.0
7-Jun-12		361	328000	0.78	0.91	<1	<1	<10	0.19	11.5	7.43	1.0
6-Jun-12		361	328003	0.53	0.64	1	<1	<10	0.60	9.3	7.54	1.0
7-Jun-12		361	327999	0.72	0.89	<1	<1	<10	0.50	10.9	7.40	1.0
7-Jun-12		374	328080	0.83	1.02	<1	<1	<10	0.18	13.4	7.45	1.0
8-Jun-12		374	328074	0.81	0 97	<1	<1	<10	0.27	13.6	7.46	1.0
7-Jun-12		374	328079	0.74	0.96	<1	<1	<10	0.16	13.4	7.39	1.0
8-Jun-12		374	328073	0.71	0 94	<1	<1	<10	0.48	13.7	7.42	1.0
7-Jun-12		375	328082	0.76	0.91	<1	<1	10	0.21	12.5	7.36	1.0
8-Jun-12		375	328078	0.73	0 91	<1	<1	<10	0.37	13.8	7.45	1.0
7-Jun-12		375	328081	0.93	1.06	<1	<1	<10	0.21	14.5	7.40	0.5
8-Jun-12		375	328077	0.72	0 94	<1	<1	<10	0.23	15.2	7.44	0.5
8-Jun-12		383	328131	0.53	0.67	<1	<1	<10	0.27	11.9	7.46	1.0
11-Jun-12		383	328125	0.49	0.64	<1	<1	<10	0.32	10.3	7.60	0.5
8-Jun-12		383	328130	0.58	0.81	<1	<1	<10	0.26	10.3	7.49	0.5
11-Jun-12		383	328124	0.53	0.68	<1	<1	<10	0.23	10.1	7.52	1.0
8-Jun-12		384	328132	0.63	0.81	2	<1	<10	0.17	12.1	7.33	1.5
11-Jun-12		384	328128	0.70	0.91	<1	<1	<10	0.22	11.9	7.58	1.0
8-Jun-12		384	328133	0.75	0.85	<1	<1	10	0.21	11.9	7.33	1.0
11-Jun-12		384	328129	0.49	0.66	<1	<1	<10	0.19	11.9	7.53	0.5
11-Jun-12		418	328343	0.38	0.56	<1	<1	<10	0.31	8.7	7.80	0.5
12-Jun-12		418	328337	0.61	0.76	<1	<1	<10	0.17	11.0	7.54	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
11-Jun-12	[redacted]	418	328344	0.36	0 50	<1	<1	<10	0.32	9.1	7.82	1.0
12-Jun-12		418	328338	0.62	0.72	<1	<1	<10	0.17	11.1	7.52	1.0
11-Jun-12		420	328346	0.40	0.55	<1	<1	<10	0.92	10.0	7.72	1.0
12-Jun-12		420	328342	0.53	0 65	<1	<1	40	0.26	10.4	7.55	1.0
11-Jun-12		420	328345	0.40	0 56	<1	<1	<10	0.51	9.9	7.68	0.5
12-Jun-12		420	328341	0.39	0 50	<1	<1	10	0.27	10.2	7.61	1.0
12-Jun-12		429	328706	0.50	0 64	<1	<1	<10	0.22	10.2	7.58	0.5
13-Jun-12		429	328700	0.33	0.44	<1	<1	<10	0.44	11.1	7.47	2.0
12-Jun-12		429	328705	0.48	0.62	2	<1	<10	0.19	9.4	7.58	1.0
13-Jun-12		429	328699	0.32	0.49	<1	<1	<10	0.48	10.3	7.35	1.0
12-Jun-12		431	328707	0.45	0 65	<1	<1	<10	0.19	11.2	7.52	1.0
13-Jun-12		431	328703	0.25	0 38	<1	<1	10	0.49	12.1	7.37	1.0
12-Jun-12		431	328708	0.46	0 62	1	<1	10	0.20	10.1	7.57	0.5
13-Jun-12		431	328704	0.21	0 33	<1	<1	<10	0.60	10.2	7.40	1.0
13-Jun-12		442	328760	0.41	0 50	<1	<1	<10	0.60	10.7	7.48	1.0
14-Jun-12		442	328756	0.31	0.43	<1	<1	<10	0.23	11.1	7.52	2.5
13-Jun-12		442	328759	0.36	0 50	<1	<1	<10	0.48	10.6	7.43	2.0
14-Jun-12		442	328755	0.38	0 50	<1	<1	<10	0.23	10.5	7.52	1.0
13-Jun-12		447	328758	0.38	0.48	<1	<1	10	0.24	12.4	7.42	2.0
14-Jun-12		447	328752	0.36	0.49	<1	<1	<10	0.30	11.2	7.49	1.0
13-Jun-12		447	328757	0.21	0 31	<1	<1	<10	0.20	14.2	7.42	2.0
14-Jun-12		447	328751	0.32	0 51	<1	<1	<10	0.29	10.9	7.60	3.0
14-Jun-12		452	328854	0.39	0 58	<1	<1	<10	0.32	13.4	7.57	1.0
15-Jun-12		452	328848	0.65	0.75	<1	<1	<10	0.34	13.8	7 55	1.0
14-Jun-12		452	328853	0.40	0 66	<1	<1	20	0.34	11.3	7 55	1.0
15-Jun-12		452	328847	0.63	0.77	<1	<1	<10	0.36	14.1	7 31	0.5
14-Jun-12		453	328856	0.72	0 96	<1	<1	<10	1.79	12.3	7.52	2.5
15-Jun-12		453	328852	0.53	0 67	<1	<1	<10	0.19	12.2	7.45	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
14-Jun-12		453	328855	0.45	0 66	<1	<1	<10	0.25	12.3	7.49	1.0
15-Jun-12		453	328851	0.62	0.77	<1	<1	10	0.18	12.3	7.47	1.0
15-Jun-12		466	328873	0.36	0 52	<1	<1	10	0.23	10.2	7.46	1.0
18-Jun-12		466	328867	0.35	0 54	<1	<1	<10	0.29	10.8	7 28	1.0
15-Jun-12		466	328874	0.34	0.51	<1	<1	<10	0.23	10.5	7.45	0.5
18-Jun-12		466	328868	0.25	0 51	<1	<1	<10	0.21	11.6	7.43	1.0
15-Jun-12		467	328875	0.46	0 58	<1	<1	<10	0.39	11.2	7.47	1.0
18-Jun-12		467	328871	0.19	0 34	<1	<1	<10	0.21	11.9	7.40	1.0
15-Jun-12		467	328876	0.37	0 50	<1	<1	<10	0.34	10.9	7.55	1.0
18-Jun-12		467	328872	0.22	0.39	1	<1	<10	0.35	11.5	7.42	1.0
20-Jun-12		467	329523	0.34	0.45	<1	<1	NR	0.23	13.9	NA	NA
18-Jun-12		495	329064	0.61	0 84	8	<1	<10	1.78	12.3	7.50	1.0
19-Jun-12		495	329058	0.67	0 80	1	<1	360	0.24	13.7	7.40	0.5
21-Jun-12		495	329544	0.64	0 81	<1	<1	320	0.31	11.5	NA	NA
18-Jun-12		495	329065	0.79	0 94	<1	<1	<10	1.04	14.4	7.45	1.0
19-Jun-12		495	329059	0.65	0 96	<1	<1	<10	0.16	14.5	7.41	1.0
18-Jun-12		498	329066	0.91	1.03	4	<1	<10	1.16	14.3	7.47	1.0
19-Jun-12		498	329062	0.74	0.91	<1	<1	<10	0.19	14.4	7.36	1.0
18-Jun-12		498	329067	0.63	0.77	<1	<1	<10	0.28	13.7	7.45	1.0
19-Jun-12		498	329063	0.61	0 82	<1	<1	<10	0.31	13.1	7.41	0.5
19-Jun-12		506	329115	0.38	0 53	<1	<1	<10	0.28	11.7	7.45	1.0
20-Jun-12		506	329109	0.23	0 35	<1	<1	NR	0.23	11.8	7.57	1.0
19-Jun-12		506	329116	0.39	0 52	<1	<1	80	0.25	10.7	7.47	1.0
20-Jun-12		506	329110	0.42	0 53	<1	<1	NR	0.24	11.2	7.62	1.0
19-Jun-12		507	329117	0.38	0 51	<1	<1	260	0.26	12.0	7.46	1.0
20-Jun-12		507	329113	0.38	0 50	10	<1	NR	0.25	11.8	7 52	1.5
22-Jun-12		507	329595	0.37	0 50	<1	<1	<10	0.26	12.2	NA	NA
19-Jun-12		507	329118	0.35	0.48	<1	<1	50	0.24	11.7	7.46	1.0
20-Jun-12		507	329114	0.33	0.45	<1	<1	NR	0.21	11.3	7.50	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
20-Jun-12		518	329495	0.11	0 21	<1	<1	NR	0.53	10.4	7 60	1.0
21-Jun-12		518	329489	0.04	0.14	<1	<1	<10	0.57	11.0	7.56	1.0
22-Jun-12		518	329731	0.05	0.15	NA	NA	NA	NA	10.9	NA	NA
25-Jun-12		518	329793	0.27	0.42	NA	NA	NA	NA	11.8	NA	NA
20-Jun-12		518	329494	0.10	0 20	<1	<1	NR	0.61	10.1	7 63	1.0
21-Jun-12		518	329488	0.08	0.15	3	<1	<10	0.83	11.4	7.55	1.0
22-Jun-12		page ppp	329730	<0.02	0.08	NA	NA	NA	NA	10.9	NA	NA
25-Jun-12		518	329732	0.18	0.30	<1	<1	<10	0.94	13.2	NA	NA
20-Jun-12		519	329496	0.12	0 26	<1	<1	NR	0.30	12.0	7 59	0.5
21-Jun-12		519	329492	0.14	0 26	4	<1	<10	0.48	11.3	7 60	0.5
25-Jun-12		519	329773	0.15	0.26	<1	<1	<10	0.46	12.6	NA	NA
20-Jun-12		519	329497	0.20	0 32	<1	<1	NR	0.29	12.0	7 56	1.0
21-Jun-12		519	329493	0.12	0 28	<1	<1	<10	0.42	11.4	7 58	1.0
21-Jun-12		531	329540	0.26	0 37	<1	<1	10	0 32	12.4	7 52	1.0
22-Jun-12		531	329534	0.23	0 31	<1	<1	<10	0.62	13.0	7 51	1.0
21-Jun-12		531	329539	0.20	0 32	<1	<1	10	0.36	11.2	7.55	1.0
22-Jun-12		531	329533	0.30	0.48	<1	<1	<10	0.23	11.0	7.39	1.0
21-Jun-12		533	329542	0.72	0 85	<1	<1	<10	0.78	14.1	7.52	1.0
22-Jun-12		533	329538	0.74	0 90	<1	<1	<10	0.23	15.2	7.44	1.0
21-Jun-12		533	329541	0.63	0 88	<1	<1	<10	1.03	13.7	7.62	1.0
22-Jun-12		533	329537	0.67	0 84	<1	<1	<10	0.32	15.2	7.55	1.0
22-Jun-12		542	329603	0.36	0.49	<1	<1	<10	0.28	11.9	7.49	1.0
25-Jun-12		542	329597	0.13	0 27	<1	<1	<10	0.48	11.4	7 58	1.0
22-Jun-12		542	329602	0.26	0.47	<1	<1	<10	0.27	11.3	7.49	0.5
25-Jun-12		542	329596	0.18	0 32	<1	<1	<10	0 50	11.7	7 67	1.0
22-Jun-12		544	329604	1.13	1 22	<1	<1	<10	5.45	14.1	7.59	1.0
25-Jun-12		544	329600	0.72	0 81	<1	<1	<10	0.17	13.8	7 60	1.0
22-Jun-12		544	329605	0.94	1 09	2	<1	<10	2.80	11.5	7 50	0.5
25-Jun-12		544	329601	0.91	1 09	<1	<1	<10	0.84	15.2	7.46	1.0
25-Jun-12		564	329781	0.44	0 57	<1	<1	<10	0.30	13.8	7.51	1.0
26-Jun-12		564	329775	0.39	0 62	<1	<1	<10	0.27	15.0	7.44	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
25-Jun-12		564	329780	0.40	0 59	<1	<1	10	0.28	12.3	7.58	1.0
26-Jun-12		564	329774	0.36	0 60	1	<1	<10	0.27	14.4	7.40	0.5
28-Jun-12		564	330263	0.36	0.50	<1	<1	<10	0.30	12.0	NA	NA
25-Jun-12		567	329783	0.10	0.22	<1	<1	<10	1.60	10.6	7.55	1.0
26-Jun-12		567	329779	0.37	0.48	<1	<1	<10	0.25	11.0	7.46	1.0
25-Jun-12		567	329782	0.11	0.20	<1	<1	20	1.48	10.7	7.40	1.0
26-Jun-12		567	329778	0.42	0 52	<1	<1	10	0.26	10.5	7.48	1.0
26-Jun-12		580	329816	0.72	0 92	<1	<1	10	0.19	13.2	7.39	1.0
28-Jun-12		580	329810	0.71	0 91	<1	<1	<10	0.36	16.0	7.60	1.0
26-Jun-12		580	329817	0.82	0 97	<1	<1	<10	0.15	16.0	7.52	1.0
28-Jun-12		580	329811	0.72	0 91	<1	<1	<10	0.39	18.0	7.64	1.0
26-Jun-12		581	329819	0.67	0 88	<1	<1	<10	0.13	13.5	7.50	1.0
28-Jun-12		581	329815	0.84	1 00	<1	<1	<10	0.37	14.6	7.59	0.5
26-Jun-12		581	329818	0.68	0 85	1	<1	<10	0.14	14.2	7.50	1.0
28-Jun-12		581	329814	0.80	0.95	<1	<1	<10	0.38	14.3	7.62	0.5
27-Jun-12		588	330208	0.64	0.86	<1	<1	<10	0.33	13.3	7.65	1.0
28-Jun-12		588	330202	0.77	0 89	<1	<1	<10	0.16	14.7	7.62	1.0
27-Jun-12		588	330207	0.65	0.90	<1	<1	<10	0.13	13.6	7.67	1.0
28-Jun-12		588	330201	0.68	0.82	<1	<1	<10	0.16	14.5	7.58	1.0
27-Jun-12		589	330209	0.33	0.49	<1	<1	<10	0.13	13.4	7.66	1.0
28-Jun-12		589	330205	0.25	0.35	<1	<1	<10	0.21	13.8	7.66	1.0
27-Jun-12		589	330210	0.31	0.45	<1	<1	<10	0.13	13.7	7.56	1.0
28-Jun-12		589	330206	0.23	0.36	<1	<1	40	0.20	13.1	7.52	1.0
28-Jun-12		601	330261	0.64	0.80	<1	<1	<10	0.13	13.7	7.62	0.5
3-Jul-12		601	330257	0.80	0.94	<1	<1	<10	0 22	16.5	7 60	1 0
28-Jun-12		601	330260	0.61	0.77	<1	<1	<10	0.18	13.4	7.70	1.0
3-Jul-12		601	330256	0.81	0.93	<1	<1	<10	0 29	16.3	7 57	1 5
28-Jun-12		602	330258	0.59	0.79	<1	<1	<10	0.13	13.9	7.68	1.0
3-Jul-12		602	330252	0.78	0.89	<1	<1	<10	0 21	16.0	7.44	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
28-Jun-12		602	330259	0.67	0 80	<1	<1	<10	0.24	13.4	7.64	1.0
3-Jul-12		602	330253	0.73	0.92	<1	<1	<10	0.18	15.2	7.40	1 5
3-Jul-12		657	330299	0.56	0.69	<1	<1	<10	0.14	11.4	7.48	1 0
4-Jul-12		657	330293	0.15	0.24	<1	<1	<10	0.25	12.1	7.46	1 0
3-Jul-12		657	330298	0.76	0.97	<1	<1	<10	0.13	12.3	7.50	1 5
4-Jul-12		657	330292	0.64	0.73	<1	<1	<10	0.13	12.3	7.35	0 5
3-Jul-12		658	330301	0.37	0.58	<1	<1	<10	0.15	11.2	7.45	1 0
4-Jul-12		658	330297	0.36	0.59	<1	<1	10	0 21	12.2	7.42	1 0
3-Jul-12		658	330300	0.59	0.71	<1	<1	<10	0.15	11.3	7.48	1 0
4-Jul-12		658	330296	0.17	0.31	<1	<1	<10	0 24	11.5	7.45	0 5
4-Jul-12		667	330907	0.70	0.81	<1	<1	<10	0.14	12.2	7.49	0 5
5-Jul-12		667	330903	0.59	0.77	<1	<1	<10	0.19	12.1	7.45	1 0
4-Jul-12		667	330908	0.71	0.81	<1	<1	10	0.14	12.2	7.49	1 0
6-Jul-12		667	330904	0.43	0.61	<1	<1	<10	0.18	11.3	7.42	0 5
4-Jul-12		668	330905	0.75	0.98	<1	<1	510	0.16	12.2	7.53	1 0
5-Jul-12		668	330899	0.40	0.60	<1	<1	<10	0.17	11.4	7.47	0 5
4-Jul-12		668	330906	0.76	0.91	<1	<1	<10	0.16	10.3	7.50	1 0
5-Jul-12		668	330900	0.47	0.58	<1	<1	<10	0.17	9 9	7.44	1 0
5-Jul-12		677	330952	0.70	0.88	<1	<1	<10	0 20	11.4	7 50	0 5
6-Jul-12		677	330946	0.54	0.81	<1	<1	<10	0 21	12.5	7.42	1 0
5-Jul-12		677	330953	0.45	0.63	<1	<1	180	0.18	12.5	7 50	0 5
6-Jul-12		677	330947	0.54	0.75	<1	<1	80	0 21	13.2	7.49	1 0
5-Jul-12		678	330955	0.53	0.66	<1	<1	<10	0.18	11.9	7.46	0 5
6-Jul-12		678	330951	0.67	0.82	<1	<1	<10	0 20	12.3	7.44	0 5
5-Jul-12		678	330954	0.47	0.65	<1	<1	<10	0.17	12.6	7.45	1 0
6-Jul-12		678	330950	0.66	0.80	<1	<1	<10	0.18	12.5	7 50	0 5
6-Jul-12		685	330998	0.60	0.78	<1	<1	10	0.17	13.3	7 53	0 5
9-Jul-12		685	330992	0.47	0.70	<1	<1	<10	0.13	12.0	7 54	1.0
6-Jul-12		685	330997	0.58	0.83	<1	<1	<10	0.16	13.5	7 64	1.0
9-Jul-12		685	330991	0.60	0.74	<1	<1	<10	0.14	13.2	7 61	0.5

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100m L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
6-Jul-12	[redacted]	686	330999	0.40	0.63	<1	<1	10	0.15	12.1	7.56	0 5
9-Jul-12	[redacted]	686	330995	0.49	0.68	<1	<1	>3000	0.14	11.2	7.57	0 5
17-Jul-12	[redacted]	686	332325	0.27	0.45	<1	<1	<10	0.15	14.9	NA	NA
6-Jul-12	[redacted]	686	331000	0.61	0.83	<1	<1	10	0.14	11.6	7.55	1 0
9-Jul-12	[redacted]	686	330996	0.42	0.56	<1	<1	<10	0.14	13.5	7.62	1 0
9-Jul-12	[redacted]	718	331182	0.46	0.64	<1	<1	<10	0.24	14.2	7.57	1 0
10-Jul-12	[redacted]	718	331178	0.71	0.86	<1	<1	<10	0.24	16.6	7.38	1 0
9-Jul-12	[redacted]	718	331181	0.17	0.34	<1	<1	<10	0.17	14.5	7.62	1 0
10-Jul-12	[redacted]	718	331177	0.10	0.26	<1	<1	<10	0.16	14.5	7.40	0 5
9-Jul-12	[redacted]	721	331180	0.60	0.75	1	<1	<10	0.19	13.6	7.62	0 5
10-Jul-12	[redacted] c)	721	331174	0.75	0.90	<1	<1	<10	0 20	14.5	7.40	0 5
9-Jul-12	[redacted]	721	331179	0.51	0.66	<1	<1	<10	0 29	16.5	7.62	1 0
10-Jul-12	[redacted]	721	331173	0.78	0.98	<1	<1	<10	1.19	15.3	7.35	1 0
10-Jul-12	[redacted]	721	331127	0.78	0.98	<1	<1	<10	0.78	15.3	7.45	1 0
10-Jul-12	[redacted]	732	331222	0.91	1.07	<1	<1	<10	0 52	15.5	7.41	1 0
12-Jul-12	[redacted]	732	331216	0.90	1.02	<1	<1	<10	0.19	15.6	7.43	1 0
10-Jul-12	[redacted]	732	331221	0.81	1.02	<1	<1	<10	0 29	16.2	7 52	1 0
12-Jul-12	[redacted]	732	331215	0.73	0.92	<1	<1	10	0 21	16.4	7.48	0 5
10-Jul-12	[redacted]	733	331223	1.06	1.19	<1	<1	<10	0.15	17.9	7 55	1 0
11-Jul-12	[redacted]	733	331219	0.82	0.94	<1	<1	<10	0 54	17.1	7.49	1 0
10-Jul-12	[redacted]	733	331224	0.97	1.12	<1	<1	<10	0.15	17.1	7.49	0 5
11-Jul-12	[redacted]	733	331220	0.89	1.00	<1	<1	<10	0 52	16.0	7.41	1.0
11-Jul-12	[redacted]	743	331647	0.13	0.31	<1	<1	<10	0.19	12.0	7.47	0.5
16-Jul-12	[redacted]	743	331641	0.71	0.81	<1	<1	10	0.17	15.4	7.46	1.0
11-Jul-12	[redacted]	743	331646	0.92	1.12	<1	<1	<10	0 24	19.5	7.49	1.0
16-Jul-12	[redacted]	743	331640	0.32	0.44	<1	<1	<10	0.18	15.0	7.42	0.5
11-Jul-12	[redacted]	744	331648	1.03	1.23	<1	<1	<10	0.79	17.3	7 59	1.0
16-Jul-12	[redacted]	744	331644	0.66	0.77	<1	<1	<10	0.17	15.9	7 58	1.0
11-Jul-12	[redacted]	744	331649	0.62	0.76	<1	<1	<10	0 35	12.9	7.45	1.0
16-Jul-12	[redacted]	744	331645	0.81	0.91	<1	<1	<10	0 23	14.0	7.47	0.5

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13-Jul-12		747	331695	0.88	1.07	<1	<1	<10	0.19	17.7	7.52	1 0
16-Jul-12		747	331689	0.63	0.85	<1	<1	<10	0.23	17.2	7.46	1 0
13-Jul-12		747	331696	0.79	0.92	<1	<1	<10	0 20	16.5	7.48	1 0
16-Jul-12		747	331690	0.76	0.98	<1	<1	<10	0 20	18.8	7.41	0 5
13-Jul-12		748	331697	0.85	1.05	<1	<1	<10	0 25	17.5	7.48	1 0
16-Jul-12		748	331693	0.80	0.93	<1	<1	<10	0.15	19.0	7.42	1 0
13-Jul-12		748	331698	0.66	0.85	<1	<1	<10	0 20	16.2	7.53	1 0
16-Jul-12		748	331694	0.81	0.93	<1	<1	<10	0.16	20.0	7.42	1 5
16-Jul-12		785	331910	0.75	0.91	<1	<1	<10	0.19	14.0	7 54	1 0
17-Jul-12		785	331904	0.58	0.76	<1	<1	<10	0.15	15.3	7.48	2 0
16-Jul-12		785	331911	0.55	0.72	<1	<1	10	0.16	14.2	7.43	1 0
17-Jul-12		785	331905	0.60	0.79	<1	<1	10	0.14	17.0	7.42	2 0
16-Jul-12		786	331913	0.60	0.80	<1	<1	<10	0.14	13.6	7.44	1 5
17-Jul-12		786	331909	0.72	0.89	<1	<1	<10	0.17	15.3	7.46	1 5
16-Jul-12		786	331912	0.66	0.81	<1	<1	<10	0.15	13.1	7.47	1 0
17-Jul-12		786	331908	0.66	0.86	<1	<1	<10	0 20	15.8	7.46	1 5
17-Jul-12		801	331976	0.69	0.86	<1	<1	<10	0.16	16.8	7 39	1 5
18-Jul-12		801	331970	0.64	0.87	<1	<1	<10	0.15	14.4	7 33	2 5
17-Jul-12		801	331977	0.71	0.92	<1	<1	<10	0.12	18.0	7.41	2.0
18-Jul-12		801	331971	0.76	0.92	<1	<1	10	0.15	14.6	7 35	2.5
17-Jul-12		802	331978	0.70	0.87	<1	<1	<10	0.13	15.9	7.42	1.5
18-Jul-12		802	331974	0.65	0.82	<1	<1	10	0 32	12.8	7.42	2.0
17-Jul-12		802	331979	0.66	0.85	<1	<1	<10	0.12	17.1	7 39	2.5
18-Jul-12		802	331975	0.71	0.84	<1	<1	<10	0 28	13.0	7.41	2.5
18-Jul-12		810	332358	0.51	0.66	<1	<1	<10	0.14	14.0	7.42	1.5
19-Jul-12		810	332352	0.70	0.86	<1	<1	10	0 21	16.8	7.42	0.5
18-Jul-12		810	332359	0.56	0.69	<1	<1	<10	0.14	14.2	7 39	1.0
19-Jul-12		810	332353	0.28	0.41	<1	<1	<10	0.19	14.1	7 37	0.5

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18-Jul-12		812	332360	0.82	0.95	<1	<1	20	0.12	14.6	7.40	1 0
19-Jul-12		812	332356	0.59	0.78	<1	<1	<10	0.14	15.3	7.40	0 5
18-Jul-12		812	332361	0.44	0.56	<1	<1	<10	0.12	13.4	7.41	1 5
19-Jul-12		812	332357	0.60	0.83	<1	<1	<10	0.14	13.8	7.42	0 5
19-Jul-12		824	332419	0.43	0.64	<1	<1	<10	0.19	15.8	7.59	0 5
20-Jul-12		824	332413	0.86	1.04	<1	<1	<10	0 33	15.4	7.63	0 5
19-Jul-12		824	332420	0.78	0.94	<1	<1	<10	0 21	13.8	7.56	1 0
20-Jul-12		824	332414	0.45	0.65	<1	<1	<10	0 21	13.1	7.56	1 0
19-Jul-12		825	332421	0.60	0.78	<1	<1	<10	0.16	13.1	7.55	0 5
20-Jul-12		825	332417	0.99	1.11	<1	<1	<10	0 31	15.7	7.48	1 0
19-Jul-12		825	332422	0.81	0.99	<1	<1	10	0.76	13.5	7.49	0 5
20-Jul-12		825	332418	0.98	1.10	<1	<1	<10	0 32	15.5	7.48	0 5
20-Jul-12		837	332457	0.69	0.85	<1	<1	<10	0.76	12.1	7 52	1 0
23-Jul-12		837	332451	0.36	0.53	<1	<1	<10	0 30	15.8	7 59	0 5
20-Jul-12		837	332456	0.43	0.64	<1	<1	<10	0 26	12.8	7 51	0 5
23-Jul-12		837	332450	0.38	0.54	<1	<1	<10	0 30	15.8	7 60	1 0
20-Jul-12		838	332458	0.47	0.59	<1	<1	<10	0.15	14.5	7 53	1 0
23-Jul-12		838	332454	0.41	0.52	<1	<1	10	0 28	11.7	7 51	1 0
20-Jul-12		838	332459	0.47	0.62	<1	<1	<10	0 22	15.2	7 52	0 5
23-Jul-12		838	332455	0.42	0.50	<1	<1	<10	0 28	11.9	7.49	1.0
23-Jul-12		867	332650	0.80	0.92	<1	<1	<10	0.40	16.5	7 37	1.0
24-Jul-12		867	332644	0.63	0.79	<1	<1	40	0 27	16.6	7 31	0.5
23-Jul-12		867	332649	0.64	0.82	<1	<1	<10	0.17	15.5	7 58	0.5
24-Jul-12		867	332643	0.62	0.78	<1	<1	60	0 26	16.0	7.42	1.0
23-Jul-12		868	332652	0.15	0.29	<1	<1	10	0 28	14.0	7.43	1.0
24-Jul-12		868	332648	0.42	0.55	<1	<1	100	0 27	15.5	7.44	1.0
23-Jul-12		868	332651	0.19	0.32	<1	<1	<10	0 25	14.8	7.49	0.5
24-Jul-12		868	332647	0.17	0.32	<1	<1	110	0 54	14.2	7.41	0.5
24-Jul-12		879	332732	0.61	0.75	<1	<1	200	0 35	17.4	7 38	1.0
25-Jul-12		879	332726	0.65	0.77	<1	<1	<10	0 35	18.1	7.44	0.5

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24-Jul-12		879	332731	0.30	0.50	<1	<1	280	0.30	16.8	7.40	1 5
25-Jul-12		879	332725	0.59	0.81	<1	<1	10	0.40	17.3	7.47	0 5
24-Jul-12		880	332734	0.55	0.75	<1	<1	50	0.50	14.9	7.42	1 0
25-Jul-12		880	332730	0.72	0.85	<1	<1	<10	0 29	16.6	7.47	1 0
24-Jul-12		880	332733	0.48	0.63	<1	<1	30	0.44	13.8	7.38	1 0
25-Jul-12		880	332729	0.67	0.84	<1	<1	<10	0 28	16.9	7.51	1 0
25-Jul-12		893	333135	0.62	0.82	<1	<1	10	0 23	14.3	7.49	1 0
26-Jul-12		893	333129	0.63	0.83	<1	<1	10	0 20	14.6	7.54	1 0
25-Jul-12		893	333134	0.62	0.82	<1	<1	<10	0.16	15.3	7.48	0 5
26-Jul-12		893	333128	0.63	0.81	<1	<1	<10	0.18	14.5	7.46	1 0
25-Jul-12		894	333137	0.45	0.65	<1	<1	<10	0 33	14.2	7.62	0 5
26-Jul-12		894	333133	0.54	0.66	<1	<1	120	0 33	13.9	7 61	1 0
25-Jul-12		894	333136	0.46	0.62	<1	<1	10	0 31	15.3	7 60	0 5
26-Jul-12		894	333132	0.43	0.59	<1	<1	<10	0 25	14.8	7 51	0 5
26-Jul-12		907	333174	0.82	0.96	3	<1	10	0 93	16.0	7 53	1 0
27-Jul-12		907	333168	0.86	0.99	<1	<1	<10	0 29	19.0	7 52	1 0
26-Jul-12		907	333173	0.72	0.91	<1	<1	<10	1.48	16.8	7 52	1 0
27-Jul-12		907	333167	0.57	0.80	<1	<1	10	0 21	16.0	7 66	1 0
26-Jul-12		908	333176	0.47	0.66	<1	<1	10	0.15	13.8	7.46	1 0
27-Jul-12		908	333172	0.43	0.63	<1	<1	<10	0 22	14.9	7.47	1 0
26-Jul-12		908	333175	0.56	0.77	<1	<1	<10	0.16	14.8	7 51	0 5
27-Jul-12		908	333171	0.43	0.59	<1	<1	<10	0 22	15.0	7.48	1 0
27-Jul-12		917	333214	0.44	0.64	<1	<1	<10	0.18	17.6	7 58	1 0
30-Jul-12		917	333208	0.77	0.93	<1	<1	<10	0 20	17.5	7 51	1.0
27-Jul-12		917	333213	0.56	0.77	<1	<1	10	0.18	16.2	7 53	1.0
30-Jul-12		917	333207	0.76	0.91	<1	<1	20	0.19	16.5	7.45	1.0
27-Jul-12		919	333215	0.32	0.50	<1	<1	10	0 28	14.9	7 61	1.0
30-Jul-12		919	333211	0.32	0.45	<1	<1	<10	0 26	16.9	7 53	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100m L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
27-Jul-12		919	333216	0.72	0.85	<1	<1	<10	0.60	16.1	7.62	1 0
30-Jul-12		919	333212	0.44	0.56	<1	<1	<10	0.23	16.3	7.56	1 0
30-Jul-12		950	333377	0.39	0.66	<1	<1	<10	0.28	14.3	7.64	0 5
31-Jul-12		950	333371	0.49	0.65	<1	<1	<10	0 26	14.9	7.61	1 0
30-Jul-12		950	333378	0.53	0.69	<1	<1	<10	0 32	14.5	7.58	1 0
31-Jul-12		950	333372	0.46	0.72	<1	<1	<10	0 22	15.5	7.52	0 5
30-Jul-12		951	333380	0.41	0.61	<1	<1	<10	0 26	14.8	7.58	0 5
31-Jul-12		951	333376	0.52	0.64	<1	<1	<10	0 20	14.5	7.57	1 0
30-Jul-12		951	333379	0.47	0.64	<1	<1	<10	0 27	13.4	7.61	1 0
31-Jul-12		951	333375	0.43	0.62	<1	<1	<10	0 23	13.8	7.58	1 0
31-Jul-12		960	333449	0.67	0.90	<1	<1	<10	0 26	12.7	7 58	1 0
1-Aug-12		960	333443	0.66	0.97	1	<1	10	0.74	14.3	7.49	1 0
3-Aug-12		960	333897	0.63	0.78	<1	<1	<10	0.18	13.4	NA	NA
31-Jul-12		960	333450	0.76	0.89	<1	<1	<10	0 29	12.6	7 52	0 5
1-Aug-12		960	333444	0.83	1.05	<1	<1	<10	0 69	14.1	7 57	1 0
31-Jul-12		961	333451	0.62	0.80	<1	<1	<10	0 24	15.0	7.42	1 0
1-Aug-12		961	333447	0.68	0.83	<1	<1	<10	0 27	14.7	7.46	1 0
31-Jul-12		961	333452	0.47	0.67	<1	<1	<10	0 26	14.9	7.49	1.0
1-Aug-12		961	333448	0.72	0.87	<1	<1	<10	0 25	14.5	7.48	1.0
1-Aug-12		974	333806	0.60	0.77	<1	<1	<10	0.15	15.0	7.40	1.0
2-Aug-12		974	333802	0.62	0.76	<1	<1	<10	0 22	16.3	7.47	1.0
1-Aug-12		974	333805	0.66	0.82	<1	<1	<10	0.15	15.6	7.47	1.0
2-Aug-12		974	333801	0.67	0.82	<1	<1	<10	0 22	15.9	7 51	1.0
1-Aug-12		975	333804	0.68	0.86	<1	<1	30	0 22	17.6	7.44	1.0
2-Aug-12		975	333798	0.58	0.70	<1	<1	<10	0 30	15.0	7.48	1.0
1-Aug-12		975	333803	0.55	0.76	<1	<1	10	0.17	14.5	7.45	1.0
2-Aug-12		975	333797	0.60	0.72	<1	<1	<10	0.41	14.0	7 52	1.0
2-Aug-12		979	333858	0.50	0.75	<1	<1	<10	0.18	16.0	7.45	1.0
3-Aug-12		979	333852	0.65	0.78	<1	<1	<10	0 63	16.7	7 51	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
2-Aug-12		979	333857	0.53	0.74	<1	<1	<10	0.17	14.9	7.46	1 0
3-Aug-12		979	333851	0.61	0.80	<1	<1	10	0.21	16.2	7.51	1 0
2-Aug-12		980	333859	0.44	0.64	<1	<1	<10	0.17	14.0	7.54	0 5
3-Aug-12		980	333855	0.61	0.77	<1	<1	<10	0.23	17.1	7.55	1 5
2-Aug-12		980	333860	0.72	0.84	<1	<1	<10	0.19	16.0	7.49	1 0
3-Aug-12		980	333856	0.51	0.67	<1	<1	<10	0 24	17.0	7.56	1 0
3-Aug-12		992	333891	0.60	0.78	<1	<1	<10	0 20	16.1	7.52	1 0
7-Aug-12		992	333885	0.42	0.53	<1	<1	<10	0.19	14.1	7.56	1 0
3-Aug-12		992	333892	0.51	0.71	<1	<1	<10	0 20	14.4	7.48	1 0
7-Aug-12		992	333886	0.47	0.58	<1	<1	<10	0 20	15.6	7.62	1 0
3-Aug-12		993	333894	0.36	0.48	<1	<1	<10	0.40	17.3	7.50	1 5
7-Aug-12		993	333890	0.69	0.81	<1	<1	<10	0 24	16.6	7.60	1 0
3-Aug-12		993	333893	0.38	0.58	<1	<1	10	0 26	17.4	7.51	1 0
7-Aug-12		993	333889	0.74	0.86	<1	<1	100	0.19	16.0	7.59	1 0

NR - No result NA - Not analyzed

Comments:

On May 18, 29 and 30, pre-flush bacteriological sample were not analyzed due to a technician error.

On May 24 and June 20 there were no results for HPC due to a contract lab error.

*Bracketed ( ) addresses indicate alternate location was sampled because initial location was inaccessible for the Post-Flush or Few days Post-Flush sampling.

No re-sample collected when a pre-flush sample test positive for bacti and the post-flush is negative.

2013 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
6-May-13		27	358925	0.82	0 98	<1	<1	150	0.22	7 2	7.55	3 5
7-May-13		27	358919	0.81	1 02	<1	<1	<10	0.25	6 3	7.53	2 5
6-May-13		27	358924	0.85	0 96	<1	<1	<10	0.26	5 3	7.55	3 0
7-May-13		27	358918	0.84	1 04	<1	<1	<10	0.16	7 3	7.54	2 5
6-May-13		29	358926	0.79	0 97	<1	<1	<10	0.28	5 0	7 53	2.5
7-May-13		29	358922	0.68	0 92	<1	<1	<10	0.44	5 5	7 50	3.0
6-May-13		29	358927	0.86	0 97	<1	<1	50	0.30	8 0	7 58	3.0
7-May-13		29	358923	0.71	0 98	<1	<1	<10	0.16	6 3	7 52	3.5
7-May-13		38	358986	0.78	1 06	<1	<1	<10	0.24	6 3	7 52	4.5
8-May-13		38	358980	0.82	0 99	<1	<1	<10	0.21	7.1	7.47	3.0
7-May-13		38	358985	0.87	1 02	<1	<1	<10	0.19	7 0	7 50	2.5
8-May-13		38	358979	0.92	1.14	<1	<1	<10	0.29	7 3	7 29	4.0
7-May-13		39	358987	0.95	1.16	<1	<1	<10	0.23	8 3	7.44	4.0
8-May-13		39	358983	0.77	0 90	<1	<1	<10	0.20	12.1	7.60	2.5
7-May-13		39	358988	0.71	1 01	<1	<1	<10	0.25	9 2	7 55	2.5
8-May-13		39	358984	0.78	0 88	<1	<1	<10	0.22	11.6	7 57	3.0
8-May-13		50	359372	0.76	0 87	<1	<1	<10	0.69	7 2	7 51	6.0
9-May-13		50	359366	0.86	1 08	<1	<1	<10	0.41	6 8	7 53	6.5
8-May-13		50	359373	0.85	1 01	<1	<1	<10	0.47	7 3	7 54	6.5
9-May-13		50	359367	0.85	1 01	<1	<1	<10	0.48	7 8	7 56	16.0
8-May-13		51	359375	0.81	0 98	<1	<1	<10	0.36	6.1	7 57	5.0
9-May-13		51	359371	0.94	1 06	<1	<1	<10	0.43	8.6	7 57	13.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
9-May-13		51	359370	1.01	1 09	<1	<1	<10	0.40	7 8	7 52	10.0
8-May-13		51	359374	0.80	0 94	<1	<1	<10	0.32	8 3	7 55	6.0
9-May-13		60	359441	0.86	1 02	<1	<1	<10	0.21	6.1	7.39	4 0
10-May-13		60	359435	0.90	1 06	<1	<1	<10	0.27	6.1	7.49	7 5
9-May-13		60	359442	0.64	0 86	<1	<1	<10	0.37	5 9	7.54	5 0
10-May-13		60	359436	0.83	1 00	<1	<1	<10	0.25	5 8	7.48	5 0
9-May-13		61	359444	0.87	1 02	<1	<1	<10	0.23	6 8	7.50	5 0
10-May-13		61	359440	0.82	0 97	<1	<1	<10	0.40	6 3	7.46	13.0
9-May-13		61	359443	0.78	0 96	<1	<1	<10	0.21	6.1	7.45	6 0
10-May-13		61	359439	0.81	0 95	<1	<1	<10	0.25	8 0	7.49	5 0
10-May-13		68	359507	0.89	1 01	<1	<1	<10	0.22	7 0	7.47	13.0
13-May-13		68	359501	0.91	1 00	<1	<1	<10	0.20	7 0	7.65	4 0
10-May-13		68	359508	0.22	0.40	<1	<1	<10	0.27	6 5	7.39	15.0
13-May-13		68	359502	0.75	0 90	<1	<1	<10	0.49	5.1	7.43	7 0
10-May-13		71	359509	1.11	1 22	<1	<1	<10	8.50	6 8	7.42	160
13-May-13		71	359505	0.76	1 00	<1	<1	<10	0.35	6 0	7.54	5 0
10-May-13		71	359510	1.43	1.67	<1	<1	<10	12.20	7 9	7.60	180
13-May-13		71	359506	0.79	1 02	<1	<1	<10	0.33	6 9	7.50	3 0
13-May-13		94	359708	0.81	0 95	<1	<1	<10	0.31	5 8	7.55	4 0
14-May-13		94	359702	0.97	1.10	<1	<1	<10	0.56	8 2	7.56	5 0
13-May-13		94	359709	0.84	0 92	<1	<1	<10	0.27	5 8	7.60	3 0
14-May-13		94	359703	0.97	1 07	<1	<1	<10	0.51	6 5	7.46	5 0
13-May-13		96	359711	0.79	0 93	<1	<1	<10	0.24	6 8	7.49	5 0
14-May-13		96	359707	0.84	1 01	<1	<1	<10	0.56	5 8	7.50	6 0
13-May-13		96	359710	0.83	1 01	<1	<1	20	0.25	6 8	7.55	2 5
14-May-13		96	359706	0.74	0 97	<1	<1	<10	0.44	6.6	7.58	4 0
14-May-13		106	359753	0.85	1 04	<1	<1	<10	0.46	6.7	7.51	3 0
15-May-13		106	359747	0.90	1 06	<1	<1	<10	0.19	6.7	7.53	6 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
14-May-13		106	359754	0.73	0 90	<1	<1	90	0.45	5 9	7.52	3 0
15-May-13		106	359748	0.92	1 03	<1	<1	<10	0.19	5 8	7 50	4.0
14-May-13		107	359756	0.90	1 08	<1	<1	<10	1.08	6 0	7 50	25.0
15-May-13		107	359752	0.84	1.04	<1	<1	10	0.20	6.1	7 51	10.0
14-May-13		107	359755	0.70	0 93	<1	<1	<10	0.63	6 2	7 51	8.0
15-May-13		107	359751	0.76	0.85	<1	<1	<10	0.20	6 0	7 52	5.0
15-May-13		117	360147	0.79	1.00	<1	<1	<10	0.31	6.5	7 55	6.0
16-May-13		117	360141	0.75	0 95	<1	<1	<10	0.22	6.4	7 56	6.0
15-May-13		117	360146	0.89	0 99	<1	<1	<10	0.29	7 5	7.52	5 0
16-May-13		117	360140	0.84	1 03	<1	<1	<10	0.25	6.6	7 51	4.0
15-May-13		118	360148	0.86	0 99	<1	<1	<10	0.35	6 8	7 51	8.0
16-May-13		118	360144	0.79	0 97	<1	<1	<10	0.26	6 9	7 54	3.0
15-May-13		118	360149	0.79	1 00	<1	<1	50	0.30	7.7	7.52	12.0
16-May-13		118	360145	0.68	0 81	<1	<1	<10	0.20	7.1	7 59	7.0
16-May-13		129	360192	0.50	0.61	<1	<1	<10	0.27	6.6	7.58	7 5
17-May-13		129	360186	0.79	1 03	<1	<1	<10	0.35	7 0	7.44	7 5
16-May-13		129	360191	0.82	0 97	<1	<1	<10	0.30	6 2	7.48	7 0
17-May-13		129	360185	0.82	1 04	<1	<1	<10	0.26	7.1	7.40	10.0
16-May-13		130	360194	0.79	1 01	<1	<1	<10	0.31	6 8	7.51	10.0
17-May-13		130	360190	0.94	1.10	<1	<1	<10	0.35	7 5	7.48	7 5
16-May-13		130	360193	0.84	0 99	<1	<1	<10	0.21	7 3	7.57	5 0
17-May-13		130	360189	0.92	1 08	<1	<1	10	0.36	7.1	7.51	10.0
17-May-13		138	360234	0.78	1 00	<1	<1	760	0.29	6 8	7.44	10.0
21-May-13		138	360228	0.58	0.74	<1	<1	<10	0.18	6.4	7.40	5 0
17-May-13		138	360235	0.87	1 01	<1	<1	<10	0.40	6 2	7.38	10.0
21-May-13		138	360229	0.64	0 84	<1	<1	<10	0.24	6.6	7.45	5 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
17-May-13		140	360236	0.76	1 00	<1	<1	<10	0.20	5 9	7.44	10.0
21-May-13		140	360232	0.63	0 93	<1	<1	10	0.21	7 3	7.41	5.0
17-May-13		140	360237	0.81	0 99	<1	<1	<10	0.23	6 5	7.47	13.0
21-May-13		140	360233	0.71	0 96	<1	<1	<10	0.29	7.1	7.45	5.0
21-May-13		183	360763	0.79	0 87	<1	<1	<10	0.24	6.4	7.42	5.0
22-May-13		183	360757	0.65	0 90	<1	<1	<10	1.38	6 9	7.50	12.0
24-May-13		183	361111	NA	NA	NA	NA	NA	0.16	NA	NA	NA
21-May-13		183	360764	0.75	0 87	<1	<1	<10	0.21	6 5	7.46	5 0
22-May-13		183	360758	0.37	0 53	<1	<1	<10	2.08	7.1	7.50	24.0
24-May-13		183	361112	NA	NA	NA	NA	NA	0.22	NA	NA	NA
21-May-13		184	360766	0.46	0.67	<1	<1	<10	0.23	7 0	7.51	2 5
22-May-13		184	360762	0.61	0.78	<1	<1	120	1.44	7 3	7.60	7.5
24-May-13		184	361118	NA	NA	NA	NA	NA	0.29	NA	NA	NA
21-May-13		184	360765	0.64	0.76	<1	<1	10	0.20	7 0	7.45	5 0
22-May-13		184	360761	0.70	0 82	<1	<1	<10	7.96	6 9	7 58	30.0
24-May-13		184	361117	NA	NA	NA	NA	NA	0.24	NA	NA	NA
22-May-13		190	360809	0.58	0 80	<1	<1	<10	0.58	7.1	7.51	3.0
23-May-13		190	360803	0.79	0 91	<1	<1	<10	0.36	7 0	7.63	7.5
22-May-13		190	360808	0.68	0 95	<1	<1	<10	0.31	7 3	7.49	5.0
23-May-13		190	360802	0.75	0 97	<1	<1	<10	0.18	7.7	7.45	2.5
22-May-13		191	360810	0.61	0.75	<1	<1	60	0.36	6 9	7 55	3.0
23-May-13		191	360806	0.74	0 99	<1	<1	<10	0.19	8 0	7.50	7 5
22-May-13		191	360811	0.90	1 09	<1	<1	<10	2.09	8 3	7.43	23.0
23-May-13		191	360807	0.81	1 02	<1	<1	<10	0.32	7 8	7.54	6 0
23-May-13		200	360920	0.78	0 94	<1	<1	<10	0.97	8.1	7.64	14.0
24-May-13		200	360914	0.78	0 93	<1	<1	<10	0.27	8 2	7.70	7 5
23-May-13		200	360919	0.75	1 03	<1	<1	<10	0.62	8.1	7.60	15.0
24-May-13		200	360913	0.75	0 93	<1	<1	<10	0.36	8 8	7.56	4 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
23-May-13		201	360922	0.75	0 96	<1	<1	<10	0.98	7 0	7.63	40.0
24-May-13		201	360918	0.68	0 96	<1	<1	<10	0.44	7.4	7.57	11.0
23-May-13		201	360921	0.70	0 92	<1	<1	<10	0.91	6 0	7.61	32.0
24-May-13		201	360917	0.84	0 98	<1	<1	<10	0.30	7 3	7.62	11.0
24-May-13		212	361018	0.51	0.78	<1	<1	<10	0.20	8 8	7.63	3 0
27-May-13		212	361012	0.72	1 02	<1	<1	<10	0.25	8.6	7 52	6.0
24-May-13		212	361017	0.58	0 85	<1	<1	30	0.20	9 0	7.58	5 0
27-May-13		212	361011	0.79	0 97	<1	<1	<10	0.31	8.4	7 59	4.0
24-May-13		213	361020	0.80	1 00	<1	<1	<10	0.48	7 8	7 58	12.0
27-May-13		213	361016	0.77	0 97	<1	<1	<10	0.27	8.1	7.55	7.0
24-May-13		213	361019	0.85	1 00	<1	<1	<10	0.20	8 3	7 52	7.0
27-May-13		213	361015	0.75	0 90	<1	<1	<10	0.32	8.6	7.51	7 5
27-May-13		246	361255	0.66	0 83	<1	<1	<10	0.20	9 0	7 56	5.0
28-May-13		246	361249	1.03	1.11	<1	<1	<10	0.38	8.6	7 56	5.0
27-May-13		246	361254	0.85	1 03	<1	<1	<10	1.51	7.7	7.64	40.0
28-May-13		246	361248	1.10	1 25	<1	<1	10	0.24	9.6	7.45	6.0
27-May-13		247	361256	0.65	0 84	<1	<1	<10	0.19	8.1	7.56	6 0
28-May-13		247	361252	0.89	1.16	<1	<1	<10	0.23	7 5	7 57	6.0
27-May-13		247	361257	0.64	0 89	<1	<1	<10	0.19	8.7	7.56	5 0
28-May-13		247	361253	1.07	1 24	<1	<1	20	0.23	7 9	7.52	3 0
28-May-13		256	361321	0.66	0 86	<1	<1	<10	0.21	9 2	7.47	6.0
29-May-13		256	361315	0.83	1 02	<1	<1	<10	0.22	9 8	7.56	4 0
28-May-13		256	361320	0.85	1.10	<1	<1	<10	0.25	9 0	7.52	6 0
29-May-13		256	361314	0.63	0 88	<1	<1	<10	0.28	9 9	7.64	6 0
28-May-13		257	361322	0.82	1 03	<1	<1	<10	0.85	8.4	7.57	24.0
29-May-13		257	361318	0.81	1 05	<1	<1	<10	0.24	8 5	7.53	4 0
28-May-13		257	361323	1.12	1 27	<1	<1	<10	0.52	7 9	7.50	14.0
29-May-13		257	361319	0.59	0.77	<1	<1	<10	0.19	7 9	7.57	6 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
29-May-13		268	361758	0.44	0.66	<1	<1	<10	0.21	8 5	7.57	3 0
30-May-13		268	361752	0.76	0 93	<1	<1	<10	0.30	8 3	7.48	6.0
29-May-13		268	361759	0.65	0 86	<1	<1	<10	0.24	8.4	7.59	5 0
30-May-13		268	361753	0.78	0 94	<1	<1	<10	0.29	8 5	7.61	2 5
29-May-13		269	361761	0.73	0 88	<1	<1	<10	0.51	7 0	7 59	5.0
30-May-13		269	361757	0.53	0.60	<1	<1	<10	3.52	8 9	7.63	8 0
3-Jun-13		269	362124	NA	NA	NA	NA	NA	0.44	NA	NA	NA
29-May-13		269	361760	0.75	0 91	<1	<1	<10	0.34	7 8	7 58	4.0
30-May-13		269	361756	0.78	0 91	<1	<1	<10	0.31	8.7	7 57	5.0
30-May-13		279	361836	0.58	0.73	<1	<1	<10	0.35	6 9	7.64	7.5
31-May-13		279	361830	0.42	0 53	<1	<1	<10	0.21	7.4	7.64	3 0
30-May-13		279	361835	0.60	0.77	<1	<1	<10	0.55	6 8	7.75	10.0
31-May-13		279	361829	0.41	0 50	<1	<1	<10	0.21	7 9	7.71	4 0
30-May-13		280	361837	0.60	0.76	<1	<1	<10	0.39	6 3	7.70	5 0
31-May-13		280	361833	0.56	0.77	<1	<1	140	0.26	7 8	7.63	3 0
30-May-13		280	361838	0.30	0.46	<1	<1	<10	0.44	7 0	7.71	5 0
31-May-13		280	361834	0.54	0.78	<1	<1	<10	0.24	7 8	7.67	5 0
31-May-13		290	361883	0.96	1.17	<1	<1	30	0.16	9 8	7.43	4 0
3-Jun-13		290	361877	0.79	1 00	<1	<1	<10	0.25	10.3	7.65	10.0
31-May-13		290	361884	0.89	1 03	<1	<1	<10	0.16	8 5	7.50	4 0
3-Jun-13		290	361878	0.88	1 03	<1	<1	<10	0.21	9 3	7.61	8.0
31-May-13		291	361886	0.68	0 80	<1	<1	<10	0.16	8 9	7.56	4 0
3-Jun-13		291	361882	0.55	0.73	<1	<1	<10	0.22	10 3	7.62	7 5
31-May-13		291	361885	0.70	0 87	<1	<1	<10	0.17	10.1	7.49	2 5
3-Jun-13		291	361881	0.97	1.10	<1	<1	<10	0.20	8.6	7.59	5 0
3-Jun-13		324	362119	0.79	0 96	<1	<1	<10	0.23	10.6	7.68	10.0
4-Jun-13		324	362113	0.80	0 90	<1	<1	<10	0.24	9 2	7.74	7 0
3-Jun-13		324	362120	0.17	0 32	<1	<1	<10	0.53	10 0	7.65	9 0
4-Jun-13		324	362114	0.79	0 92	<1	<1	<10	0.26	8 5	7.71	5 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
3-Jun-13		325	362121	0.80	0 98	<1	<1	<10	0.34	8 0	7.66	8.0
4-Jun-13		325	362117	0.81	1 00	<1	<1	<10	0.23	8.6	7.55	6.0
3-Jun-13		325	362122	0.75	0 95	<1	<1	<10	0.29	8 2	7.69	11.0
4-Jun-13		325	362118	0.80	1 04	<1	<1	<10	0.26	8.6	7.60	2 5
4-Jun-13		334	362149	0.96	1 07	<1	<1	<10	0.23	11.6	7.62	7 5
5-Jun-13		334	362143	0.73	0 93	<1	<1	<10	0.39	12 3	7.66	12.0
4-Jun-13		334	362150	0.69	0 83	<1	<1	<10	0.25	14 2	7.65	7 5
5-Jun-13		334	362144	0.64	0 97	<1	<1	<10	0.29	14.4	7.65	8 0
5-Jun-13		340	362545	0.52	0.76	<1	<1	<10	0.22	14.6	7.57	8 0
6-Jun-13		340	362539	0.55	0.75	<1	<1	<10	0.24	11.1	7.54	7 0
5-Jun-13		340	362546	0.70	0 83	<1	<1	<10	0.31	13.4	7.64	10.0
6-Jun-13		340	362540	0.72	0 85	<1	<1	10	0.21	10 3	7.66	6 0
5-Jun-13		341	362547	0.70	0 88	<1	<1	<10	0.49	10 5	7.59	12.0
6-Jun-13		341	362543	0.59	0.75	<1	<1	<10	0.30	11.1	7.51	10.0
5-Jun-13		341	362548	0.74	0 91	<1	<1	<10	0.49	10.1	7.55	13.0
6-Jun-13		341	362544	0.72	0 91	<1	<1	10	0.38	10 5	7.58	10.0
6-Jun-13		349	362616	0.88	1 02	<1	<1	<10	0.23	9 0	7.53	7 0
10-Jun-13		349	362610	0.84	1 07	<1	<1	<10	0.33	10.6	7.52	7 5
6-Jun-13		349	362615	0.82	0 97	<1	<1	<10	0.21	12.1	7.50	7 5
10-Jun-13		349	362609	0.78	0 99	<1	<1	<10	0.27	12.4	7.59	10.0
6-Jun-13		350	362617	0.64	0.79	<1	<1	<10	0.37	7.7	7.56	13.0
10-Jun-13		350	362613	0.71	0 93	<1	<1	<10	0.29	7.6	7.56	6 0
6-Jun-13		350	362618	0.57	0.74	<1	<1	<10	0.35	9.7	7.54	13.0
10-Jun-13		350	362614	0.68	0 84	<1	<1	<10	0.26	9 9	7.52	5 0
7-Jun-13		352	362681	0.50	0.61	<1	<1	NR	0.32	10 8	7.57	11.0
10-Jun-13		352	362677	0.54	0.71	<1	<1	10	0.88	12 2	7.52	8 0
7-Jun-13		352	362680	0.41	0 57	<1	<1	NR	0.42	9 8	7.61	9 0
10-Jun-13		352	362676	0.51	0.68	<1	<1	<10	0.89	10 8	7.50	10.0

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7-Jun-13		353	362678	0.64	0 84	<1	<1	NR	0.28	10.6	7.64	3.0
10-Jun-13		353	362672	0.60	0 83	<1	<1	<10	0.25	10.2	7.62	4.0
7-Jun-13		353	362679	0.58	0.76	<1	<1	NR	0.33	11.0	7.65	4.0
10-Jun-13		353	362673	0.63	0.76	<1	<1	<10	0.27	10.8	7 59	3.5
10-Jun-13		374	362871	0.75	0 92	<1	<1	<10	0.26	10.8	7.52	4.0
11-Jun-13		374	362865	0.74	0 95	<1	<1	<10	0.26	12.1	7.48	4 0
10-Jun-13		374	362872	0.69	0 90	<1	<1	<10	0.25	11.1	7.63	3 0
11-Jun-13		374	362866	0.81	0 97	<1	<1	<10	0.21	12 2	7.45	5 0
10-Jun-13		375	362873	0.76	0 96	<1	<1	<10	0.22	11.1	7.61	5 0
11-Jun-13		375	362869	0.72	0 91	<1	<1	<10	0.27	10 8	7.43	4 5
10-Jun-13		375	362874	0.63	0 85	<1	<1	<10	0.68	10 3	7.63	7 5
11-Jun-13		375	362870	0.78	1 01	<1	<1	10	0.21	11.6	7.50	2 5
11-Jun-13		381	362893	0.24	0 57	<1	<1	<10	0.34	9 8	7.58	3 0
12-Jun-13		381	362887	0.31	0.49	<1	<1	10	0.77	9.6	7.71	9 0
11-Jun-13		381	362894	0.42	0.63	<1	<1	10	0.36	9 8	7.52	2 5
12-Jun-13		381	362888	0.28	0 51	<1	<1	20	0.91	10 2	7.53	11.0
11-Jun-13		383	362896	0.64	0 84	<1	<1	<10	0.26	10 3	7.46	5 0
12-Jun-13		383	362892	0.78	0 97	<1	<1	<10	0.28	11 3	7.58	13.0
11-Jun-13		383	362895	0.58	0 84	<1	<1	<10	0.26	9.4	7.48	5 0
12-Jun-13		383	362891	0.77	0 96	<1	<1	<10	0.23	10 5	7.54	7 5
12-Jun-13		390	363331	0.42	0.67	<1	<1	<10	0.22	10 8	7.58	0 5
13-Jun-13		390	363325	0.57	0.77	<1	<1	NR	0.20	12.4	7.57	0 5
12-Jun-13		390	363332	0.55	0.66	<1	<1	<10	0.52	12 8	7.64	0 5
13-Jun-13		390	363326	0.55	0.71	<1	<1	NR	0.17	13 3	7.54	0 5

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12-Jun-13		391	363333	0.45	0.66	<1	<1	<10	0.50	9 5	7 58	0.5
13-Jun-13		391	363329	0.26	0.42	<1	<1	NR	0.91	9.4	7 57	0.5
12-Jun-13		391	363334	0.57	0.75	<1	<1	<10	0.29	8 9	7 59	0.5
13-Jun-13		391	363330	0.26	0.40	<1	<1	NR	0.90	9 2	7 51	0.5
13-Jun-13		393	363408	0.66	0 93	<1	<1	NR	0.21	10 9	7.58	0 5
14-Jun-13		393	363402	0.83	1 02	<1	<1	NR	0.21	11.5	7.62	0.5
13-Jun-13		393	363409	0.76	0 95	<1	<1	NR	0.22	10.9	7.52	0 5
14-Jun-13		393	363403	0.80	0 98	<1	<1	NR	0.21	11.5	7.64	0.5
13-Jun-13		394	363410	0.75	0 93	<1	<1	NR	0.32	11.3	7.49	0.5
14-Jun-13		394	363406	0.77	0 95	<1	<1	NR	0.31	11.4	7 58	0.5
13-Jun-13		394	363411	0.73	0 90	<1	<1	NR	0.19	12.1	7 52	0.5
14-Jun-13		394	363407	0.70	0 91	<1	<1	NR	0.32	11.1	7.63	0.5
14-Jun-13		403	363448	0.65	0.75	<1	<1	NR	0.31	9 8	7.61	0.5
17-Jun-13		403	363442	0.49	0.71	<1	<1	<10	0.28	10.0	7.57	1.0
14-Jun-13		403	363449	0.53	0.76	<1	<1	NR	0.42	10.0	7 59	0.5
17-Jun-13		403	363443	0.50	0.69	<1	<1	10	0.27	10.2	7.59	1.0
14-Jun-13		404	363450	0.62	0.74	<1	<1	NR	0.34	8.6	7.60	0 5
17-Jun-13		404	363446	0.73	0 91	<1	<1	30	0.25	10.1	7.61	0.5
14-Jun-13		404	363451	0.56	0.69	<1	<1	NR	0.32	9 0	7 56	0.5
17-Jun-13		404	363447	0.73	0 85	<1	<1	20	0.29	10.5	7.63	0.5
17-Jun-13		428	363650	0.64	0.81	<1	<1	<10	0.45	12.4	7.70	0.5
18-Jun-13		428	363644	0.57	0.72	<1	<1	NR	0.55	13.1	7.65	0.5
17-Jun-13		428	363651	0.64	0.85	<1	<1	<10	0.38	11.6	7.64	0.5
18-Jun-13		428	363645	0.53	0.73	<1	<1	NR	0.56	11.6	7.64	0.5
17-Jun-13		430	363652	0.35	0.53	<1	<1	10	0.41	7.7	7.67	1.0
18-Jun-13		430	363648	0.54	0.73	<1	<1	NR	0.60	10.2	7 59	0.5
17-Jun-13		430	363653	0.35	0.51	<1	<1	10	0.40	7.5	7.65	0.5
18-Jun-13		430	363649	0.45	0.67	<1	<1	NR	0.62	10.9	7.65	1.0

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18-Jun-13		435	363692	0.58	0 80	<1	<1	NR	0.26	10.1	7 53	0.5
19-Jun-13		435	363686	0.78	0 98	<1	<1	<10	0.33	11.7	7.63	0.5
18-Jun-13		435	363693	0.64	0.79	<1	<1	NR	0.30	9.7	7.60	0.5
19-Jun-13		435	363687	0.79	1 00	<1	<1	10	0.36	12.1	7.60	0.5
18-Jun-13		436	363694	0.60	0.78	<1	<1	NR	0.33	9.4	7 56	0.5
19-Jun-13		436	363690	0.77	0 96	<1	<1	<10	0.45	11.1	7.62	0.5
18-Jun-13		436	363695	0.60	0 80	<1	<1	NR	0.35	9.1	7 53	0.5
19-Jun-13		436	363691	0.74	0 89	<1	<1	<10	0.37	11.2	7.63	0.5
19-Jun-13		443	364148	0.58	0 83	<1	<1	<10	0.51	9.6	7.55	0 5
20-Jun-13		443	364142	0.66	0 82	<1	<1	10	0.34	10 5	7.55	0 5
19-Jun-13		443	364149	0.54	0.78	<1	<1	<10	0.40	10.6	7.64	0 5
20-Jun-13		443	364143	0.65	0.77	<1	<1	<10	0.38	11 2	7.62	0 5
19-Jun-13		444	364150	0.45	0.63	<1	<1	<10	1.23	9 2	7.63	0 5
20-Jun-13		444	364146	0.56	0.69	<1	<1	<10	0.54	9.7	7.55	0 5
19-Jun-13		444	364151	0.53	0.74	<1	<1	<10	1.11	9 0	7.63	0 5
20-Jun-13		444	364147	0.49	0.62	<1	<1	<10	0.47	9.6	7.63	1 0
20-Jun-13		456	364200	0.86	1 07	<1	<1	<10	0.35	9 9	7.61	0 5
21-Jun-13		456	364194	0.82	0 99	<1	<1	<10	0.34	10 9	7.51	1 0
20-Jun-13		456	364201	0.83	1.10	<1	<1	<10	0.28	11.4	7.62	0 5
21-Jun-13		456	364195	0.81	1 00	<1	<1	<10	0.37	11 8	7.58	0 5
20-Jun-13		457	364202	0.55	0.75	<1	<1	<10	0.39	10 2	7.65	1 0
21-Jun-13		457	364198	0.24	0.40	<1	<1	<10	10.70	11 3	7.51	1 0
24-Jun-13		457	364462	NA	NA	NA	NA	NA	0.22	NA	NA	NA
20-Jun-13		457	364203	0.66	0 80	<1	<1	<10	0.36	11.4	7.62	0 5
21-Jun-13		457	364199	0.98	1.17	<1	<1	<10	8.77	12.4	7.58	0 5
24-Jun-13		457	364463	NA	NA	NA	NA	NA	0.23	NA	NA	NA
21-Jun-13		464	364241	0.52	0.76	<1	<1	10	0.94	11.4	7.49	0 5
24-Jun-13		464	364235	0.34	0 50	<1	<1	<10	0.58	9.6	7.60	1 0
21-Jun-13		464	364242	0.54	0.71	<1	<1	10	1.26	10.4	7.49	1 0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
24-Jun-13		464	364236	0.41	0 56	<1	<1	<10	0.41	8 9	7.61	0.5
21-Jun-13		466	364243	0.72	0 91	<1	<1	20	0.23	11.1	7.68	1.0
24-Jun-13		466	364239	0.56	0.69	<1	<1	40	0.27	9 8	7.66	1.0
21-Jun-13		466	364244	0.61	0 81	<1	<1	50	0.32	9.4	7.64	1.0
24-Jun-13		466	364240	0.41	0 59	<1	<1	30	0.36	10.8	7.64	1.0
24-Jun-13		497	364446	0.82	1 04	<1	<1	<10	0.23	17.8	7.66	1.0
25-Jun-13		497	364440	0.86	0 99	<1	<1	<10	0.46	17.3	7.57	0.5
24-Jun-13		497	364447	0.88	1 03	<1	<1	10	0.21	17.7	7.67	1 0
25-Jun-13		497	364441	0.77	0 94	<1	<1	<10	0.49	17 3	7.57	0 5
24-Jun-13		498	364448	0.70	0 85	<1	<1	10	0.23	14 0	7.60	1 0
25-Jun-13		498	364444	0.67	0 86	<1	<1	<10	0.32	14.1	7.47	0 5
24-Jun-13		498	364449	0.82	1 01	<1	<1	<10	0.27	13 9	7.49	1 0
25-Jun-13		498	364445	0.61	0.76	<1	<1	10	0.37	13 5	7.43	0 5
25-Jun-13		505	364821	0.64	0 86	<1	<1	<10	0.22	9.6	7.49	0 5
26-Jun-13		505	364815	0.84	0 99	<1	<1	<10	0.25	12.6	7.49	0 5
25-Jun-13		505	364822	0.75	0 92	<1	<1	<10	0.32	12.1	7.59	1 0
26-Jun-13		505	364816	0.83	0 93	<1	<1	<10	0.24	14 0	7.54	1 0
25-Jun-13		506	364823	0.71	0 92	<1	<1	10	0.33	12 0	7.50	0 5
26-Jun-13		506	364819	0.39	0.60	<1	<1	<10	0.23	13 0	7.67	1 0
25-Jun-13		506	364824	0.66	0 84	<1	<1	<10	0.35	13 3	7.49	0 5
26-Jun-13		506	364820	0.67	0.79	<1	<1	<10	0.22	15 3	7.59	0 5
26-Jun-13		514	364901	0.66	0 84	<1	<1	<10	0.25	10 3	7.59	0 5
27-Jun-13		514	364895	0.54	0.72	<1	<1	<10	0.27	11 9	7.59	0 5
26-Jun-13		514	364902	0.62	0.76	<1	<1	<10	0.24	11 9	7.64	1 0
27-Jun-13		514	364896	0.60	0 80	<1	<1	<10	0.25	11 5	7.56	0 5

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
26-Jun-13		515	364903	0.65	0 81	<1	<1	<10	0.23	9 0	7.60	0.5
27-Jun-13		515	364899	0.63	0 80	<1	<1	10	0.30	9 8	7.67	0.5
26-Jun-13		515	364904	0.66	0.77	<1	<1	<10	0.26	10.0	7.67	1.0
27-Jun-13		515	364900	0.65	0 82	<1	<1	<10	0.31	9 9	7.61	0.5
27-Jun-13		523	364974	0.72	0 85	<1	<1	<10	0.22	11.8	7.56	0.5
28-Jun-13		523	364968	0.70	0 98	<1	<1	<10	0.27	11.7	7 58	0.5
27-Jun-13		523	364975	0.69	0 82	<1	<1	30	0.17	12.5	7.53	1.0
28-Jun-13		523	364969	0.72	0 90	<1	<1	<10	0.20	12.2	7 54	0.5
27-Jun-13		524	364976	0.50	0.70	<1	<1	<10	0.22	10.1	7.55	0 5
28-Jun-13		524	364972	0.67	0 88	<1	<1	<10	0.21	11.4	7.58	0 5
27-Jun-13		524	364977	0.70	0 85	<1	<1	10	0.18	13 5	7.41	1 0
28-Jun-13		524	364973	0.54	0.76	<1	<1	<10	0.22	11.6	7.46	1 0
28-Jun-13		534	365009	0.52	0.72	1	<1	<10	0.32	11.1	7.52	0 5
30-Jun-13		534	365003	0.23	0.42	<1	<1	<10	0.28	12 0	7.45	0 5
28-Jun-13		534	365010	0.72	0 90	<1	<1	<10	0.22	11.6	7.45	0 5
30-Jun-13		534	365004	0.72	0 87	<1	<1	<10	0.18	12.1	7.50	0 5
28-Jun-13		535	365011	0.77	0 99	<1	<1	<10	0.21	13 3	7.51	0 5
30-Jun-13		535	365007	0.71	0 86	<1	<1	<10	0.17	13.6	7.54	0 5
28-Jun-13		535	365012	0.72	0 89	<1	<1	<10	0.19	14.1	7.45	1 0
30-Jun-13		535	365008	0.63	0 81	<1	<1	<10	0.20	14.1	7.57	1 0
3-Jul-13		569	365187	0.56	0.77	<1	<1	<10	0.21	12 8	7.63	0 5
4-Jul-13		569	365181	0.68	0 90	<1	<1	<10	0.21	11.9	7.65	1.0
3-Jul-13		569	365188	0.71	0 85	<1	<1	<10	0.20	14.1	7.54	0 5
4-Jul-13		569	365182	0.51	0.70	<1	<1	<10	0.24	13.2	7 52	1.0
3-Jul-13		570	365189	0.51	0.69	5	<1	140	0.22	12.1	7.61	0.5
4-Jul-13		570	365185	0.77	1 00	27	<1	1100	0.38	11 9	7.60	0 5
8-Jul-13		570	365907	0.56	0.76	<1	<1	80	0.24	11 0	NA	NA

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
3-Jul-13		570	365190	0.59	0.78	<1	<1	<10	0.23	11.8	7.64	0.5
4-Jul-13		570	365186	0.87	1.10	<1	<1	<10	0.40	14 8	7 58	0.5
4-Jul-13		583	365611	0.64	0.79	<1	<1	<10	0.28	12.0	7 56	1.0
5-Jul-13		583	365605	0.80	0 94	<1	<1	<10	0.25	15.8	7 58	1.0
4-Jul-13		584	365613	0.54	0.77	<1	<1	<10	0.18	10.9	7 58	0.5
5-Jul-13		584	365609	0.87	1 00	<1	<1	10	0.27	12.6	7 52	1.0
4-Jul-13		583	365610	0.54	0.79	1	<1	<10	0.20	13.1	7 52	1.0
5-Jul-13		583	365604	0.69	0 95	<1	<1	<10	0.25	16.0	7 53	1.0
4-Jul-13		584	365612	0.63	0 84	<1	<1	<10	0.19	11 0	7.67	0 5
5-Jul-13		584	365608	0.69	0 89	<1	<1	<10	0.32	11.9	7 56	1.0
5-Jul-13		596	365712	0.44	0.65	<1	<1	<10	0.24	12 2	7.55	1 0
8-Jul-13		596	365708	0.40	0 52	<1	<1	10	0.24	15 5	7.78	0 5
5-Jul-13		596	365711	0.84	0 98	<1	<1	<10	0.23	12.1	7.57	1 0
8-Jul-13		596	365707	0.22	0 39	<1	<1	<10	0.30	11 3	7.65	0 5
5-Jul-13		594	365710	0.74	0 93	<1	<1	10	0.27	12 3	7.51	1 0
8-Jul-13		594	365704	0.62	0.78	<1	<1	<10	0.29	12 8	7.64	0 5
5-Jul-13		594	365709	0.80	0 99	<1	<1	<10	0.30	12 0	7.56	1 0
8-Jul-13		594	365703	0.66	0 93	<1	<1	<10	0.30	13 5	7.65	0 5
8-Jul-13		614	365873	0.57	0.71	<1	<1	<10	0.30	10 5	7.71	0 5
9-Jul-13		614	365867	0.52	0.69	<1	<1	<10	0.25	10 0	7.71	1 0
8-Jul-13		616	365874	0.53	0.68	<1	<1	<10	7.09	12.1	7.70	1 0
9-Jul-13		616	365870	0.61	0.78	<1	<1	<10	0.28	14.7	7.69	0 5
8-Jul-13		616	365875	0.22	0 52	<1	<1	80	0.39	13 0	7.79	0 5
9-Jul-13		616	365871	0.51	0.63	<1	<1	<10	0.31	13 0	7.77	0 5
8-Jul-13		614	365872	0.43	0.65	<1	<1	<10	0.28	9.1	7.67	1 0
9-Jul-13		614	365866	0.58	0.76	<1	<1	<10	0.28	9 3	7.65	0 5
9-Jul-13		626	365923	0.40	0.62	<1	<1	<10	0.22	11 8	7.65	1 0
10-Jul-13		626	365917	0.48	0.66	<1	<1	<10	0.26	12 2	7.65	0 5

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9-Jul-13		626	365922	0.27	0.44	<1	<1	<10	0.22	13 0	7.70	1 0
10-Jul-13		626	365916	0.42	0.68	<1	<1	<10	0.31	11.6	7.69	1 0
9-Jul-13		628	365924	0.43	0.62	<1	<1	<10	0.32	11 9	7.61	0 5
10-Jul-13		628	365920	0.52	0.73	<1	<1	10	0.36	11.9	7.62	0.5
9-Jul-13		628	365925	0.47	0 59	<1	<1	<10	0.30	12 8	7.65	0 5
10-Jul-13		628	365921	0.50	0.69	<1	<1	<10	0.29	12.2	7.66	1.0
10-Jul-13		634	366340	0.56	0.73	<1	<1	10	0.24	12.7	7.67	1 0
11-Jul-13		634	366336	0.40	0 59	<1	<1	<10	0.33	12.6	7.74	0.5
10-Jul-13		634	366341	0.66	0 86	<1	<1	<10	0.21	13.1	7.68	0 5
11-Jul-13		634	366337	0.45	0.60	<1	<1	<10	0.32	13.1	7.68	0.5
10-Jul-13		632	366338	0.62	0 84	<1	<1	<10	0.77	12.7	7.57	1 0
11-Jul-13		632	366332	0.60	0.78	<1	<1	<10	0.25	13.5	7.71	0.5
10-Jul-13		632	366339	0.34	0.46	<1	<1	<10	0.59	13 3	7.62	0 5
11-Jul-13		632	366333	0.56	0.74	<1	<1	<10	0.27	13.3	7.70	0.5
11-Jul-13		645	366389	0.52	0.70	83	<1	20	0.22	13 0	7.77	0 5
12-Jul-13		645	366383	0.69	0 90	56	<1	40	0.25	13 5	7.61	0 5
16-Jul-13		645	366653	0.54	0.75	53	<1	80	0.19	14 5	NA	NA
16-Jul-13		645	366654	0.43	0.64	<1	<1	<10	0.21	13 8	NA	NA
16-Jul-13		645	366655	0.44	0.68	<1	<1	<10	0.19	12 8	NA	NA
11-Jul-13		645	366390	0.40	0.61	<1	<1	<10	0.29	12 5	7.70	0 5
12-Jul-13		645	366384	0.24	0 37	<1	<1	<10	0.31	16 0	7.66	0 5
11-Jul-13		648	366391	0.42	0.64	<1	<1	<10	0.20	11.3	7.70	0.5
12-Jul-13		648	366387	1.04	1 26	<1	<1	<10	2.44	16 0	7.62	0 5
15-Jul-13		648	366640	NA	NA	NA	NA	NA	0.21	NA	NA	NA
11-Jul-13		648	366392	0.62	0 86	<1	<1	<10	0.28	16 0	7.67	0 5
12-Jul-13		648	366388	0.84	1 08	<1	<1	<10	2.58	15 2	7.59	0 5
15-Jul-13		648	366641	NA	NA	NA	NA	NA	0.20	NA	NA	NA

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12-Jul-13		652	366432	0.58	0.76	>200	<1	70	0.23	12 0	7.66	11.0
15-Jul-13		652	366426	0.60	0 89	<1	<1	30	0.20	17.0	7.61	0.5
16-Jul-13		652	366656	0.72	0 84	2	<1	<10	0.22	15.9	NA	NA
19-Jul-13		652	367229	0.35	0 55	<1	<1	<10	0.17	13.9	NA	NA
16-Jul-13		652	366657	0.70	0 85	<1	<1	<10	0.20	17.0	NA	NA
16-Jul-13		652	366658	0.55	0.75	<1	<1	<10	0.19	15.0	NA	NA
12-Jul-13		652	366433	0.54	0.74	<1	<1	<10	0.19	13 5	7.61	12.0
15-Jul-13		652	366427	0.58	0 82	<1	<1	30	0.18	15.3	7.56	0.5
12-Jul-13		653	366435	0.63	0 80	<1	<1	<10	0.19	12 8	7.59	0 5
15-Jul-13		653	366431	0.69	0 87	<1	<1	<10	0.32	15.1	7.61	0 5
12-Jul-13		653	366434	0.62	0.75	<1	<1	<10	0.21	12 8	7.65	0 5
15-Jul-13		653	366430	0.61	0.75	<1	<1	<10	0.30	12 8	7.68	0 5
15-Jul-13		685	366617	0.48	0.65	<1	<1	<10	0.38	14.1	7.65	0 5
16-Jul-13		685	366611	0.45	0.73	<1	<1	<10	0.20	14 5	7.60	0 5
15-Jul-13		686	366619	0.74	0 90	<1	<1	10	0.23	14.6	7.64	0 5
16-Jul-13		686	366615	0.49	0.70	<1	<1	<10	0.19	13 8	7.56	0 5
15-Jul-13		686	366618	0.78	0 92	<1	<1	<10	0.32	16 0	7.68	0 5
16-Jul-13		686	366614	0.44	0.60	<1	<1	<10	0.21	13 0	7.60	0 5
15-Jul-13		685	366616	0.68	0 88	<1	<1	10	0.39	13.6	7.62	0 5
16-Jul-13		685	366610	0.48	0.63	<1	<1	10	0.21	13 8	7.63	0 5
16-Jul-13		697	366666	0.60	0.76	3	<1	<10	0.25	13 8	7.63	0 5
19-Jul-13		697	366660	0.48	0.64	<1	<1	<10	0.19	15 0	7.66	0 5
16-Jul-13		697	366665	0.57	0.79	<1	<1	30	0.31	11 8	7.56	0 5
19-Jul-13		697	366659	0.41	0.60	<1	<1	<10	0.23	12 5	7.64	1 0
16-Jul-13		698	366668	0.52	0.64	<1	<1	<10	0.20	15 8	7.63	0 5
19-Jul-13		698	366664	0.50	0.64	<1	<1	<10	0.21	14 9	7.66	1 0
16-Jul-13		698	366667	0.55	0.78	<1	<1	<10	0.21	13 0	7.62	0 5
19-Jul-13		698	366663	0.60	0.72	<1	<1	<10	0.24	13.6	7.64	0 5

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19-Jul-13		713	367225	0.55	0.75	<1	<1	<10	0.17	13.7	7.49	1 0
22-Jul-13		713	367219	0.70	0 95	<1	<1	<10	0.21	17.7	7 53	1.0
19-Jul-13		713	367224	0.72	0 93	<1	<1	20	0.20	14 3	7.59	1 0
22-Jul-13		713	367218	0.64	0 84	<1	<1	<10	0.13	14.6	7.56	1 0
19-Jul-13		714	367227	0.65	0 83	<1	<1	<10	0.14	15 2	7.57	0 5
22-Jul-13		714	367223	0.73	0 86	<1	<1	<10	0.11	14.8	7.60	1.0
19-Jul-13		714	367226	0.65	0.79	<1	<1	<10	0.16	13 0	7.57	0 5
22-Jul-13		714	367222	0.61	0.76	<1	<1	<10	0.12	14.6	7.54	1 0
22-Jul-13		741	367435	0.69	0 88	<1	<1	<10	0.14	15.6	7.57	1 0
23-Jul-13		741	367429	0.71	0 92	<1	<1	<10	0.15	16.1	7.54	1 0
22-Jul-13		742	367437	0.71	0 86	<1	<1	<10	0.11	15.6	7.62	1 0
23-Jul-13		742	367433	0.61	0.78	<1	<1	<10	0.11	15 0	7.69	1 0
22-Jul-13		741	367436	0.50	0.68	<1	<1	<10	0.17	16.1	7.62	1 0
23-Jul-13		741	367430	0.68	0 86	<1	<1	10	0.16	14 9	7.59	1 0
22-Jul-13		742	367438	0.75	0 91	<1	<1	<10	0.10	15.4	7.57	1 0
23-Jul-13		742	367434	0.65	0 84	<1	<1	<10	0.10	13 9	7.59	1 0
23-Jul-13		752	367464	0.44	0.61	<1	<1	<10	0.14	14 5	7.57	1 0
24-Jul-13		752	367460	0.61	0.78	<1	<1	NR	0.13	14 5	7.61	0 5
23-Jul-13		751	367461	0.50	0.72	<1	<1	10	0.23	14.6	7.54	1 0
24-Jul-13		751	367455	0.70	0 90	<1	<1	NR	0.17	16 0	7.58	0 5
23-Jul-13		751	367462	0.54	0.72	<1	<1	10	0.18	16.1	7.58	1 0
24-Jul-13		751	367456	0.76	0 89	<1	<1	NR	0.25	14 2	7.63	0 5
23-Jul-13		752	367463	0.61	0 83	<1	<1	<10	0.17	13 5	7.58	1 0
24-Jul-13		752	367459	0.58	0.70	<1	<1	NR	0.16	13 8	7.61	0 5
24-Jul-13		761	367868	0.62	0.79	<1	<1	NR	0.15	13.1	7.48	1 0
25-Jul-13		761	367862	0.72	0 85	<1	<1	<10	0.20	16.7	7.54	1 0
24-Jul-13		761	367867	0.64	0 86	<1	<1	NR	0.19	15.4	7.50	1 0
25-Jul-13		761	367861	0.67	0 85	<1	<1	10	0.17	17 0	7.48	1 0

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24-Jul-13		763	367870	0.44	0.60	<1	<1	NR	0.17	16 0	7.58	0 5
25-Jul-13		763	367866	0.62	0.77	<1	<1	10	0.49	15.5	7.66	2.5
24-Jul-13		763	367869	0.64	0.81	<1	<1	NR	0.18	14.5	7 52	0.5
25-Jul-13		763	367865	0.49	0.62	<1	<1	20	1.52	14.5	7 55	2.5
26-Jul-13		763	367952	NA	NA	NA	NA	NA	0.17	NA	NA	NA
25-Jul-13		775	367912	0.42	0.63	<1	<1	30	0.10	13.2	7.64	1.0
26-Jul-13		775	367908	0.22	0.32	<1	<1	NR	2.46	13.0	7 54	0.5
29-Jul-13		775	368147	NA	NA	NA	NA	NA	0.14	NA	NA	NA
25-Jul-13		774	367909	0.48	0.62	<1	<1	<10	0.16	13.7	7 57	1.0
26-Jul-13		774	367903	0.58	0.76	<1	<1	NR	0.24	16.4	7.48	0.5
25-Jul-13		774	367910	0.61	0.78	<1	<1	<10	0.13	16.0	7 55	1.0
26-Jul-13		774	367904	0.41	0.58	<1	<1	NR	0.19	14.0	7 56	0.5
25-Jul-13		775	367911	0.48	0.62	<1	<1	10	0.11	15.7	7.64	0.5
26-Jul-13		775	367907	0.21	0.37	<1	<1	NR	0.14	15.4	7 59	0.5
26-Jul-13		780	367948	0.50	0.62	<1	<1	NR	0.18	15.0	7 56	0.5
29-Jul-13		780	367942	0.61	0.76	<1	<1	<10	0.45	14.5	7.60	0.5
26-Jul-13		780	367947	0.49	0.67	<1	<1	NR	0.16	14.7	7.65	0.5
29-Jul-13		780	367941	0.42	0.56	<1	<1	<10	0.31	13.4	7.77	0.5
26-Jul-13		781	367950	0.36	0.49	<1	<1	NR	0.15	14.7	7 57	0.5
29-Jul-13		781	367946	0.70	0.84	<1	<1	<10	0.51	16.7	7.67	0.5
26-Jul-13		781	367949	0.48	0.61	<1	<1	NR	0.18	14.3	7.62	0.5
29-Jul-13		781	367945	0.75	0.89	<1	<1	<10	0.63	16.5	7.74	0.5
29-Jul-13		811	368142	0.37	0.51	<1	<1	<10	0.26	13.4	7.70	0.5
30-Jul-13		811	368136	0.37	0.60	<1	<1	<10	0.22	13.4	7.62	1.0
29-Jul-13		811	368143	0.27	0.48	<1	<1	<10	0.22	14.0	7.77	0.5
30-Jul-13		811	368137	0.37	0 50	<1	<1	<10	0.23	13.3	7.72	1.0
29-Jul-13		812	368145	0.66	0 84	<1	<1	<10	0.24	16.9	7.66	1.0
30-Jul-13		812	368141	0.41	0.59	<1	<1	<10	0.21	15.5	7 59	1.0
29-Jul-13		812	368144	0.47	0.68	<1	<1	<10	0.19	14.3	7.71	1.0

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
30-Jul-13		812	368140	0.51	0.66	<1	<1	<10	0.25	15.3	7.71	1.0
30-Jul-13		823	368172	0.74	0 91	<1	<1	<10	0.77	13.7	7.54	1 0
31-Jul-13		823	368168	0.45	0.63	<1	<1	<10	0.20	15.2	7 55	0.5
30-Jul-13		823	368173	0.44	0.60	<1	<1	<10	0.18	16 2	7.58	0 5
31-Jul-13		823	368169	0.38	0 55	<1	<1	<10	0.25	15.5	7.54	0.5
30-Jul-13		822	368170	0.74	0 91	<1	<1	<10	0.76	15.6	7.69	0 5
31-Jul-13		822	368164	0.61	0 81	<1	<1	<10	0.16	15.1	7.55	0 5
30-Jul-13		822	368171	0.73	0 89	<1	<1	<10	0.77	15 3	7.62	1 0
31-Jul-13		822	368165	0.55	0.67	<1	<1	<10	0.23	15 0	7.51	0 5
31-Jul-13		832	368559	0.48	0.61	<1	<1	<10	0.13	13.7	7 56	0.5
1-Aug-13		832	368555	0.51	0.68	<1	<1	10	0.16	12 5	7.48	0 5
31-Jul-13		832	368560	0.34	0 52	1	<1	<10	0.10	12.8	7.53	0.5
1-Aug-13		832	368556	0.41	0 53	<1	<1	<10	0.19	12.6	7.49	0 5
31-Jul-13		831	368557	0.42	0.62	<1	<1	<10	0.12	13.6	7.61	0 5
1-Aug-13		831	368551	0.51	0.73	<1	<1	<10	0.22	12 2	7.44	0.5
31-Jul-13		831	368558	0.32	0.48	<1	<1	<10	0.13	12 8	7.59	0 5
1-Aug-13		831	368552	0.30	0.46	<1	<1	<10	0.18	12 5	7.57	1 0
1-Aug-13		840	368596	0.69	0 84	<1	<1	<10	0.10	16 0	7.49	0 5
2-Aug-13		840	368590	0.52	0.77	<1	<1	<10	0.76	15 0	7.52	1 0
1-Aug-13		840	368595	0.71	0 89	<1	<1	<10	0.10	14 3	7.57	0 5
2-Aug-13		840	368589	0.53	0.70	<1	<1	<10	0.65	13 9	7.51	0 5
1-Aug-13		842	368597	0.57	0.70	<1	<1	<10	0.10	15 2	7.52	0 5
2-Aug-13		842	368593	0.84	0 98	<1	<1	<10	0.21	16 0	7.62	0 5
1-Aug-13		842	368598	0.51	0.73	<1	<1	<10	0.10	15 0	7.48	0 5
2-Aug-13		842	368594	0.74	0 90	<1	<1	<10	0.16	15 2	7.52	0 5

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
2-Aug-13		855	368644	0.62	0.78	<1	<1	<10	0.20	14 5	7.52	1 0
5-Aug-13		855	368638	0.72	0 87	<1	<1	<10	0.20	16 3	7.45	1 0
2-Aug-13		855	368643	0.40	0.60	<1	<1	<10	0.25	13 5	7.56	0 5
5-Aug-13		855	368637	0.37	0.48	<1	<1	<10	0.27	14 0	7.49	1 0
2-Aug-13		856	368646	0.40	0 52	<1	<1	<10	0.70	15.1	7.64	0 5
5-Aug-13		856	368642	0.54	0.66	<1	<1	<10	0.26	15.6	7.61	1 0
2-Aug-13		856	368645	0.44	0 56	<1	<1	<10	0.67	14 5	7.56	0 5
5-Aug-13		856	368641	0.67	0 82	<1	<1	<10	0.24	15 2	7.60	1 0
6-Aug-13		894	368823	0.54	0.65	<1	<1	<10	0.23	12.1	7.54	0 5
7-Aug-13		894	368817	0.63	0 81	<1	<1	30	0.29	15 0	7.58	1 0
6-Aug-13		894	368822	0.57	0.69	<1	<1	<10	0.21	12.7	7.46	0 5
7-Aug-13		894	368816	0.59	0 82	<1	<1	20	0.36	14.7	7.46	1 0
6-Aug-13		895	368824	0.57	0.71	<1	<1	<10	0.13	13 0	7.59	1 0
7-Aug-13		895	368820	0.60	0.74	<1	<1	<10	0.17	13 2	7.55	0 5
6-Aug-13		895	368825	0.57	0.75	<1	<1	20	0.16	13.1	7.56	1 0
7-Aug-13		895	368821	0.64	0.76	<1	<1	90	0.17	13 3	7.55	1 0
7-Aug-13		904	369279	0.46	0.63	<1	<1	<10	0.16	11 9	7.81	0 5
8-Aug-13		904	369273	0.44	0.61	<1	<1	20	0.31	12 0	7.74	0 5
7-Aug-13		904	369278	0.53	0.64	<1	<1	<10	0.15	14 5	7.51	0 5
8-Aug-13		904	369272	0.48	0.67	<1	<1	<10	0.16	14.4	7.64	0 5
7-Aug-13		906	369280	0.34	0.46	<1	<1	<10	0.15	12.6	7.71	0 5
8-Aug-13		906	369276	0.32	0.48	<1	<1	<10	0.31	12 3	7.83	0 5
7-Aug-13		906	369281	0.55	0.70	<10	<10	<10	24.60	14 3	7.62	0 5
8-Aug-13		906	369277	0.40	0 52	<1	<1	20	0.33	13 2	7.84	0 5
8-Aug-13		915	369330	0.37	0.47	<1	<1	<10	0.18	10 5	7.61	0 5
9-Aug-13		915	369324	0.47	0.61	<1	<1	<10	0.22	11 0	7.48	0 5
8-Aug-13		915	369329	0.43	0 54	<1	<1	<10	0.19	10.7	7.75	0 5
9-Aug-13		915	369323	0.59	0.70	<1	<1	<10	0.23	10 9	7.47	0 5

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
8-Aug-13		916	369332	0.44	0 56	<1	<1	10	0.29	10.6	7.70	0 5
9-Aug-13		916	369328	0.60	0.75	<1	<1	<10	0.26	11.8	7.55	1.0
8-Aug-13		916	369331	0.42	0 59	<1	<1	10	0.23	10 8	7.73	0 5
9-Aug-13		916	369327	0.50	0.63	<1	<1	10	0.28	13.0	7 57	0.5
9-Aug-13		925	369364	0.23	0 37	<1	<1	10	0.36	14.0	7.61	0.5
12-Aug-13		925	369358	0.23	0 36	<1	<1	30	0.15	12.9	7.62	0.5
9-Aug-13		925	369365	0.34	0.46	<1	<1	<10	0.26	13.3	7.60	0.5
12-Aug-13		925	369359	0.34	0.44	<1	<1	<10	0.14	12.9	7 56	0.5
9-Aug-13		926	369366	0.52	0.63	<1	<1	<10	0.11	11.6	7 57	0.5
12-Aug-13		926	369362	0.25	0 35	<1	<1	<10	0.15	15 0	7.61	0 5
9-Aug-13		926	369367	0.35	0.48	<1	<1	70	0.15	10 9	7.62	0 5
12-Aug-13		926	369363	0.22	0 33	<1	<1	<10	0.13	16 0	7.61	0 5

NOTE: On June 7, 13, 14, and 18, and July 24, and 26, 2013 there were no results for HPC due to contract lab error.

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
8-Jul-14		26	401404	0.95	1.26	<1	<1	<10	0.18	17.7	7.54	1 5
9-Jul-14		26	401398	0.98	1.18	<1	<1	<10	0.20	16.1	7.45	0 5
8-Jul-14		26	401405	1.06	1.29	<1	<1	<10	0.17	16 9	7.47	2 0
9-Jul-14		26	401399	1.06	1.22	<1	<1	<10	0.26	16.2	7.46	1.0
8-Jul-14		28	401406	0.99	1.26	<1	<1	<10	0.22	17 8	7.58	2 5
9-Jul-14		28	401402	0.94	1.13	<1	<1	<10	0.21	17.7	7.53	0.5
8-Jul-14		28	401407	1.05	1.22	<1	<1	<10	0.23	16.4	7.55	2.0
9-Jul-14		28	401403	1.07	1.19	<1	<1	<10	0 28	13.3	7.63	1.5
9-Jul-14		34	402037	1.15	1.31	<1	<1	<10	0.35	16 9	7.47	0 5
10-Jul-14		34	402031	1.10	1.31	<1	<1	<10	0.18	14.5	7.64	2.0
9-Jul-14		34	402038	1.10	1.31	<1	<1	<10	0.22	15.6	7.47	1.0
10-Jul-14		34	402032	1.12	1.32	<1	<1	<10	0.19	17.8	7.56	2.5
9-Jul-14		35	402040	1.08	1.24	<1	<1	50	0.30	15.5	7.48	0.5
10-Jul-14		35	402036	0.98	1.19	<1	<1	<10	0.15	17.5	7.56	2.0
9-Jul-14		35	402039	1.05	1.19	<1	<1	<10	0.25	16.0	7.52	0.5
10-Jul-14		35	402035	1.03	1.23	<1	<1	<10	0.17	14.7	7.56	2.0
10-Jul-14		45	402059	1.17	1.33	<1	<1	<10	1.73	16.8	7.60	1.5
11-Jul-14		45	402053	1.08	1.21	<1	<1	<10	0 24	15.7	7.56	1.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
10-Jul-14		45	402060	1.02	1.19	<1	<1	<10	0.88	12 9	7.59	2 0
11-Jul-14		45	402054	1.07	1.26	<1	<1	<10	0.22	16.3	7.47	2 0
10-Jul-14		46	402061	1.12	1.32	<1	<1	<10	1.19	17.1	7.61	1 0
11-Jul-14		46	402057	1.10	1.27	<1	<1	<10	0.18	18.4	7.53	2.0
10-Jul-14		46	402062	0.80	0.98	<1	<1	<10	0.20	13.3	7.68	1.5
11-Jul-14		46	402058	1.07	1.23	<1	<1	10	0.18	13.7	7.55	1.5
11-Jul-14		47	402124	0.74	0.92	<1	<1	<10	0.37	17.4	7.49	3 0
14-Jul-14		47	402118	0.69	0.87	<1	<1	<10	0.20	17 5	7.50	1 0
11-Jul-14		47	402125	0.72	0 94	<1	<1	<10	0.22	13 8	7.63	2 5
14-Jul-14		47	402119	0.65	0.83	<1	<1	<10	0.21	13.5	7.56	2 0
11-Jul-14		48	402126	0.68	0.91	<1	<1	30	0.25	16.4	7.65	1 5
14-Jul-14		48	402122	0.73	0.91	<1	<1	<10	0.22	16 9	7.58	0 5
11-Jul-14		48	402127	0.78	0.98	<1	<1	<10	0.24	18 5	7.68	2 0
15-Jul-14		48	402123	0.77	0 96	<1	<1	<10	0.19	18.1	7.71	2 5
11-Jul-14		55	402135	0.76	1 03	<1	<1	<10	0.16	15.4	7.43	1 0
14-Jul-14		55	402129	0.92	1.06	<1	<1	<10	0.15	16 9	7.52	2 0
11-Jul-14		55	402136	0.86	1.07	<1	<1	<10	0.18	16 9	7.58	2 5
14-Jul-14		55	402130	1.06	1.12	<1	<1	30	0.21	15.9	7.50	1 0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
11-Jul-14		56	402137	0.90	1.09	<1	<1	<10	0.17	15.4	7.41	1 0
14-Jul-14		56	402133	0.67	0.86	<1	<1	<10	0.18	11.0	7.51	0.5
11-Jul-14		56	402138	0.81	1.00	<1	<1	<10	0.20	15.2	7.58	1 5
14-Jul-14		56	402134	0.86	0.98	<1	<1	<10	0.27	14.9	7.65	0.5
14-Jul-14		69	402351	0.67	0.85	<1	<1	<10	0.20	14 2	7.64	0 5
15-Jul-14		69	402345	0.68	1.06	<1	<1	<10	0.21	14 5	7.85	2 0
14-Jul-14		69	402352	0.83	1.00	<1	<1	<10	0.22	11.1	7.65	0 5
15-Jul-14		69	402346	0.81	0.91	<1	<1	<10	0.21	17 5	7.79	2 5
14-Jul-14		70	402353	0.85	1.03	<1	<1	<10	0.22	13.7	7.70	2 0
15-Jul-14		70	402349	0.75	1.07	<1	<1	<10	0.21	13 5	7.79	1 5
14-Jul-14		70	402354	0.77	0.92	<1	<1	<10	0.17	16.7	7.56	2.0
15-Jul-14		70	402350	0.80	0.98	<1	<1	<10	0 22	13.9	7.78	2.0
14-Jul-14		131	402362	0.62	0.91	<1	<1	<10	0.19	17 5	7.48	1 0
15-Jul-14		131	402356	1.00	1.16	<1	<1	<10	0.25	17 9	7.55	2 5
14-Jul-14		131	402363	0.70	0.87	<1	<1	10	0.23	17 3	7.43	1 0
15-Jul-14		131	402357	0.83	1.02	<1	<1	<10	0.31	17 8	7.73	2 0
14-Jul-14		132	402365	0.68	0.83	<1	<1	<10	0.25	14 5	7.55	1 0
15-Jul-14		132	402361	0.73	0.87	<1	<1	<10	0.22	16 9	7.77	1 0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
14-Jul-14		132	402364	0.59	0.82	14	<1	50	0.26	15 9	7.52	1 5
15-Jul-14		132	402360	0.71	0.85	29	<1	90	0.21	17.1	7.74	0 5
21-Jul-14		132	403175	0.57	0.77	<1	<1	30	0.21	16 8	NA	NA
21-Jul-14		132	403179	0.64	0.73	<1	<1	10	0.22	14.6	NA	NA
21-Jul-14		132	403180	0.61	0.71	<1	<1	<10	0.20	15.9	NA	NA
15-Jul-14		76	402384	0.82	0.98	<1	<1	10	0.22	14.6	7.78	2 5
16-Jul-14		76	402378	0.92	1.19	<1	<1	<10	0.20	14.1	7.50	1 0
15-Jul-14		76	402385	1.08	1.22	<1	<1	<10	0.25	16.5	7.79	2.0
16-Jul-14		76	402379	0.95	1.12	<1	<1	<10	0.19	16.7	7.47	1 5
15-Jul-14		77	402386	1.10	1.29	<1	<1	<10	0.18	18 3	7.84	2 5
16-Jul-14		77	402382	0.96	1.11	<1	<1	<10	0.18	15.2	7.54	2.0
15-Jul-14		77	402387	0.62	0.76	<1	<1	10	0.28	21.4	7.75	2.5
16-Jul-14		77	402383	0.83	1.03	<1	<1	<10	0.20	15.6	7.48	1.0
15-Jul-14		139	402397	0.61	0.82	<1	<1	10	0.15	11.6	7.77	2.0
16-Jul-14		139	402391	0.65	0.85	<1	<1	<10	0.51	11.3	7.47	2.0
15-Jul-14		139	402398	0.64	0.85	<1	<1	<10	0.15	14.3	7.72	1.5
16-Jul-14		139	402392	0.71	0.87	<1	<1	<10	0.40	13.5	7.45	2.5
15-Jul-14		140	402399	0.63	0.81	<1	<1	<10	0 25	13.9	7.84	2.0
16-Jul-14		140	402395	0.60	0.80	<1	<1	<10	0 58	13.0	7.45	2.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
15-Jul-14		140	402400	0.61	0.79	<1	<1	<10	0.18	13 9	7.72	1 0
16-Jul-14		140	402396	0.67	0.82	<1	<1	<10	0.77	14 2	7.44	1 5
16-Jul-14		85	402854	0.76	0.96	<1	<1	<10	0.47	13 9	7.49	2 0
17-Jul-14		85	402848	0.73	0 90	<1	<1	<10	0.24	14 0	7.47	1 0
16-Jul-14		85	402855	0.74	0.92	<1	<1	<10	0.24	13 5	7.51	2 0
17-Jul-14		85	402849	0.79	0 96	<1	<1	<10	0.20	16.7	7.56	2 0
16-Jul-14		86	402856	0.79	0.92	<1	<1	<10	0.87	13 3	7.69	2 0
17-Jul-14		86	402852	0.71	0.89	<1	<1	<10	0.35	12 5	7.59	1 0
16-Jul-14		86	402857	0.77	0.97	<1	<1	<10	1.54	15 0	7.59	1 5
17-Jul-14		86	402853	0.69	0.89	<1	<1	<10	0.29	14.6	7.70	2 0
16-Jul-14		149	402842	0.73	0.91	<1	<1	<10	1.56	13.1	7.40	6 0
17-Jul-14		149	402836	0.72	0.79	<1	<1	<10	2.38	14.7	7.40	1 5
18-Jul-14		149	402946	0.82	0.95	<1	<1	<10	0.40	13.7	7.50	1 5
16-Jul-14		149	402843	0.78	1.00	<1	<1	<10	0.72	14.1	7.36	3.0
17-Jul-14		149	402837	0.71	0.93	<1	<1	<10	3.29	13 2	7.36	1 0
18-Jul-14		149	402947	0.78	0.93	<1	<1	<10	0.37	14 5	7.52	2 0
16-Jul-14		150	402844	0.48	0.60	<1	<1	<10	0.28	14.4	7.50	2.0
17-Jul-14		150	402840	0.53	0.71	<1	<1	10	0.22	15.6	7.52	0 5
16-Jul-14		150	402845	0.76	0.94	<1	<1	<10	0.25	17.1	7.39	1.0
17-Jul-14		150	402841	0.89	1.08	<1	<1	<10	0.29	17.6	7.41	1 0
17-Jul-14		92	402898	0.64	0.88	<1	<1	<10	0.42	13.3	7.46	1.0
18-Jul-14		92	402892	0.51	0.70	<1	<1	<10	0.26	12 5	7.56	1 5
17-Jul-14		92	402899	0.29	0.46	<1	<1	<10	0.37	12.6	7.45	2.0

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18-Jul-14		92	402893	0.65	0.84	<1	<1	<10	0.62	13 3	7.49	2 0
17-Jul-14		94	402900	1.10	1.28	<1	<1	<10	0.18	18.6	7.66	0.5
18-Jul-14		94	402896	1.12	1.33	<1	<1	<10	0.45	18.6	7.65	2 0
17-Jul-14		94	402901	1.08	1.23	<1	<1	10	0.16	19 0	7.41	0 5
18-Jul-14		94	402897	1.08	1.25	<1	<1	<10	0.41	17.9	7.50	1 0
17-Jul-14		162	402909	0.73	0.85	<1	<1	<10	0.17	13.1	7.43	2 0
18-Jul-14		162	402903	0.93	1.12	<1	<1	40	0.32	16 8	7.52	1 0
17-Jul-14		162	402910	0.69	0.86	<1	<1	<10	0.18	15.6	7.46	2 0
18-Jul-14		162	402904	1.03	1.15	<1	<1	<10	0.31	16 9	7.56	1 0
17-Jul-14		163	402911	0.90	1.11	<1	<1	<10	0.65	20.6	7.59	0 5
18-Jul-14		163	402907	0.60	0.79	<1	<1	<10	0.35	13.7	7.64	1 0
17-Jul-14		163	402912	1.05	1.22	<1	<1	<10	0.46	18.6	7.40	1 0
18-Jul-14		163	402908	0.74	0.90	<1	<1	<10	0.35	14 5	7.59	1 0
18-Jul-14		97	402955	0.81	0.99	5	<1	<10	0.29	14.6	7.60	1 0
21-Jul-14		97	402949	1.03	1.19	<1	<1	<10	0.23	13 5	7.55	1 5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
18-Jul-14		97	402956	0.86	1.03	<1	<1	10	0.17	15 3	7.70	1 0
21-Jul-14		97	402950	1.02	1.18	<1	<1	<10	0.16	18 2	7.75	1 0
18-Jul-14		98	402957	1.02	1.23	<1	<1	<10	0.19	15.7	7.61	1 0
21-Jul-14		98	402953	0.93	1.15	<1	<1	10	0.14	14.7	7.62	1 5
18-Jul-14		98	402958	0.97	1.23	<1	<1	<10	0.18	14.6	7.62	1 0
21-Jul-14		98	402954	1.07	1.27	<1	<1	10	0.15	17.2	7.56	0.5
18-Jul-14		167	402967	1.12	1.31	<1	<1	<10	0.24	20.5	7.48	1.5
21-Jul-14		167	402961	1.20	1.33	<1	<1	<10	0.28	21.4	7.48	2.0
18-Jul-14		167	402968	1.02	1.26	<1	<1	<10	0.58	14.5	7.59	2.0
21-Jul-14		167	402962	1.16	1.37	<1	<1	<10	0.21	14.3	7.59	1.0
18-Jul-14		169	402969	1.33	1.55	<1	<1	<10	3 23	18.0	7.53	1.5
21-Jul-14		169	402965	1.22	1.40	<1	<1	<10	0.23	18.3	7.50	2.0
18-Jul-14		169	402970	1.12	1.38	<1	<1	<10	0.74	18.9	7.54	1.0
21-Jul-14		169	402966	1.25	1.34	<1	<1	<10	0 24	19.3	7.71	1.5
21-Jul-14		124	403159	0.96	1.16	<1	<1	20	0 28	18.4	7.61	0.5
22-Jul-14		124	403153	1.18	1.34	<1	<1	<10	0.19	15.0	7.49	3.0
21-Jul-14		124	403160	1.00	1.28	<1	<1	<10	0.18	16.1	7.56	1.0
22-Jul-14		124	403154	1.16	1.31	<1	<1	<10	0 20	16.5	7.62	2.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
21-Jul-14		125	403162	1.13	1.31	<1	<1	<10	0.34	16 9	7.52	1 5
22-Jul-14		125	403158	0.79	0.95	<1	<1	<10	0.18	14.2	7.64	2 5
21-Jul-14		125	403161	0.32	0.43	<1	<1	<10	0.32	24.0	7.50	0 5
22-Jul-14		125	403157	0.80	0.99	<1	<1	<10	0.28	15.5	7.60	2.0
21-Jul-14		201	403170	0.90	1.11	<1	<1	<10	0.20	18.7	7.53	0.5
22-Jul-14		201	403164	0.87	1.04	<1	<1	<10	0.19	17.6	7.50	1.5
21-Jul-14		201	403171	0.78	0.96	<1	<1	<10	0.42	18.3	7.69	1.5
22-Jul-14		201	403165	0.91	1.06	<1	<1	<10	0.20	18 2	7.63	1 5
21-Jul-14		202	403172	0.71	0.86	<1	<1	<10	0.34	14.4	7.58	1 0
22-Jul-14		202	403168	0.69	0.85	<1	<1	<10	0.24	13 8	7.48	2 0
21-Jul-14		202	403173	0.63	0.84	<1	<1	<10	2.40	15 3	7.49	1 0
22-Jul-14		202	403169	0.89	1.02	<1	<1	<10	0.21	17 9	7.52	2 0
22-Jul-14		136	403212	0.11	0.19	<1	<1	40	0.16	14.9	7.47	1.5
23-Jul-14		136	403206	0.97	1.07	<1	<1	<10	0.21	14 3	7.65	0 5
22-Jul-14		136	403211	0.86	1.02	<1	<1	<10	0.17	15.1	7.54	3.0
23-Jul-14		136	403205	0.79	1.10	<1	<1	<10	0 20	15.6	7.58	2.5
22-Jul-14		141	403214	0.57	0.67	<1	<1	10	0.19	12 5	7.55	1 0
23-Jul-14		141	403210	0.31	0.47	<1	<1	<10	0.79	13 3	7.50	2 0

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22-Jul-14		141	403213	0.62	0.75	<1	<1	<10	0.18	11.4	7.58	2 0
23-Jul-14		141	403209	0.65	0.76	<1	<1	<10	0.47	12 8	7.54	1 5
22-Jul-14		210	403200	0.72	0.89	<1	<1	<10	0.13	14.7	7.44	1.5
23-Jul-14		210	403194	0.86	1.11	<1	<1	<10	0.21	15.0	7.38	0.5
22-Jul-14		210	403201	0.80	0.96	<1	<1	<10	0.13	16.3	7.62	2.5
23-Jul-14		210	403195	0.83	0.99	<1	<1	<10	0.34	16.0	7.64	1.5
22-Jul-14		212	403202	0.95	1.10	<1	<1	<10	0.20	15.5	7.47	2.0
23-Jul-14		212	403198	0.90	1.08	<1	<1	<10	0.45	15.1	7.41	2.0
22-Jul-14		212	403203	0.94	1.09	<1	<1	<10	0.18	18.0	7.50	2.5
23-Jul-14		212	403199	0.92	1.05	<1	<1	<10	0.41	18.4	7.48	1.0
23-Jul-14		143	403625	0.71	0.81	<1	<1	<10	0.15	14.9	7.81	1.0
24-Jul-14		143	403619	0.68	0.82	<1	<1	<10	0 36	14.5	7.61	2.0
23-Jul-14		143	403624	0.70	0.90	<1	<1	<10	0.15	16.5	7.69	1.5
24-Jul-14		143	403618	0.48	0.62	<1	<1	<10	0 38	14.9	7.58	1.0
23-Jul-14		144	403626	0.70	0.84	<1	<1	<10	0 30	12.9	7.64	0.5
24-Jul-14		144	403622	0.58	0.77	<1	<1	<10	0 29	15.5	7.53	2.0
23-Jul-14		144	403627	0.64	0.85	<1	<1	<10	0 22	14.6	7.69	2.0
24-Jul-14		144	403623	0.50	0.68	<1	<1	<10	0.41	13.7	7.46	2.5

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23-Jul-14		222	403635	0.63	0.84	<1	<1	<10	0.20	16 5	7.52	2 0
25-Jul-14		222	403629	1.05	1.16	<1	<1	<10	0.18	16 5	7.61	2 5
23-Jul-14		222	403636	0.84	0.99	<1	<1	<10	0.16	17.1	7.52	1 0
25-Jul-14		222	403630	0.29	0.42	<1	<1	<10	0.18	18.4	7.62	1 5
23-Jul-14		223	403637	0.64	0.80	<1	<1	<10	1.27	16.6	7.57	0 5
24-Jul-14		223	403633	0.79	0.96	<1	<1	20	0.24	16.1	7.63	1 5
23-Jul-14		223	403638	0.71	0.82	<1	<1	<10	0.18	16 9	7.63	1 5
24-Jul-14		223	403634	0.60	0.74	<1	<1	<10	0.22	17 3	7.66	1 0
24-Jul-14		155	403710	0.75	1.01	<1	<1	<10	0.36	17 5	7.53	2 5
25-Jul-14		155	403704	0.70	0.92	<1	<1	10	0.23	16.5	7.68	0.5
24-Jul-14		155	403711	0.46	0.58	<1	<1	<10	0.30	22.9	7.69	1.5
25-Jul-14		155	403705	0.86	1.01	<1	<1	<10	0.20	17.7	7.64	1.5
24-Jul-14		156	403712	0.78	0.88	<1	<1	20	0.24	12.8	7.54	2.0
25-Jul-14		156	403708	0.61	0.78	<1	<1	<10	0.71	17.2	7.58	1.0
24-Jul-14		156	403713	0.75	0.88	<1	<1	<10	0.21	16.9	7.57	1.0
25-Jul-14		156	403709	0.51	0.66	<1	<1	<10	0.43	21.6	7.69	3.0
24-Jul-14		233	403699	0.88	1.00	<1	<1	10	0 26	15.3	7.50	2.0
25-Jul-14		233	403693	0.55	0.94	<1	<1	<10	0.17	13.7	7.49	1.0

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24-Jul-14		233	403700	0.65	0.81	<1	<1	<10	0.18	15 5	7.49	2 0
25-Jul-14		233	403694	0.84	1.04	<1	<1	<10	0.29	15 9	7.56	1 5
24-Jul-14		234	403701	0.82	0.94	<1	<1	<10	0.47	16.9	7.47	2.0
25-Jul-14		234	403697	0.22	0.50	<1	<1	<10	0.15	13.7	7.51	1.0
24-Jul-14		234	403702	0.68	0.86	<1	<1	<10	0.49	15.9	7.49	1.0
25-Jul-14		234	403698	0.79	0.98	<1	<1	<10	0.22	16.5	7.52	1.5
25-Jul-14		170	403898	0.93	1.00	<1	<1	<10	0.14	17.6	7.56	2.0
28-Jul-14		170	403892	1.15	1.31	<1	<1	<10	0.16	18.2	7.60	1.0
25-Jul-14		170	403897	1.10	1.27	<1	<1	10	0.13	18.9	7.63	1.5
28-Jul-14		170	403891	1.15	1.31	<1	<1	<10	0.19	19.4	7.63	2.0
25-Jul-14		172	403900	0.96	1.12	<1	<1	<10	0.11	17.8	7.59	1.0
28-Jul-14		172	403896	1.07	1.29	<1	<1	<10	0.17	18.3	7.70	0.5
25-Jul-14		172	403899	1.09	1.25	<1	<1	<10	0.19	18.8	7.54	1.0
28-Jul-14		172	403895	1.14	1.34	<1	<1	<10	0.17	18.4	7.54	1.0
25-Jul-14		243	403909	0.79	0.99	<1	<1	10	0 21	16.7	7.60	0.5
28-Jul-14		243	403903	0.28	0.40	<1	<1	<10	0 83	14.5	7.60	1.0
25-Jul-14		243	403908	0.79	1.04	<1	<1	<10	0 21	16.4	7.54	2.0
28-Jul-14		243	403902	0.80	0.98	<1	<1	10	0 28	15.1	7.55	2.0

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25-Jul-14		245	403910	0.75	0.92	<1	<1	<10	0.18	19.1	7.54	2 0
28-Jul-14		245	403906	0.58	0.72	<1	<1	<10	0.20	19.1	7.53	1 0
25-Jul-14		245	403911	0.89	1.12	<1	<1	<10	0.41	19 8	7.48	1 0
28-Jul-14		245	403907	1.01	1.13	<1	<1	<10	0.29	19.6	7.59	1 0
28-Jul-14		201	403978	0.85	1.03	<1	<1	<10	0.14	18.9	7.52	1.5
29-Jul-14		201	403972	0.95	1.10	<1	<1	<10	0.19	18.9	7.51	0.5
28-Jul-14		201	403979	0.83	1.00	<1	<1	<10	0.14	17.5	7.52	2.0
29-Jul-14		201	403973	0.98	1.12	<1	<1	<10	0.19	17.6	7.46	1.0
28-Jul-14		202	403980	1.05	1.24	<1	<1	<10	2 04	19.4	7.57	2.0
29-Jul-14		202	403976	0.87	0.99	<1	<1	<10	0.89	19.1	7.46	1.0
28-Jul-14		202	403981	0.91	1.08	<1	<1	20	2 89	18.7	7.50	2.0
29-Jul-14		202	403977	0.90	1.06	<1	<1	<10	1.16	19.3	7.66	3.0
30-Jul-14		202	404473	NA	NA	NA	NA	NA	0.26	19.9	NA	NA
28-Jul-14		271	403990	0.94	1.16	<1	<1	<10	0.17	17.9	7.52	1.0
29-Jul-14		271	403984	0.98	1.13	<1	<1	<10	0.16	18.9	7.50	2.0
28-Jul-14		271	403989	0.92	1.13	<1	<1	10	0 35	17.9	7.52	1.5
29-Jul-14		271	403983	0.90	1.10	<1	<1	10	0.15	18.6	7.40	0.5
28-Jul-14		273	403991	1.00	1.22	<1	<1	30	0 20	15.1	7.48	2.0
29-Jul-14		273	403987	0.77	0.96	<1	<1	<10	0 29	16.9	7.43	2.0

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28-Jul-14	[redacted]	273	403992	1.05	1.24	<1	<1	<10	0.14	17 9	7.52	2 0
29-Jul-14	[redacted]	273	403988	0.60	0.77	<1	<1	<10	0.55	18 9	7.67	1 0
29-Jul-14	[redacted]	212	404021	1.03	1.22	<1	<1	<10	0.85	17 9	7.53	2 5
30-Jul-14	[redacted]	212	404015	0.97	1.12	<1	<1	<10	0.19	18 9	7.53	2 5
29-Jul-14	[redacted]	212	404020	0.89	1.09	<1	<1	230	1.06	17 8	7.56	1 0
30-Jul-14	[redacted]	212	404014	0.89	1.08	<1	<1	<10	0.21	19.4	7.50	2 0
29-Jul-14	[redacted]	213	404022	0.78	0.93	<1	<1	<10	0.45	18.1	7.42	1 0
30-Jul-14	[redacted]	213	404018	0.99	1.15	<1	<1	<10	0.20	19.4	7.40	1 0
29-Jul-14	[redacted]	213	404023	0.78	1.03	<1	<1	10	0.42	18.4	7.43	0 5
30-Jul-14	[redacted]	213	404019	0.94	1.13	<1	<1	<10	0.28	19 5	7.49	1 0
29-Jul-14	[redacted]	281	404033	0.70	0.87	<1	<1	<10	0.76	15.4	7.43	0 5
30-Jul-14	[redacted]	281	404027	0.70	0.88	<1	<1	<10	0.21	15.7	7.56	1 0
29-Jul-14	[redacted]	281	404032	0.56	0.86	<1	<1	<10	0.22	15.6	7.57	1.5
30-Jul-14	[redacted]	281	404026	0.66	0.83	<1	<1	<10	0.22	15 5	7.59	1 0
29-Jul-14	[redacted]	283	404035	0.21	0.35	<1	<1	20	0.22	14 8	7.53	1 0
30-Jul-14	[redacted]	283	404031	0.73	0.90	<1	<1	<10	0.22	14 5	7.59	1 0
29-Jul-14	[redacted]	283	404034	0.54	0.70	<1	<1	<10	0.23	15.1	7.46	0.5
30-Jul-14	[redacted]	283	404030	0.70	0.81	<1	<1	<10	0.21	16.1	7.49	1 0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
30-Jul-14		228	404480	0.72	0 98	<1	<1	<10	0.16	15 8	7.54	2 5
31-Jul-14		228	404474	0.30	0.41	<1	<1	<10	0.16	15.1	7.63	2 0
30-Jul-14		228	404481	0.82	1.06	<1	<1	<10	0.16	18.1	7.55	2 5
31-Jul-14		228	404475	0.90	1.10	<1	<1	10	0.21	18 3	7.58	0 5
30-Jul-14		229	404482	0.94	1.15	<1	<1	<10	0.21	16 5	7.50	2 5
31-Jul-14		229	404478	1.00	1.13	<1	<1	<10	0.25	15 8	7.54	0 5
30-Jul-14		229	404483	0.97	1.15	<1	<1	<10	0.19	15.5	7.58	2.0
31-Jul-14		229	404479	1.03	1.21	<1	<1	<10	0.29	18.5	7.62	0.5
30-Jul-14		291	404495	0.70	0.93	<1	<1	<10	0.26	15.1	7.53	1.5
31-Jul-14		291	404489	0.76	0.95	<1	<1	<10	0.41	14 5	7.56	2 5
30-Jul-14		291	404496	0.64	0.83	<1	<1	<10	0.78	14.4	7.51	2.0
31-Jul-14		291	404490	0.60	0.79	<1	<1	10	0.29	13.7	7.48	0 5
30-Jul-14		292	404497	0.58	0.74	<1	<1	<10	3.73	14 8	7.50	2 5
1-Aug-14		292	404493	0.62	0.78	<1	<1	<10	0.73	15 2	7.39	3 0
30-Jul-14		292	404498	0.57	0.79	<1	<1	<10	0.60	15 2	7.48	2 0
1-Aug-14		292	404494	0.76	0.88	<1	<1	<10	0.48	14 2	7.42	1 0
31-Jul-14		236	404553	0.70	0.92	<1	<1	<10	0.74	17.6	7.56	1.5
1-Aug-14		236	404547	0.71	0.89	<1	<1	<10	0.20	17.5	7.49	2 0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
31-Jul-14		236	404554	0.85	0.95	<1	<1	<10	1.02	17 8	7.54	0 5
1-Aug-14		236	404548	0.84	0.94	<1	<1	<10	0.98	18 2	7.53	2 0
31-Jul-14		237	404555	0.90	1.12	<1	<1	<10	0.33	18 3	7.54	1 0
1-Aug-14		237	404551	0.98	1.15	<1	<1	<10	0.34	18 9	7.49	1 0
31-Jul-14		237	404556	1.00	1.15	<1	<1	<10	0.45	16 5	7.55	0 5
1-Aug-14		237	404552	0.87	1.04	<1	<1	10	0.65	16 3	7.59	2 0
31-Jul-14		296	404542	0.61	0.81	<1	<1	40	0.19	17.1	7.41	0 5
1-Aug-14		296	404536	0.82	0.97	<1	<1	170	0.28	18.7	7.38	1 0
31-Jul-14		296	404543	0.71	0.86	<1	<1	<10	0.22	16 0	7.48	2 0
1-Aug-14		296	404537	0.73	0.91	<1	<1	<10	0.26	17 2	7.49	2 0
31-Jul-14		298	404544	0.44	0.61	<1	<1	<10	0.22	14.6	7.53	1 0
1-Aug-14		298	404540	0.25	0.39	<1	<1	<10	0.40	15.7	7.51	1 0
31-Jul-14		298	404545	0.56	0.75	<1	<1	<10	0.17	15.7	7.52	0 5
1-Aug-14		298	404541	0.60	0.75	<1	<1	<10	0.30	16 3	7.49	1 0
1-Aug-14		260	404638	0.78	0.92	<1	<1	<10	0.21	16 5	7.51	1 0
5-Aug-14		260	404632	0.86	1.00	<1	<1	<10	0.31	18.6	7.65	3 0
1-Aug-14		260	404639	0.68	0.90	<1	<1	<10	0.23	16.8	7.50	1 0
5-Aug-14		260	404633	0.80	0.93	<1	<1	<10	0.34	17.1	7.52	1.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
1-Aug-14		262	404640	0.65	0.90	<1	<1	<10	0.21	16 2	7.50	0 5
5-Aug-14		262	404636	0.82	0.97	<1	<1	10	0.38	18 3	7.64	0 5
1-Aug-14		262	404641	0.66	0.79	<1	<1	<10	0.25	18.8	7.60	1.0
5-Aug-14		262	404637	0.67	0.88	<1	<1	<10	0.46	19 3	7.46	0 5
1-Aug-14		304	404650	0.84	1.00	<1	<1	<10	0.27	16.4	7.48	2 0
5-Aug-14		304	404644	0.66	0.83	<1	<1	20	0.33	17 0	7.49	1 5
1-Aug-14		304	404649	0.77	0.94	<1	<1	<10	0.18	17.6	7.42	1 0
5-Aug-14		304	404643	0.82	1.03	<1	<1	<10	0.23	18 0	7.49	0 5
1-Aug-14		305	404651	0.80	0.99	<1	<1	<10	0.28	15.2	7.49	1.5
5-Aug-14		305	404647	0.53	0.71	<1	<1	40	0.21	16 3	7.58	1 5
1-Aug-14		305	404652	0.68	0.90	<1	<1	<10	0.28	16.1	7.40	2.0
5-Aug-14		305	404648	0.38	0.61	<1	<1	<10	0.21	15.1	7.37	0 5
5-Aug-14		295	404865	0.64	0.81	<1	<1	<10	0.20	18 0	7.52	1 0
6-Aug-14		295	404859	0.13	0.25	<1	<1	<10	0.60	16 9	7.47	5 0
7-Aug-14		295	405375	0.02	0.03	NA	NA	NA	NA	15.7	NA	NA
8-Aug-14		295	405427	<0.02	<0 02	NA	NA	NA	NA	15.7	NA	NA
11-Aug-14		295	405590	<0.02	0.04	NA	NA	NA	NA	15.8	NA	NA
13-Aug-14		295	406200	0.65	0.80	NA	NA	NA	NA	17.6	NA	NA
25-Sep-14		295	410667	0.63	0.84	<1	<1	<10	0 28	16.2	7.79	2.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
5-Aug-14		295	404866	0.73	0.88	<1	<1	<10	0.21	17.9	7.52	2.0
6-Aug-14		295	404860	0.17	0.27	<1	<1	<10	0.66	16.5	7.45	5 5
7-Aug-14		295	405376	<0.02	<0 02	NA	NA	NA	NA	16.4	NA	NA
13-Aug-14		295	405428	0.22	0 38	NA	NA	NA	NA	16 8	NA	NA
5-Aug-14		297	404867	0.77	0.87	<1	<1	<10	0.17	17.9	7.50	1.5
6-Aug-14		297	404863	0.70	0.89	<1	<1	<10	0.43	18 0	7.53	3 0
5-Aug-14		297	404868	0.71	0.87	<1	<1	10	0.17	17.7	7.64	1 5
6-Aug-14		297	404864	0.64	0.82	<1	<1	10	0.55	16 9	7.54	5 0
5-Aug-14		345	404876	0.78	1.02	<1	<1	<10	0.31	18.2	7.64	2.5
6-Aug-14		345	404870	0.85	1.03	<1	<1	<10	0.18	17.4	7.56	5 0
5-Aug-14		345	404877	0.68	0.89	<1	<1	<10	0.30	16.2	7.45	1.5
6-Aug-14		345	404871	0.84	1.03	<1	<1	<10	0.18	18 3	7.52	3 5
5-Aug-14		348	404878	0.81	0.99	<1	<1	<10	0.80	16.4	7.48	2.0
6-Aug-14		348	404874	0.85	1.04	<1	<1	<10	0.24	18 2	7.53	2 5
5-Aug-14		348	404879	0.73	0.93	<1	<1	<10	0.92	18.2	7.51	1.0
6-Aug-14		348	404875	0.89	1.05	<1	<1	<10	0.25	17 9	7.54	6 0
6-Aug-14		302	405316	0.19	0.36	<1	<1	<10	0.61	13.5	7.46	1.0
7-Aug-14		302	405310	0.05	0.11	<1	<1	<10	1 07	13.6	7.68	0.5
8-Aug-14		302	405429	0.09	0.19	NA	NA	NA	0.75	13.8	NA	NA
11-Aug-14		302	405588	0.89	1.07	NA	NA	NA	NA	18.8	NA	NA
14-Nov-14		302	410670	0.63	0.82	<1	<1	<10	0.46	9.7	7.68	NA
6-Aug-14		302	405317	0.17	0.29	<1	<1	10	0.68	13.9	7.50	2.5
7-Aug-14		302	405311	0.04	0.11	<1	<1	<10	1.13	13.4	7.61	0.5
8-Aug-14		302	405430	0.08	0.21	NA	NA	NA	0 95	14.1	NA	NA
11-Aug-14		302	405589	0.83	0.98	NA	NA	NA	NA	19.5	NA	NA

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
6-Aug-14		303	405319	1.06	1.22	<1	<1	<10	0.17	20.1	7.43	5 5
7-Aug-14		303	405315	0.94	1.15	<1	<1	<10	0.23	19 2	7.61	1 5
6-Aug-14		303	405318	0.72	0.87	<1	<1	<10	0.20	18 2	7.54	5 0
7-Aug-14		303	405314	0.91	1.06	<1	<1	<10	0.22	19.1	7.62	0 5
6-Aug-14		358	405303	0.59	0.77	<1	<1	<10	0.79	15.4	7.50	5 0
7-Aug-14		358	405299	0.62	0.79	2	<1	<10	0.15	14 9	7.68	2 0
13-Aug-14		358	406063	0.55	0.72	<1	<1	<10	0.18	14.8	NA	NA
6-Aug-14		357	405300	0.66	0.84	<1	<1	<10	1.08	14.0	7.59	2.0
7-Aug-14		357	405294	0.53	0.70	<1	<1	<10	0.26	15.7	7.77	0.5
6-Aug-14		357	405301	0.73	0.89	<1	<1	<10	1.29	15.4	7.50	5.5
7-Aug-14		357	405295	0.77	0.94	1	<1	<10	0.18	15.9	7.57	1.0
13-Aug-14		357	406062	0.60	0.77	6	<1	<10	0.16	17.0	NA	NA
10-Sep-14		357	409138	0.62	0.82	<1	<1	<10	0 21	16.8	NA	NA
6-Aug-14		358	405302	0.66	0.88	<1	<1	<10	0 93	14.5	7.54	6.0
7-Aug-14		358	405298	0.22	0.34	<1	<1	<10	0.16	13.4	7.63	1.0
7-Aug-14		312	405371	0.31	0.43	<1	<1	30	0.19	14.3	7.62	0.5
8-Aug-14		312	405365	0.49	0.70	<1	<1	<10	0.44	16.6	7.40	2.0
7-Aug-14		312	405370	0.64	0.79	<1	<1	10	1.23	14.5	7.52	1.0
8-Aug-14		312	405364	0.55	0.71	<1	<1	<10	0.37	13.8	7.39	2.0
7-Aug-14		313	405372	0.56	0.67	<1	<1	10	0.31	14.5	7.53	0.5
8-Aug-14		313	405368	0.48	0.60	1	<1	10	0.30	17 3	7.37	1 5
12-Aug-14		313	405665	0.41	0.51	<1	<1	10	0.60	16.9	NA	NA
7-Aug-14		313	405373	0.25	0.39	<1	<1	<10	0.17	18.4	7.97	0.5
8-Aug-14		313	405369	0.78	0.91	<1	<1	<10	0 38	17.4	7.40	1.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
7-Aug-14		372	405390	0.40	0.59	<1	<1	<10	0.44	15 0	7.57	1 0
8-Aug-14		372	405384	0.29	0.48	<1	<1	<10	0.20	15 8	7.44	2 0
7-Aug-14		372	405391	0.58	0.72	<1	<1	<10	0.39	13.6	7.52	0 5
8-Aug-14		372	405385	0.57	0.74	<1	<1	<10	0.20	14.4	7.43	1 0
7-Aug-14		373	405393	0.56	0.73	<1	<1	<10	0.38	15.1	7.62	0.5
8-Aug-14		373	405389	0.51	0.68	<1	<1	<10	0.21	15.5	7.47	2.0
7-Aug-14		373	405392	0.56	0.66	<1	<1	<10	0.26	15.1	7.70	0.5
8-Aug-14		373	405388	0.57	0.71	<1	<1	<10	0.20	15.7	7.45	2.0
8-Aug-14		321	405437	0.38	0.52	<1	<1	<10	8.60	15.3	7.50	2.0
11-Aug-14		321	405431	0.39	0.52	<1	<1	10	0.54	15.8	7.62	0.5
8-Aug-14		321	405438	0.45	0.55	<1	<1	<10	0.47	14.5	7.41	1.5
11-Aug-14		321	405432	0.55	0.65	<1	<1	<10	0.43	17.8	7.55	0.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
8-Aug-14		323	405439	0.53	0.69	<1	<1	40	1.18	18.4	7.37	2 0
11-Aug-14		323	405435	0.68	0.79	<1	<1	10	0.36	17 8	7.61	2 0
8-Aug-14		323	405440	0.68	0.80	<1	<1	<10	1.05	19 0	7.36	0 5
11-Aug-14		323	405436	0.71	0.92	<1	<1	<10	0.32	19 3	7.57	1 5
8-Aug-14		388	405419	0.30	0.44	<1	<1	<10	0.30	15 8	7.51	1 0
11-Aug-14		388	405413	0.64	0.79	<1	<1	10	0.23	16.1	7.56	1 0
8-Aug-14		388	405420	0.23	0.35	1	<1	<10	0.22	13 2	7.49	2 0
11-Aug-14		388	405414	0.59	0.82	<1	<1	<10	0.23	16 5	7.55	0 5
8-Aug-14		389	405421	0.24	0.36	3	<1	30	0.67	13 3	7.45	1 0
11-Aug-14		389	405417	0.14	0.28	<1	<1	<10	0.34	14 8	7.64	0 5
8-Aug-14		389	405422	0.35	0.43	<1	<1	<10	1.09	13.5	7.50	2.5
11-Aug-14		389	405418	0.14	0.39	<1	<1	<10	0.37	13 5	7.66	1 0
11-Aug-14		354	405597	0.40	0.51	<1	<1	<10	0.18	13.3	7.59	0.5
12-Aug-14		354	405591	0.16	0.30	<1	<1	<10	0.58	15.8	7.50	2.0
11-Aug-14		354	405598	0.41	0.58	<1	<1	<10	0.18	15.1	7.71	0.5
12-Aug-14		354	405592	0.16	0.25	<1	<1	<10	0 87	17.5	7.53	0.5
11-Aug-14		357	405599	0.60	0.76	<1	<1	<10	0.27	17.1	7.72	0.5
12-Aug-14		357	405595	0.46	0.66	<1	<1	<10	0.66	17.6	7.64	2 5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
11-Aug-14		357	405600	0.63	0.80	<1	<1	<10	0.29	17 3	7.68	0 5
12-Aug-14		357	405596	0.40	0.54	<1	<1	<10	0.73	16 9	7.60	2 0
11-Aug-14		412	405608	0.80	1.02	<1	<1	<10	0.68	17.7	7.46	0.5
13-Aug-14		412	405602	0.39	0.56	<1	<1	<10	0.25	16 3	7.51	0 5
11-Aug-14		412	405609	0.77	0.96	<1	<1	10	0.65	16.3	7.48	0.5
13-Aug-14		412	405603	0.51	0.65	<1	<1	10	0.23	15.6	7.40	0 5
11-Aug-14		414	405610	0.78	0.92	<1	<1	10	0.47	17.1	7.62	1 0
15-Aug-14		414	405606	0.64	0.80	<1	<1	<10	1.01	16.6	7.55	0 5
18-Aug-14		414	406483	0.79	1.04	NA	NA	NA	0.31	18.1	NA	NA
11-Aug-14		414	405611	0.74	0.86	<1	<1	<10	0.49	16 3	7.49	1 0
15-Aug-14		414	405607	0.23	0.40	<1	<1	20	0.35	13 8	7.53	0 5
12-Aug-14		369	405673	0.27	0.44	<1	<1	<10	0.63	15.5	7.59	1.5
13-Aug-14		369	405667	0.26	0.36	<1	<1	<10	0.33	15.7	7.59	1 0
12-Aug-14		369	405672	0.27	0.45	<1	<1	<10	0.65	15.9	7.62	2.5
13-Aug-14		369	405666	0.26	0.37	<1	<1	<10	0.86	16 2	7.61	0 5
12-Aug-14		370	405674	0.08	0.19	<1	<1	<10	0.48	13.9	7.52	1.0
13-Aug-14		370	405670	0.46	0.60	<1	<1	<10	0.35	13.6	7.59	1 0
12-Aug-14		370	405675	0.06	0.14	<1	<1	<10	0.42	11.6	7.57	0.5
13-Aug-14		370	405671	0.28	0.41	<1	<1	<10	0.45	13.7	7.61	0 5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
13-Aug-14		374	406135	0.23	0.38	<1	<1	<10	0.33	15.1	7.47	0 5
14-Aug-14		374	406129	0.27	0.41	<1	<1	<10	0.68	15.7	7.47	1 0
13-Aug-14		374	406136	0.33	0.44	<1	<1	<10	0.38	14.7	7.62	1 0
14-Aug-14		374	406130	0.27	0.48	<1	<1	<10	0.56	15.7	7.51	1 0
13-Aug-14		375	406137	0.31	0.44	<1	<1	<10	0.44	14.0	7.54	1.0
14-Aug-14		375	406133	0.46	0.64	<1	<1	<10	0.49	17 5	7.56	1 0
13-Aug-14		375	406138	0.30	0.40	<1	<1	10	0.45	14.7	7.57	0 5
14-Aug-14		375	406134	0.41	0.53	<1	<1	<10	0.52	16 3	7.62	0 5
14-Aug-14		389	406230	0.55	0.69	<1	<1	<10	0.62	17.6	7.44	1.0
15-Aug-14		389	406226	0.18	0.35	<1	<1	<10	0.30	16 2	7.50	0 5
14-Aug-14		389	406231	0.54	0.68	<1	<1	<10	0.51	17.5	7.55	1.0
15-Aug-14		389	406227	0.21	0.39	<1	<1	<10	0.30	16.1	7.53	0 5
14-Aug-14		388	406228	0.51	0.65	<1	<1	10	1.60	16.8	7.45	0.5
15-Aug-14		388	406222	0.31	0.43	<1	<1	10	0.25	16 8	7.54	1 5
14-Aug-14		388	406229	0.71	0.86	16	<1	<10	0.42	18.9	7.50	0.5
15-Aug-14		388	406223	0.38	0.52	<1	<1	<10	0.34	17.1	7.51	0 5
25-Sep-14		388	410671	0.67	0.82	<1	<1	<10	0.27	16 5	7.82	0 5
15-Aug-14		405	406275	0.65	0.87	<1	<1	20	0.19	18.9	7.60	0.5
18-Aug-14		405	406269	0.81	1.11	<1	<1	<10	0.20	19.3	7.38	1.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
15-Aug-14		405	406276	1.01	1.14	<1	<1	<10	0.20	20.7	7.46	0 5
18-Aug-14		405	406270	0.75	0.93	<1	<1	<10	0.20	20.6	7.40	2 5
15-Aug-14		407	406278	0.82	0.99	<1	<1	130	0.19	17.6	7.48	0 5
18-Aug-14		407	406274	0.46	0.71	<1	<1	<10	0.23	18.7	7.50	2 0
15-Aug-14		407	406277	0.88	1.05	<1	<1	<10	0.16	18.5	7.47	1.0
18-Aug-14		407	406273	0.62	0.80	<1	<1	160	0.21	18 2	7.44	1 0
15-Aug-14		421	405637	0.76	0.91	<1	<1	<10	0.25	14.9	7.48	0.5
18-Aug-14		421	405633	0.73	1.02	<1	<1	<10	0.19	14 9	7.49	2 0
15-Aug-14		421	405636	0.75	0.90	<1	<1	<10	0.23	15.4	7.40	1.0
18-Aug-14		421	405632	0.78	0.98	<1	<1	<10	0.21	17.6	7.48	2 5
15-Aug-14		419	405635	0.70	0.88	<1	<1	20	0.36	17.5	7.39	0.5
18-Aug-14		419	405629	0.77	0.92	<1	<1	<10	0.19	18 2	7.41	0 5
15-Aug-14		419	405634	0.81	1.00	<1	<1	<10	0.51	18.8	7.40	1.0
19-Aug-14		419	405628	0.73	0.87	<1	<1	<10	0.29	19 2	7.41	1 5
18-Aug-14		443	406492	0.77	0.92	<1	<1	<10	1.14	18.2	7.57	2.5
19-Aug-14		443	406488	0.75	0.98	<1	<1	<10	0.35	18 0	7.51	0 5
18-Aug-14		443	406493	0.89	0.99	<1	<1	<10	0.37	18.7	7.46	1.0
19-Aug-14		443	406489	0.81	0.98	<1	<1	10	0.28	19 3	7.52	0 5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
18-Aug-14		442	406490	0.70	1.06	<1	<1	10	0.37	18 5	7.65	1 0
19-Aug-14		442	406484	0.69	0.78	<1	<1	<10	0.33	18 9	7.62	1 0
18-Aug-14		442	406491	0.66	0.84	<1	<1	<10	0.49	18.6	7.56	2 0
19-Aug-14		442	406485	0.50	0.64	<1	<1	<10	0.32	18.4	7.58	1 0
18-Aug-14		447	406300	0.37	0.52	<1	<1	<10	0.34	13.7	7.48	1 5
19-Aug-14		447	406294	0.42	0.57	<1	<1	<10	0.38	14 2	7.49	1 0
18-Aug-14		447	406301	0.62	0.85	<1	<1	<10	0.23	16 8	7.44	0 5
19-Aug-14		447	406295	0.59	0.72	<1	<1	<10	0.29	17.4	7.45	1 5
18-Aug-14		448	406302	0.67	0.80	<1	<1	<10	1.27	15.3	7.49	2.0
19-Aug-14		448	406298	0.71	0.92	<1	<1	<10	0.41	16 3	7.48	0 5
18-Aug-14		448	406303	0.23	0.30	<1	<1	<10	0.37	17.5	7.40	1.0
19-Aug-14		448	406299	0.28	0.37	<1	<1	<10	0.58	17 5	7.35	0 5
19-Aug-14		449	406539	0.31	0.43	<1	<1	<10	0.27	13 9	7.66	0 5
20-Aug-14		449	406535	0.48	0 59	<1	<1	<10	0.35	16.7	7.50	2 0
19-Aug-14		449	406538	0.56	0.71	<1	<1	<10	0.32	18.7	7.48	1.0
20-Aug-14		449	406534	0.44	0.67	<1	<1	<10	0.28	18 3	7.38	1 5
19-Aug-14		448	406536	0.79	0.95	<1	<1	10	2.19	16.9	7.63	0.5
20-Aug-14		448	406530	0.30	0.46	<1	<1	10	0.29	19 2	7.48	0 5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
19-Aug-14		448	406537	0.51	0.65	<1	<1	<10	1.26	17.1	7.48	1 5
20-Aug-14		448	406531	0.63	0.80	<1	<1	<10	0.24	17.7	7.37	0 5
19-Aug-14		456	406502	0.29	0.47	<1	<1	70	0.32	15.7	7.49	1 0
20-Aug-14		456	406496	0.31	0.46	<1	<1	<10	0.37	14.7	7.42	2 5
19-Aug-14		455	406504	0.68	0.86	<1	<1	<10	5.38	17 3	7.54	0 5
20-Aug-14		455	406500	0.57	0.83	<1	<1	<10	0.44	19.4	7.58	2 5
19-Aug-14		455	406503	0.72	0.95	<1	<1	<10	3.81	17.7	7.51	0 5
20-Aug-14		455	406499	0.73	0.91	<1	<1	<10	0.30	19.7	7.61	2 0
19-Aug-14		456	406501	0.67	0.83	<1	<1	<10	0.19	17 3	7.42	0 5
20-Aug-14		456	406495	0.39	0.57	<1	<1	<10	0.38	15 5	7.42	2 0
20-Aug-14		464	406922	0.63	0.86	<1	<1	10	3.94	12 9	7.49	2 0
21-Aug-14		464	406916	0.43	0.58	<1	<1	10	0.79	14 5	7.56	1 0
20-Aug-14		464	406923	0.65	0.86	<1	<1	<10	0.46	14.0	7.43	0.5
21-Aug-14		464	406917	0.48	0.73	<1	<1	<10	0.49	14 3	7.53	0 5
20-Aug-14		466	406924	0.50	0.65	<1	<1	<10	1.46	13 8	7.55	1 0
22-Aug-14		466	406920	0.42	0.59	<1	<1	<10	0.29	14.6	7.48	2 0
20-Aug-14		466	406925	0.44	0.58	<1	<1	<10	1.48	14.6	7.40	2 0
22-Aug-14		466	406921	0.64	0.81	1	<1	<10	0.36	14.4	7.47	2 0
25-Aug-14		466	407320	0.47	0.66	<1	<1	<10	0.28	15 2	NA	NA

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
20-Aug-14		471	406933	0.39	0.53	<1	<1	30	0.66	16.7	7.39	1 0
21-Aug-14		471	406927	0.43	0.58	<1	<1	<10	1.95	15 9	7.52	2 0
22-Aug-14		471	407111	0.40	0.54	NA	NA	NA	0.19	16.4	NA	NA
20-Aug-14		471	406934	0.45	0.58	<1	<1	<10	0.69	17.6	7.40	2.0
21-Aug-14		471	406928	0.15	0.19	<1	<1	<10	0.19	16 9	7.49	0 5
20-Aug-14		472	406936	0.30	0.46	<1	<1	<10	0.30	16.5	7.45	2.0
21-Aug-14		472	406932	0.26	0.53	<1	<1	<10	0.76	16 5	7.72	0 5
20-Aug-14		472	406935	0.45	0.61	<1	<1	<10	0.36	17.9	7.46	2.5
21-Aug-14		472	406931	0.16	0.34	<1	<1	<10	1.64	18 0	7.78	2 5
22-Aug-14		472	407112	0.38	0.60	NA	NA	NA	0.18	17.3	NA	NA
21-Aug-14		471	407011	0.51	0.66	<1	<1	<10	0.19	17.8	7.44	0.5
22-Aug-14		471	407005	0.75	0.98	<1	<1	<10	0.24	17.9	7.44	1.0
21-Aug-14		471	407010	0.24	0.47	<1	<1	<10	0 23	15.6	7.45	1.0
22-Aug-14		471	407004	0.27	0.43	<1	<1	<10	0.24	15.3	7.47	2.5
21-Aug-14		472	407013	0.20	0.36	<1	<1	<10	2.43	14.3	7.51	1.5
22-Aug-14		472	407009	0.80	0.91	<1	<1	<10	0.28	16.5	7.52	0.5
21-Aug-14		472	407012	0.36	0.53	<1	<1	60	0 29	12.0	7.45	0.5
22-Aug-14		472	407008	0.16	0.30	<1	<1	30	0.28	12.2	7.57	2.0
21-Aug-14		481	407021	1.11	1.27	<1	<1	<10	0 20	22.2	7.58	0.5
22-Aug-14		481	407015	0.89	1.06	<1	<1	<10	0.29	21.7	7.41	1 0
21-Aug-14		481	407022	0.95	1.15	<1	<1	<10	0.19	21.6	7.68	1.5
22-Aug-14		481	407016	0.92	1.09	<1	<1	<10	0 22	22.0	7.51	0.5
21-Aug-14		482	407024	0.69	0.93	1	<1	<10	0.16	14.5	7.59	2.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E.Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
22-Aug-14		482	407020	0.65	0.95	<1	<1	<10	1.47	15 2	7.44	1 0
25-Aug-14		482	407298	0.88	0 99	NA	NA	NA	0.18	20 2	NA	NA
21-Aug-14		482	407023	0.76	0 97	<1	<1	<10	0.18	13 0	7.58	2 0
22-Aug-14		482	407019	0.91	1.16	<1	<1	<10	0.65	20 2	7.41	2 0
22-Aug-14		478	407131	0.16	0.28	<1	<1	<10	0.25	17.8	7.43	0.5
25-Aug-14		478	407125	0.61	0.75	<1	<1	<10	0.32	17.8	7.51	1.0
22-Aug-14		478	407130	0.78	1.14	<1	<1	<10	0.26	18.4	7.42	0.5
25-Aug-14		478	407124	0.70	0.86	<1	<1	<10	0.25	18.3	7.53	0.5
22-Aug-14		479	407133	0.70	0.86	<1	<1	<10	0 28	19.6	7.39	2.5
25-Aug-14		479	407129	0.84	1.09	<1	<1	<10	0.19	17.8	7.51	1.5
22-Aug-14		479	407132	0.76	1.03	<1	<1	<10	0 34	19.8	7.43	2.0
25-Aug-14		479	407128	0.70	0.88	<1	<1	<10	0.21	18.5	7.55	0.5
22-Aug-14		492	407121	0.93	1.08	<1	<1	<10	0.69	21.4	7.57	1.0
25-Aug-14		492	407117	0.75	0.94	<1	<1	<10	0.16	20.4	7.57	2.0
22-Aug-14		492	407122	0.93	1.07	<1	<1	<10	0.47	21.7	7.58	0 5
25-Aug-14		492	407118	0.86	0.98	<1	<1	<10	0.15	21 0	7.60	1 0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
22-Aug-14	[redacted]	496	407120	1.02	1.19	<1	<1	<10	2.70	18 9	7.48	2 0
25-Aug-14	[redacted]	496	407114	0.89	1.11	<1	<1	<10	0.19	19 3	7.51	2 5
22-Aug-14	[redacted]	496	407119	0.92	1.12	<1	<1	10	0.27	20 9	7.39	0 5
25-Aug-14	[redacted]	496	407113	0.66	0.79	<1	<1	20	0.18	21 0	7.47	1 5
25-Aug-14	[redacted]	498	407266	0.23	0.49	<1	<1	<10	0.16	14.7	7.44	1.0
26-Aug-14	[redacted]	498	407260	0.38	0.53	<1	<1	<10	0.30	14.9	7.38	2.0
25-Aug-14	[redacted]	498	407267	0.48	0.68	<1	<1	<10	0.28	14.4	7.55	0.5
26-Aug-14	[redacted]	498	407261	0.37	0.56	<1	<1	<10	0.78	15.1	7.50	1.0
25-Aug-14	[redacted]	499	407269	0.63	0.79	<1	<1	10	1.07	16.0	7.47	2.0
26-Aug-14	[redacted]	499	407265	0.65	0.73	<1	<1	<10	0.30	16.9	7.43	2.0
25-Aug-14	[redacted]	499	407268	0.46	0.67	<1	<1	<10	0.46	18.1	7.52	2.5
26-Aug-14	[redacted]	499	407264	0.51	0.68	<1	<1	<10	0.22	17.9	7.48	0.5
25-Aug-14	[redacted]	513	407293	0.37	0.62	<1	<1	<10	0.19	16.5	7.55	1.0
26-Aug-14	[redacted]	513	407287	0.39	0.81	<1	<1	<10	0.46	18.1	7.56	2.5
25-Aug-14	[redacted]	513	407294	0.64	0.95	<1	<1	<10	0.18	18.2	7.51	0.5
26-Aug-14	[redacted]	513	407288	0.37	0.53	<1	<1	<10	0.43	18.1	7.56	2.5
25-Aug-14	[redacted]	515	407296	0.75	0.92	<1	<1	<10	0.17	18.2	7.60	0.5
27-Aug-14	[redacted]	515	407292	0.59	0.74	<1	<1	<10	0.18	17.2	7.58	0.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
25-Aug-14		515	407295	0.71	0.92	<1	<1	<10	0.16	17 9	7.56	2 0
27-Aug-14		515	407291	0.79	0.91	<1	<1	<10	0.19	15 2	7.44	1 0
26-Aug-14		508	407316	0.60	0.75	<1	<1	<10	0.26	15 8	7.45	0 5
27-Aug-14		508	407310	0.70	0.85	<1	<1	<10	0.27	16.1	7.52	0 5
26-Aug-14		508	407315	0.40	0.55	<1	<1	<10	0.30	14.1	7.46	2.0
27-Aug-14		508	407309	0.58	0.87	<1	<1	<10	0.30	15.4	7.39	0 5
26-Aug-14		510	407317	0.18	0.38	<1	<1	<10	0.56	19 3	7.49	1 0
28-Aug-14		510	407313	0.57	0.79	<1	<1	<10	0.90	19 8	7.50	2 5
26-Aug-14		510	407318	0.14	0.27	<1	<1	10	0.32	16 5	7.50	1 0
28-Aug-14		510	407314	0.45	0.62	<1	<1	<10	0.30	17.1	7.38	0 5
26-Aug-14		520	407329	1.00	1.28	<1	<1	<10	0.15	20.1	7.49	1.0
27-Aug-14		520	407325	0.91	1.04	<1	<1	<10	0.29	19.6	7.45	0 5
26-Aug-14		520	407330	1.06	1.21	<1	<1	<10	0.14	20.4	7.57	0.5
27-Aug-14		520	407326	0.91	1.09	<1	<1	<10	0 21	18.8	7.46	0.5
26-Aug-14		519	407327	0.52	0.70	<1	<1	<10	0.17	20.1	7.40	2.0
27-Aug-14		519	407321	1.13	1.29	<1	<1	<10	0.32	20.8	7.44	1.0
26-Aug-14		519	407328	0.56	0.73	<1	<1	<10	0.16	20.5	7.42	1.0
27-Aug-14		519	407322	1.00	1.29	<1	<1	<10	0.25	20.5	7.47	0.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
27-Aug-14		516	407696	0.39	0.54	<1	<1	<10	0.39	18.4	7.51	0 5
28-Aug-14		516	407692	0.51	0.66	<1	<1	<10	0.24	18 9	7.47	2 0
27-Aug-14		516	407695	0.68	0.88	<1	<1	<10	0.39	17 3	7.47	0 5
28-Aug-14		516	407691	0.43	0.67	<1	<1	<10	0.27	17 2	7.44	2 5
27-Aug-14		515	407694	0.80	0.98	<1	<1	<10	0.14	15.3	7.39	1.0
28-Aug-14		515	407688	0.64	0.81	<1	<1	<10	0.45	16.1	7.42	1 0
27-Aug-14		515	407693	0.57	0.80	<1	<1	<10	0.14	15.0	7.42	0.5
28-Aug-14		515	407687	0.57	0.75	<1	<1	<10	0.52	16.7	7.42	2 5
27-Aug-14		534	407682	0.33	0.50	<1	<1	<10	0 20	19.6	7.54	1.0
28-Aug-14		534	407676	0.41	0.55	<1	<1	<10	0.22	19.2	7.58	0.5
27-Aug-14		534	407681	0.79	1.00	<1	<1	<10	0.22	17.9	7.48	0.5
28-Aug-14		534	407675	0.74	0.91	<1	<1	10	0.24	18 9	7.34	1 0
27-Aug-14		535	407684	0.48	0.64	<1	<1	<10	0 23	18.0	7.58	0.5
28-Aug-14		535	407680	0.40	0.56	<1	<1	<10	0.72	18.4	7.52	1.0
27-Aug-14		535	407683	0.48	0.63	<1	<1	<10	0.18	17.0	7.47	0.5
28-Aug-14		535	407679	0.41	0.58	<1	<1	<10	1.14	16.3	7.43	2.0
29-Aug-14		535	407826	0.38	0.55	NA	NA	NA	0.19	15.8	NA	NA
28-Aug-14		524	407778	0.59	0.79	<1	<1	<10	0 20	16.5	7.38	0.5
29-Aug-14		524	407772	0.61	0.78	<1	<1	<10	0.37	16.3	7.37	3.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
28-Aug-14		524	407779	0.80	0.94	<1	<1	<10	0.18	15 9	7.40	1 0
29-Aug-14		524	407773	0.70	0.93	<1	<1	<10	0.30	16.7	7.51	0 5
28-Aug-14		526	407780	0.79	0.96	<1	<1	<10	0.25	13.7	7.37	0 5
29-Aug-14		526	407776	0.59	0.85	<1	<1	<10	0.28	14.7	7.44	1 0
28-Aug-14		526	407781	0.43	0.62	<1	<1	10	0.36	15 2	7.37	1 0
29-Aug-14		526	407777	0.52	0.74	1	<1	<10	0.23	16 3	7.44	0 5
4-Sep-14		526	408495	0.42	0.55	<1	<1	10	0.18	15 2	NA	NA
4-Sep-14		596	408505	0.58	0.78	<1	<1	<10	0.36	18.0	7.45	2.5
11-Sep-14		596	408501	0.52	0.66	<1	<1	<10	0.22	17.1	7.45	1 0
4-Sep-14		596	408504	0.72	0.81	<1	<1	<10	0.51	18.1	7.53	2.5
11-Sep-14		596	408500	0.31	0.83	<1	<1	<10	0.40	16.5	7.57	1.5
4-Sep-14		595	408503	0.64	0.79	<1	<1	<10	0.38	18.2	7.40	1.5
11-Sep-14		595	408497	0.83	1.02	<1	<1	<10	0.26	18.1	7.40	2 5
4-Sep-14		595	408502	0.20	0.76	<1	<1	20	0.50	13.2	7.38	1.0
11-Sep-14		595	408496	0.69	0.90	<1	<1	<10	0.26	17 8	7.39	5 0
11-Sep-14		667	409177	0.55	0.78	<1	<1	<10	0.48	15.6	7.52	3.5
12-Sep-14		667	409173	1.03	1.30	<1	<1	<10	1.47	15.3	7.42	5.0
15-Sep-14		667	409368	NA	NA	NA	NA	NA	0 29	17.1	NA	NA

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
11-Sep-14		667	409178	0.52	0.79	<1	<1	<10	3.52	15.7	7.49	2.0
12-Sep-14		667	409174	0.77	0.95	<1	<1	<10	1.30	16.2	7.48	1.0
15-Sep-14		667	409369	NA	NA	NA	NA	NA	0.44	16.9	NA	NA
11-Sep-14		665	409175	0.87	1.02	<1	<1	<10	0.21	16.4	7.59	0.5
12-Sep-14			409169	1.00	1.14	<1	<1	<10	1.85	16 8	7.40	2 5
15-Sep-14		665	409366	NA	NA	NA	NA	NA	0.37	16.5	NA	NA
11-Sep-14		665	409176	0.44	0.60	<1	<1	<10	0.22	16.8	7.60	2.0
12-Sep-14		665	409170	0.52	0.82	<1	<1	<10	1.85	16.7	7.54	2 5
15-Sep-14		665	409367	NA	NA	NA	NA	NA	0.29	16.4	NA	NA
12-Sep-14		678	409253	0.55	0.80	<1	<1	<10	1.42	17.1	7.43	6.0
15-Sep-14		678	409249	0.33	0.64	<1	<1	<10	0.29	15.8	7.47	1 0
12-Sep-14		678	409252	0.40	0.71	<1	<1	<10	1.78	14.4	7.50	5.0
15-Sep-14		678	409248	0.42	0.59	2	<1	10	0.33	14.9	7.83	1.5
18-Sep-14		678	409885	0.35	0.69	<1	<1	10	0.43	14.1	NA	NA
12-Sep-14		677	409251	0.54	0.75	<1	<1	<10	1.68	15.8	7.44	4.0
15-Sep-14		677	409245	0.59	0.75	<1	<1	<10	0.26	14.7	7.59	2.0
12-Sep-14		677	409250	0.78	1.00	<1	<1	20	2.40	14.9	7.40	6.0
15-Sep-14		677	409244	0.58	0.79	<1	<1	<10	0 33	15.0	7.68	5.0
15-Sep-14		707	409406	0.39	0.63	<1	<1	<10	0 35	15.1	7.49	3.0
16-Sep-14		707	409402	0.30	0.47	<1	<1	<10	0.28	14.8	7.60	1.0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
15-Sep-14		707	409407	0.64	0.78	<1	<1	<10	0.21	14.1	7.40	2 0
16-Sep-14		707	409403	0.38	0.61	<1	<1	<10	0.25	14 3	7.60	0 5
15-Sep-14		706	409404	0.57	0.74	<1	<1	<10	0.22	15 0	7.39	2 0
16-Sep-14		706	409399	0.29	0.42	<1	<1	<10	0.61	14 5	7.67	2 5
15-Sep-14		706	409405	0.56	0.75	<1	<1	<10	0.27	15.1	7.46	2.0
16-Sep-14		706	409398	0.68	0.88	<1	<1	10	0.29	15 9	7.52	0 5
16-Sep-14		713	409430	0.45	0.62	<1	<1	<10	0.28	15.1	7.67	2.5
18-Sep-14		713	409426	0.45	0.64	<1	<1	<10	0.34	14.7	7.71	3 0
16-Sep-14		713	409431	0.50	0.67	<1	<1	<10	0.33	15.0	7.73	2.0
18-Sep-14		713	409427	0.40	0.59	<1	<1	<10	0.30	14 8	7.77	1 0
16-Sep-14		712	409429	1.12	1.30	<1	<1	<10	0.26	15.9	7.66	1.0
18-Sep-14		712	409423	0.68	0.90	<1	<1	<10	0.41	15.4	7.74	3 5
16-Sep-14		712	409428	0.40	0.75	<1	<1	<10	0.31	15.1	7.73	1.0
18-Sep-14		712	409422	0.22	0.44	<1	<1	10	0.26	15 2	7.76	5 0
18-Sep-14		729	409892	0.35	0.72	<1	<1	<10	0.59	14.5	7.65	2.5
19-Sep-14		729	409886	0.13	0.28	<1	<1	<10	0.57	14 2	7.60	2 5
18-Sep-14		729	409893	0.12	0.29	<1	<1	<10	0.56	14.6	7.64	5.0
19-Sep-14		729	409887	0.13	0.28	<1	<1	<10	0.59	14.7	7.56	2 5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
18-Sep-14		730	409894	0.13	0.32	<1	<1	<10	0.44	12 5	7.65	2 5
19-Sep-14		730	409890	0.20	0.33	<1	<1	<10	0.51	12 8	7.56	5 0
18-Sep-14		730	409895	0.11	0.29	<1	<1	<10	1.66	14 3	7.75	1 0
19-Sep-14		730	409891	0.12	0.25	<1	<1	<10	0.55	14 3	7.74	5 0
19-Sep-14		735	409978	0.34	0.49	<1	<1	<10	0.66	14.9	7.64	1.0
22-Sep-14		735	409972	0.19	0.36	<1	<1	<10	0.49	14.6	7.63	5 0
19-Sep-14		736	409980	0.17	0.38	<1	<1	50	0.37	15.1	7.60	0.5
22-Sep-14		736	409976	0.22	0.49	<1	<1	<10	0.36	15.1	7.52	0 5
19-Sep-14		736	409981	0.13	0.27	<1	<1	<10	0.41	15.7	7.72	0.5
22-Sep-14		736	409977	0.15	0.30	<1	<1	<10	0.40	15 9	7.71	2 0
19-Sep-14		735	409979	0.13	0.28	<1	<1	<10	0.99	14.2	7.61	2.0
22-Sep-14		735	409973	0.18	0.33	<1	<1	<10	0.38	13 5	7.62	6 0
22-Sep-14		82	410173	0.93	1.13	<1	<1	<10	0.28	15.6	7.58	5.0
23-Sep-14		82	410167	1.01	1.13	<1	<1	<10	0.30	16 5	7.63	1 0
22-Sep-14		84	410175	0.74	0.93	<1	<1	<10	0.30	15.7	7.50	2.5
23-Sep-14		84	410171	0.78	0.93	<1	<1	<10	0.35	15.0	7.53	2.0
22-Sep-14		82	410172	0.72	0.87	<1	<1	<10	0.30	14.9	7.55	6.0
23-Sep-14		82	410166	0.71	0.94	<1	<1	<10	0.27	14 8	7.61	2 0

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
22-Sep-14		84	410174	0.74	1.11	<1	<1	<10	0.29	15.4	7.52	1 0
23-Sep-14		84	410170	0.68	0.94	<1	<1	<10	0.40	15 8	7.63	2 5
23-Sep-14		94	410211	0.90	1.06	<1	<1	<10	0.38	15.7	7.64	0.5
25-Sep-14		94	410205	0.86	1.05	<1	<1	<10	0.38	15.9	7.80	4.0
23-Sep-14		95	410213	0.73	0.92	<1	<1	<10	0.39	15.7	7.59	0.5
25-Sep-14		95	410209	0.99	1.10	<1	<1	<10	0.33	15.0	7.74	5.0
23-Sep-14		94	410212	0.79	0.94	<1	<1	<10	0 31	16.0	7.64	0.5
25-Sep-14		94	410206	0.95	1.11	<1	<1	<10	0.38	15.9	7.69	6.0
23-Sep-14		95	410214	0.76	0.98	<1	<1	<10	0 27	18.3	7.59	2.0
25-Sep-14		95	410210	0.98	1.18	<1	<1	<10	0 37	15.7	7.69	5.0
25-Sep-14		113	410661	0.56	0.67	<1	<1	<10	1.40	17.8	7.75	1.0
29-Sep-14		113	410655	0.90	1.09	<1	<1	<10	0 30	16.5	7.59	4.0
25-Sep-14		113	410662	0.59	0.78	<1	<1	<10	0 96	16.2	7.76	2.0
29-Sep-14		113	410656	0.78	1.02	<1	<1	<10	0 32	16.2	7.63	3.0
25-Sep-14		114	410663	0.93	1.03	<1	<1	<10	0 52	15.5	7.85	4.0
29-Sep-14		114	410659	0.62	0.89	<1	<1	<10	0 31	16.3	7.71	5.0
25-Sep-14		114	410664	0.73	0.88	<1	<1	10	0 51	16.7	7.83	3.0
29-Sep-14		114	410660	0.88	0.99	<1	<1	<10	0 30	16.1	7.69	2.5

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Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
30-Sep-14		162	410941	0.88	0.99	<1	<1	<10	0.48	14 5	7.70	0 5
2-Oct-14		162	410937	0.75	0.95	<1	<1	10	0.26	13 9	7.73	0 5
30-Sep-14		162	410940	0.63	0.78	<1	<1	<10	0.59	13.1	7.68	2 5
2-Oct-14		162	410936	0.94	1.10	<1	<1	<10	0.30	13 0	7.58	1 0
30-Sep-14		161	410938	0.67	0.82	<1	<1	<10	0.54	12.5	7.66	2.5
2-Oct-14		161	410932	0.64	0.86	<1	<1	<10	0.37	12.5	7.63	3.0
30-Sep-14		161	410939	0.75	0.87	<1	<1	20	0.57	12.0	7.67	1.0
2-Oct-14		161	410933	0.99	1.19	<1	<1	40	0.34	12.3	7.60	2.0
2-Oct-14		188	411455	0.86	1.08	<1	<1	<10	0.26	15.8	7.66	1.0
3-Oct-14		188	411449	0.78	0.90	<1	<1	<10	0.46	15.1	7.61	2.5
2-Oct-14		188	411454	1.09	1.29	<1	<1	<10	0.34	16.4	7.56	5.0
3-Oct-14		188	411448	1.21	1.93	<1	<1	10	0.35	16.9	7.61	1.0
2-Oct-14		189	411457	0.85	1.02	<1	<1	<10	0.35	15.9	7.59	1.0
3-Oct-14		189	411453	1.05	1.20	<1	<1	<10	0.30	14.3	7.52	2.5
2-Oct-14		189	411456	0.81	1.10	<1	<1	<10	0.27	16.7	7.54	2.5
3-Oct-14		189	411452	0.43	0.69	<1	<1	<10	0.24	15.8	7.64	0.5
3-Oct-14		204	411517	0.65	0.74	<1	<1	<10	0.79	15.9	7.58	2.5
6-Oct-14		204	411511	0.76	1.22	<1	<1	<10	0.33	15.4	7.53	0 5

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3-Oct-14		204	411518	0.85	1.23	<1	<1	<10	0.60	15.4	7.57	2 0
6-Oct-14		204	411512	0.59	0.81	<1	<1	<10	0.22	15.4	7.48	0 5
3-Oct-14		205	411519	0.96	1.22	<1	<1	<10	1.10	15.1	7.50	7 0
6-Oct-14		205	411515	0.77	0.95	<1	<1	<10	0.23	14.6	7.53	0 5
3-Oct-14		205	411520	0.81	1.17	<1	<1	<10	0.81	17.6	7.57	2 0
6-Oct-14		205	411516	0.81	1.00	<1	<1	<10	0.22	16 3	7.45	0 5
6-Oct-14		238	411702	0.50	0.65	<1	<1	<10	0.23	15.4	7.51	0.5
7-Oct-14		238	411696	0.65	0.80	<1	<1	<10	0.22	14 5	7.55	2 5
6-Oct-14		238	411703	0.11	0.19	<1	<1	<10	0.51	13.7	7.44	0.5
7-Oct-14		238	411697	0.21	0.37	<1	<1	<10	0.51	13.4	7.56	2 0
6-Oct-14		241	411704	0.24	0.41	<1	<1	10	0.40	13.8	7.53	1.0
7-Oct-14		241	411700	0.34	0.54	<1	<1	<10	0.32	15.0	7.61	1.5
6-Oct-14		241	411705	0.10	0.44	<1	<1	<10	0.50	16.0	7.64	0.5
7-Oct-14		241	411701	0.20	0.41	<1	<1	<10	0.42	14 5	7.75	4 5
7-Oct-14		254	411738	0.66	0.86	<1	<1	<10	0.21	14.7	7.56	0 5
9-Oct-14		254	411734	0.50	0.77	<1	<1	<10	0.30	13.7	7.54	1.0
7-Oct-14		254	411737	0.75	1.03	<1	<1	10	0.20	14.5	7.48	0.5
9-Oct-14		254	411733	0.75	0.92	<1	<1	20	0.51	14.5	7.46	2.0

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7-Oct-14		249	411735	0.99	1.18	<1	<1	<10	0.23	15.1	7.58	2 5
9-Oct-14		249	411729	0.93	1.03	<1	<1	60	0.80	13 9	7.56	1 0
7-Oct-14		249	411736	0.87	1.27	<1	<1	<10	0.23	14 3	7.45	0 5
9-Oct-14		249	411730	0.82	0.99	<1	<1	<10	0.25	14.3	7.44	0.5
9-Oct-14		285	412018	0.25	0.44	<1	<1	<10	0.40	17.8	7.53	2.5
10-Oct-14		285	412014	1.11	1.25	<1	<1	<10	0.55	14 2	7.53	0 5
9-Oct-14		285	412017	0.57	0.85	<1	<1	<10	0.28	15.1	7.48	5.0
10-Oct-14		285	412013	0.56	0.86	<1	<1	<10	0.50	14.7	7.51	0 5
9-Oct-14		284	412016	0.54	0.77	<1	<1	10	0.30	17.4	7.41	0.5
10-Oct-14		284	412010	0.21	0.41	<1	<1	<10	0.44	15 3	7.71	0 5
9-Oct-14		284	412015	0.83	1.11	<1	<1	<10	0.81	15.4	7.67	2.5
10-Oct-14		284	412009	0.11	0.43	1	<1	<10	0.59	14 3	7.66	0 5
14-Oct-14		284	412744	0.28	0.44	<1	<1	<10	0.98	14 8	NA	NA
10-Oct-14		297	412079	0.11	0.21	<1	<1	10	0.36	14.7	7.78	2 5
14-Oct-14		297	412073	0.12	0.24	<1	<1	<10	0.51	15 0	8.18	0 5
10-Oct-14		297	412078	0.59	0.82	<1	<1	NR	0.47	15.7	7.64	4.0
14-Oct-14		297	412072	0.20	0.34	<1	<1	<10	0.71	15 0	7.91	2 0
10-Oct-14		298	412080	0.12	0.23	<1	<1	<10	0.35	14.8	7.75	0.5
14-Oct-14		298	412076	0.10	0.18	1	<1	<10	0.43	16 5	8.18	0 5
17-Oct-14		298	412896	0.40	0.64	<1	<1	<10	0.50	16.7	NA	NA
10-Oct-14		298	412081	0.29	0.56	<1	<1	<10	0.34	15.5	7.66	1.0
14-Oct-14		298	412077	0.23	0.38	<1	<1	10	0.82	14 8	7.99	2 5
14-Oct-14		846	412277	0.32	0.38	<1	<1	<10	1 22	17.7	8.03	0.5

2014 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
16-Oct-14		846	412271	0.56	0.79	<1	<1	<10	0.60	16.1	7.81	5.0
14-Oct-14		846	412278	0.75	0.87	<1	<1	<10	0.24	13.8	7.86	0.5
16-Oct-14		846	412272	0.81	0.91	<1	<1	<10	0.43	13.4	7.62	2.5
14-Oct-14		850	412280	0.97	1.14	<1	<1	<10	0.60	14.9	7.84	0.5
16-Oct-14		850	412276	0.83	0.98	<1	<1	10	0.28	13.1	7.69	3.0
14-Oct-14		850	412279	0.92	1.08	<1	<1	<10	0 94	13.9	7.90	1.0
16-Oct-14		850	412275	0.68	0.84	<1	<1	<10	0 29	14.9	7.66	5.5
16-Oct-14		869	412810	0.81	0.98	<1	<1	<10	0 37	13.5	7.81	2.5
20-Oct-14		869	412804	1.14	1.34	<1	<1	<10	0.51	12.5	7.54	3.0
16-Oct-14		870	412812	0.70	0.94	<1	<1	<10	0.45	16.1	7.74	2.5
20-Oct-14		870	412809	0.50	0.61	<1	<1	<10	0.42	18.5	7.57	2.5
16-Oct-14		870	412813	0.77	0.97	<1	<1	<10	0 25	15.1	7.78	5.0
20-Oct-14		870	412808	1.01	1.26	<1	<1	10	0.41	15.3	7.54	2.0
16-Oct-14		869	412811	0.87	1.05	<1	<1	<10	0.63	14.3	7.65	7.0
20-Oct-14		869	412805	1.18	1.35	<1	<1	<10	0 51	13.9	7.46	2.0

2014 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
17-Oct-14		871	412891	0.85	1.05	<1	<1	<10	0.20	14.2	7.60	1 0
20-Oct-14		871	412885	1.05	1.29	<1	<1	30	0.59	13.2	7.54	3 0
17-Oct-14		871	412892	0.55	0.74	<1	<1	10	0.29	13.7	7.62	1.0
20-Oct-14		871	412886	0.69	0.79	<1	<1	10	0.95	13.4	7.46	1 0
17-Oct-14		872	412894	0.34	0.53	<1	<1	10	0.29	13 9	7.69	1 5
20-Oct-14		872	412890	0.85	1.04	<1	<1	<10	0.47	12 2	7.50	2 5
17-Oct-14		872	412893	0.75	0.96	<1	<1	<10	0.22	13.1	7.72	1 0
20-Oct-14		872	412889	1.00	1.17	<1	<1	<10	0.77	12.4	7.53	2 0
21-Oct-14		921	413095	0.79	1.03	<1	<1	<10	0.22	13.8	7.56	0.5
23-Oct-14		921	413092	0.68	0.91	<1	<1	<10	0.26	14.7	7.54	0 5
21-Oct-14		921	413096	0.78	0.98	<1	<1	<10	0.27	13.3	7.57	1.0
23-Oct-14		921	413091	0.76	0.95	<1	<1	<10	0.21	13.5	7.59	0.5
21-Oct-14		572	413104	0.74	0.85	<1	<1	<10	0.31	11.3	7.60	0.5
23-Oct-14		572	413098	0.59	0.76	<1	<1	<10	0.43	11.1	7.55	0 5
21-Oct-14		572	413105	0.10	0.24	<1	<1	110	0.45	10.1	7.68	1.0
23-Oct-14		572	413099	0.43	0.60	<1	<1	<10	0.48	10.6	7.62	2 5
21-Oct-14		920	413094	0.80	0.97	<1	<1	<10	1.78	12.7	7.58	3.0
23-Oct-14		920	413088	0.45	0.57	<1	<1	<10	0.19	13 5	7.63	2 5

Winnipeg

2014 Water Main Cleaning Program

Laboratory Analysis Report Household Monitoring

Date Sampled	Sample Location	Sequence Number	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100m 100mL)	E.Coli (MPNU/ L)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (°C)	pH (units)	True Colour (tcu)
21-Oct-14		920	413093	0.31	0.45	<1	<1	<10	1.37	13 9	7.63	2 0
23-Oct-14		920	413087	0.21	0.44	<1	<1	<10	0.28	14.4	7.54	2 5
21-Oct-14		575	413107	0.35	0.45	<1	<1	1000	0.73	12 3	7.58	2 0
23-Oct-14		575	413102	0.33	0.51	<1	<1	<10	0.33	10 9	7.61	0 5
27-Oct-14		575	413782	0.42	0.62	<1	<1	1250	0.17	13 5	NA	NA
30-Oct-14		575	414240	0.40	0.55	<1	<1	100	0.23	12.7	NA	NA
21-Oct-14		575	413106	0.57	0.68	<1	<1	<10	0.30	10.6	7.60	0 5
23-Oct-14		575	413103	0.68	0.81	<1	<1	<10	0.37	10.6	7.61	0.5
22-Oct-14		941	413529	0.68	0.76	<1	<1	<10	0.74	13.8	7.68	2.0
23-Oct-14		941	413524	0.68	0.89	<1	<1	<10	0.32	12.7	7.64	0 5
22-Oct-14		941	413530	0.74	0.90	<1	<1	<10	0.54	13 5	7.62	1 5
23-Oct-14		941	413523	0.83	0.98	<1	<1	<10	0.20	13.1	7.63	0 5

NOTE: On October 10, there was no result for HPC due to contract lab error.
Several attempts were made to resample at 1104 Aberdeen, but access was not granted. Therefore, the resample was taken next door.

Notes: NA: not analysed
NR: no result

E4d Regional Monitoring (DS) Reports 2011-2014

2011 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

NE06_ .

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290380	0.49	0.70	<1	<1	<10	0.17	4.6	2.5	0.5	7.38	12.2
9-May-11	291099	0.71	1.00	<1	<1	<10	0.15	10.1	2.5	<0.5	7.43	11.8
16-May-11	291764	0.91	1.21	<1	<1	<10	0.15	8.1	6.5	1.5	7.36	12.8
24-May-11	292419	0.99	1.23	<1	<1	100	0.20	11.9	6.5	1.5	7.43	11.9
30-May-11	293218	0.81	1.04	<1	<1	<10	0.17	12.7	13.0	1.0	7.78	11.9
6-Jun-11	294084	0.83	1.02	<1	<1	<10	0.20	13.1	13.0	5.0	7.73	11.4
13-Jun-11	294912	0.72	0.83	<1	<1	<10	0.37	15.3	5.0	2.5	7.46	11.5
20-Jun-11	295618	0.72	1.02	<1	<1	<10	0.16	13.7	11.0	2.0	7.31	10.8
27-Jun-11	296274	0.81	0.95	<1	<1	<10	0.15	18.2	16.0	2.5	7.40	10.9
4-Jul-11	296998	0.73	0.91	<1	<1	<10	0.14	15.7	10.0	2.5	7.37	10.8
12-Jul-11	297768	0.80	0.92	<1	<1	<10	0.29	21.1	5.0	NR[1]	7.27	10.4
18-Jul-11	298484	0.87	1.12	<1	<1	<10	0.20	17.3	7.5	0.5	7.35	9.9
25-Jul-11	299256	0.84	0.98	<1	<1	10	0.23	21.8	7.5	2.5	7.40	10.8
2-Aug-11	299941	0.71	0.94	<1	<1	<10	0.18	20.3	5.0	0.5	7.39	10.5
8-Aug-11	300518	0.80	0.90	<1	<1	<10	0.18	22.1	5.0	1.0	7.57	9.6
15-Aug-11	301266	0.78	1.02	<1	<1	<10	0.26	21.7	5.0	1.0	7.48	10.7
22-Aug-11	301917	0.76	0.96	<1	<1	<10	0.16	21.3	5.0	2.0	7.51	9.9
29-Aug-11	302601	0.95	1.14	<1	<1	<10	0.15	21.2	5.0	2.0	7.28	10.8
6-Sep-11	303439	1.18	1.38	<1	<1	<10	0.17	20.1	5.0	1.0	7.25	10.3
12-Sep-11	304084	0.96	1.22	<1	<1	<10	0.17	19.6	5.0	1.0	7.46	10.4
19-Sep-11	304756	1.32	1.46	<1	<1	<10	0.26	17.6	5.0	1.0	7.56	10.4
26-Sep-11	305518	1.27	1.46	<1	<1	<10	0.25	17.2	5.0	1.0	7.34	11.1

NE07_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290381	0.64	0.88	<1	<1	<10	0.16	7.1	2.5	0.5	7.38	12.2
9-May-11	291100	0.53	0.79	<1	<1	<10	0.18	5.9	2.5	<0.5	7.43	11.6
16-May-11	291765	0.78	1.02	<1	<1	<10	0.17	7.9	5.0	1.5	7.37	13.0
24-May-11	292420	0.82	1.01	<1	<1	<10	0.17	8.1	7.0	1.0	7.49	12.0
30-May-11	293219	0.77	1.15	<1	<1	<10	0.33	8.2	11.0	2.5	7.79	11.8
6-Jun-11	294085	0.71	0.93	<1	<1	<10	0.21	11.1	15.0	5.0	7.71	11.6
13-Jun-11	294913	0.50	0.73	<1	<1	<10	0.21	11.9	7.5	5.0	7.45	11.7
20-Jun-11	295619	0.68	0.93	<1	<1	<10	0.17	10.2	10.0	2.5	7.48	11.0
27-Jun-11	296275	0.67	0.81	<1	<1	<10	0.20	15.1	18.0	7.5	7.43	11.1
4-Jul-11	296999	0.46	0.62	<1	<1	<10	0.18	14.4	10.0	2.0	7.42	10.8
12-Jul-11	297769	0.44	0.70	<1	<1	<10	0.25	15.7	7.5	NR[1]	7.44	10.5
18-Jul-11	298485	0.76	1.14	<1	<1	<10	0.95	18.7	13.0	2.5	7.43	10.2
25-Jul-11	299257	0.41	0.49	<1	<1	<10	0.33	18.6	10.0	2.5	7.46	10.8
2-Aug-11	299942	0.58	0.76	<1	<1	<10	0.20	19.3	10.0	2.0	7.45	10.3
8-Aug-11	300519	0.55	0.73	<1	<1	<10	0.19	19.0	5.0	1.0	7.50	11.2
15-Aug-11	301267	0.47	0.71	<1	<1	<10	0.20	20.7	5.0	2.0	7.53	10.6
22-Aug-11	301918	0.47	0.66	<1	<1	<10	0.15	19.1	6.0	2.0	7.56	10.8
29-Aug-11	302602	0.89	1.07	<1	<1	<10	0.19	20.1	6.0	2.0	7.36	10.2
6-Sep-11	303440	0.95	1.08	<1	<1	<10	0.21	18.7	5.0	1.0	7.29	10.3
12-Sep-11	304085	0.98	1.25	<1	<1	10	0.25	19.4	5.0	1.0	7.45	10.4
19-Sep-11	304757	1.07	1.25	<1	<1	<10	0.19	17.6	6.0	1.0	7.51	10.6
26-Sep-11	305519	1.11	1.17	<1	<1	<10	0.30	16.2	5.0	1.0	7.37	11.7

NE09_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290382	0.30	0.51	<1	<1	<10	0.36	5.4	2.5	0.5	7.41	12.0
9-May-11	291101	0.28	0.55	<1	<1	<10	0.26	6.7	2.5	<0.5	7.52	11.6
18-May-11	291766	0.41	0.60	<1	<1	<10	0.22	7.8	7.5	3.0	7.53	12.0
24-May-11	292421	0.43	0.64	<1	<1	<10	0.23	9.0	6.0	1.5	7.49	11.6
30-May-11	293220	0.38	0.71	<1	<1	<10	0.25	8.6	10.0	1.0	7.79	11.4
6-Jun-11	294086	0.32	0.55	<1	<1	<10	0.23	9.3	13.0	5.0	7.74	11.3
13-Jun-11	294914	0.24	0.45	<1	<1	<10	0.26	9.9	7.5	4.0	7.54	11.3
20-Jun-11	295620	0.33	0.52	<1	<1	<10	0.21	10.7	10.0	2.0	7.37	10.5
27-Jun-11	296276	0.37	0.48	<1	<1	<10	0.17	21.1	18.0	7.5	7.42	10.4
4-Jul-11	297000	0.19	0.41	<1	<1	<10	0.21	14.7	10.0	2.5	7.46	10.4
12-Jul-11	297770	0.27	0.39	<1	<1	<10	0.23	13.2	5.0	NR[1]	7.39	9.9
18-Jul-11	298486	0.16	0.72	<1	<1	<10	0.88	17.4	15.0	2.5	7.42	10.0
25-Jul-11	299258	0.15	0.30	<1	<1	<10	0.36	15.9	7.5	2.0	7.48	10.1
2-Aug-11	299943	0.12	0.26	<1	<1	<10	0.22	18.2	5.0	2.0	7.48	10.1
8-Aug-11	300520	0.13	0.28	<1	<1	<10	0.30	17.2	5.0	1.0	7.62	10.9
15-Aug-11	301268	0.10	0.31	<1	<1	<10	0.31	17.2	5.0	1.0	7.51	10.0
22-Aug-11	301919	0.10	0.19	<1	<1	20	0.59	17.3	5.0	1.0	7.56	9.9
24-Aug-11	302525*	0.04	0.20	NA	NA	NA	NA	17.7	NA	NA	NA	NA
26-Aug-11	302588*	0.04	0.19	NA	NA	NA	NA	17.9	NA	NA	NA	NA
29-Aug-11	302603	0.06	0.18	<1	<1	<10	0.36	21.9	5.0	2.0	7.46	10.0
2-Sep-11	303304*	0.10	0.25	NA	NA	NA	NA	17.3	NA	NA	NA	NA
6-Sep-11	303441	<0.02	0.13	<1	<1	<10	0.34	16.5	6.0	1.0	7.37	9.7
7-Sep-11	303982*	0.12	0.30	NA	NA	NA	NA	17.9	NA	NA	NA	NA
8-Sep-11	304034*	0.10	0.29	NA	NA	NA	NA	17.7	NA	NA	NA	NA
12-Sep-11	304086	0.18	0.43	<1	<1	<10	0.27	16.8	5.0	1.0	7.49	9.9
15-Sep-11	304679*	0.24	0.39	NA	NA	NA	NA	17.3	NA	NA	NA	NA
19-Sep-11	304758	0.28	0.46	<1	<1	20	0.27	16.6	5.0	1.0	7.42	10.5
26-Sep-11	305520	0.41	0.54	<1	<1	<10	0.28	16.0	6.0	1.0	7.25	11.0

*Throughout the end of August and the beginning of September this location was resampled for free and total chlorine on several different occasions due to low chlorine results. All other parameters were not analysed. The chlorine set point was increased and additional testing was conducted in the immediate area. The free chlorine levels at the location and surrounding areas increased and continued to meet the compliance limit. A few closed and broken valves were found which may have contributed to the low chlorine results.

NE10_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290383	0.45	0.67	<1	<1	<10	0.30	4.6	0.5	0.5	7.53	12.5
9-May-11	291102	0.10	0.31	<1	<1	<10	0.28	10.6	2.0	<0.5	7.57	11.7
13-May-11	291840**	0.34	0.57	NA	NA	NA	NA	8.5	NA	NA	NA	NA
16-May-11	291767	0.47	0.85	<1	<1	<10	0.19	10.5	5.0	1.0	7.42	12.6
24-May-11	292422	0.50	0.75	<1	<1	<10	0.18	9.4	5.0	1.0	7.53	12.1
30-May-11	293221	0.58	0.90	<1	<1	<10	0.20	8.2	13.0	2.5	7.82	11.7
6-Jun-11	294087	0.44	0.66	<1	<1	<10	0.19	14.2	13.0	5.0	7.76	10.8
13-Jun-11	294915	0.44	0.56	<1	<1	<10	0.28	11.9	7.5	5.0	7.62	11.4
20-Jun-11	295621	0.36	0.59	<1	<1	<10	0.17	12.1	10.0	5.0	7.45	10.7
27-Jun-11	296277	0.41	0.58	<1	<1	<10	0.21	12.8	15.0	5.0	7.49	10.9
4-Jul-11	297001	0.21	0.39	<1	<1	<10	0.17	15.8	10.0	2.0	7.51	10.4
12-Jul-11	297771	0.31	0.48	<1	<1	<10	0.21	19.5	5.0	NR[1]	7.52	10.3
18-Jul-11	298487	0.33	0.51	<1	<1	<10	0.21	16.2	10.0	2.5	7.44	10.1
25-Jul-11	299259	0.23	0.40	<1	<1	<10	0.16	17.3	5.0	2.0	7.49	10.5
2-Aug-11	299944	0.47	0.65	<1	<1	<10	0.16	17.9	5.0	1.0	7.51	10.5
8-Aug-11	300521	0.40	0.57	<1	<1	<10	0.18	18.8	6.0	1.0	7.49	10.8
15-Aug-11	301269	0.35	0.60	<1	<1	<10	0.28	22.6	6.0	1.0	7.57	10.2
22-Aug-11	301920	0.39	0.61	<1	<1	30	0.16	18.5	5.0	2.0	7.63	9.7
29-Aug-11	302604	0.45	0.69	<1	<1	<10	0.17	17.7	5.0	2.0	7.47	9.5
6-Sep-11	303442	0.92	1.18	<1	<1	<10	0.18	17.0	6.0	1.0	7.33	9.3
12-Sep-11	304087	1.04	1.24	<1	<1	<10	NA***	18.2	5.0	1.0	7.45	10.4
19-Sep-11	304759	0.64	0.87	<1	<1	<10	0.20	16.9	6.0	1.0	7.48	9.7
26-Sep-11	305521	1.17	1.38	<1	<1	<10	0.21	16.7	6.0	1.0	7.36	11.3

** On May 13, this location was resampled due to a low chlorine reported on May 9. All other parameters were not analysed.
*** On September 12, this sample was not analysed for turbidity due to technician error.

SE01_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290384	0.70	0.91	<1	<1	<10	0.13	6.3	2.5	0.5	7.47	12.4
9-May-11	291103	0.74	0.95	<1	<1	<10	0.15	8.9	1.5	0.5	7.49	11.6
18-May-11	291768	0.86	1.10	<1	<1	<10	0.19	10.5	2.5	0.5	7.47	12.3
24-May-11	292423	0.77	1.13	<1	<1	<10	0.17	12.2	5.0	0.5	7.38	12.0
31-May-11	293222	0.87	1.01	<1	<1	<10	0.17	13.6	15.0	2.5	7.69	11.7
6-Jun-11	294088	0.93	1.04	<1	<1	<10	0.21	13.6	13.0	5.0	7.73	11.8
13-Jun-11	294916	0.77	0.98	<1	<1	<10	0.24	15.4	7.5	5.0	7.52	11.6
20-Jun-11	295622	0.85	1.02	<1	<1	<10	0.16	16.8	10.0	1.0	7.43	10.9
27-Jun-11	296278	0.79	0.94	<1	<1	<10	0.14	19.1	15.0	7.5	7.45	11.1
4-Jul-11	297002	0.75	0.97	<1	<1	<10	0.15	20.5	10.0	2.5	7.36	10.9
12-Jul-11	297772	0.83	0.93	<1	<1	<10	0.20	22.1	5.0	NR[1]	7.33	10.6
18-Jul-11	298488	1.14	1.23	<1	<1	<10	0.18	19.7	5.0	0.5	7.36	10.6
25-Jul-11	299260	0.81	0.96	<1	<1	<10	0.17	23.0	5.0	2.5	7.34	10.9
2-Aug-11	299945	0.86	1.23	<1	<1	<10	0.15	22.3	5.0	0.5	7.35	11.0
10-Aug-11	300522	0.84	0.99	<1	<1	10	0.16	22.9	5.0	1.0	7.58	10.1
17-Aug-11	301270	0.79	0.95	<1	<1	<10	0.18	22.7	5.0	1.0	7.54	10.1
22-Aug-11	301921	0.74	0.94	<1	<1	<10	0.15	21.8	5.0	2.0	7.68	10.4
29-Aug-11	302605	0.97	1.18	<1	<1	30	0.15	21.1	5.0	2.0	7.58	10.4
6-Sep-11	303443	1.17	1.38	<1	<1	<10	0.14	20.8	5.0	1.0	7.34	10.8
12-Sep-11	304088	1.13	1.34	<1	<1	10	0.18	20.3	5.0	1.0	7.57	10.7
19-Sep-11	304760	1.16	1.41	<1	<1	10	0.18	17.6	5.0	1.0	7.33	11.4
26-Sep-11	305522	1.24	1.45	<1	<1	<10	0.20	15.2	5.0	1.0	7.38	11.9

SE04_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290385	0.57	0.80	<1	<1	<10	0.20	4.7	2.5	0.5	7.41	12.1
9-May-11	291104	0.52	0.68	<1	<1	<10	0.16	5.8	1.0	<0.5	7.44	11.5
16-May-11	291769	0.57	0.95	1	<1	<10	0.18	6.6	2.5	0.5	7.44	12.5
19-May-11	292274*	0.73	0.89	<1	<1	<10	0.17	7.0	NA	NA	NA	NA
24-May-11	292424	0.63	0.85	<1	<1	<10	0.17	7.8	6.0	1.0	7.49	12.0
30-May-11	293223	0.54	0.91	<1	<1	<10	0.18	8.7	13.0	1.0	7.82	11.9
6-Jun-11	294089	0.44	0.59	<1	<1	<10	0.18	9.7	15.0	2.0	7.76	11.5
13-Jun-11	294917	0.54	0.72	<1	<1	<10	0.23	11.0	8.0	5.5	7.55	11.1
20-Jun-11	295623	0.49	0.68	<1	<1	<10	0.19	13.3	10.0	0.5	7.44	10.6
27-Jun-11	296279	0.64	0.80	<1	<1	30	0.20	13.8	15.0	7.5	7.41	10.8
4-Jul-11	297003	0.48	0.75	29	<1	TNTC	0.15	14.8	6.0	2.0	7.41	10.3
6-Jul-11	297518**	0.54	0.72	<1	<1	200	0.29	15.0	NA	NA	NA	NA
6-Jul-11	297520**	0.56	0.73	<1	<1	<10	0.14	18.6	NA	NA	NA	NA
6-Jul-11	297519**	0.48	0.66	<1	<1	<10	0.15	14.7	NA	NA	NA	NA
12-Jul-11	297773	0.51	0.72	<1	<1	<10	0.21	14.6	6.0	NR[1]	7.43	10.4
18-Jul-11	298489	0.62	0.85	<1	<1	<10	0.27	16.6	5.0	0.5	7.41	10.1
25-Jul-11	299261	0.53	0.65	<1	<1	<10	0.19	15.7	5.0	2.5	7.49	10.1
2-Aug-11	299946	0.54	0.73	<1	<1	<10	0.22	19.8	5.0	0.5	7.50	10.1
8-Aug-11	300523	0.67	0.77	<1	<1	340	0.19	19.4	5.0	1.0	7.58	10.5
15-Aug-11	301271	0.53	0.78	<1	<1	150	0.18	17.7	5.0	1.0	7.51	9.8
22-Aug-11	301922	0.58	0.78	<1	<1	40	0.13	18.1	5.0	2.0	7.55	10.1
29-Aug-11	302606	0.74	0.92	<1	<1	230	0.15	18.3	5.0	2.0	7.37	10.3
6-Sep-11	303444	0.77	1.00	<1	<1	140	0.23	17.7	5.0	1.0	7.33	10.4
12-Sep-11	304089	0.86	1.05	<1	<1	60	0.24	17.7	5.0	1.0	7.48	10.4
19-Sep-11	304761	0.96	1.16	<1	<1	20	0.18	17.1	5.0	1.0	7.49	9.7
26-Sep-11	305523	0.95	1.17	<1	<1	480	0.21	16.0	5.0	1.0	7.37	11.1

*On May 19, this location was re-sampled due to a high total coliform of 1 MPNU/100mL on May 16. Apparent and true colour, pH and dissolved oxygen were not analysed for the re-sample.

**On July 6, the location was re-sampled, as well as locations upstream and downstream due to a high total coliform of 29 MPNU/100mL and an HPC of too numerous to count on July 4. Apparent and true colour, pH and dissolved oxygen were not analyzed for the resample.

SE05_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290386	0.52	0.77	<1	<1	<10	0.18	4.7	2.5	0.5	7.30	12.6
9-May-11	291105	0.53	0.78	<1	<1	<10	0.16	5.7	2.0	<0.5	7.42	11.7
16-May-11	291770	0.59	0.92	<1	<1	<10	0.18	7.1	3.5	1.0	7.41	12.7
24-May-11	292425	0.65	0.92	<1	<1	<10	0.16	9.8	5.0	1.0	7.49	12.0
30-May-11	293224	0.64	0.97	<1	<1	<10	0.18	10.8	11.0	0.5	7.86	11.8
6-Jun-11	294090	0.54	0.77	<1	<1	<10	0.25	11.9	13.0	5.0	7.72	11.7
13-Jun-11	294918	0.58	0.72	<1	<1	<10	0.29	13.4	8.0	5.0	7.44	11.6
20-Jun-11	295624	0.51	0.78	<1	<1	<10	0.16	13.1	10.0	2.5	7.35	10.5
27-Jun-11	296280	0.65	0.79	<1	<1	<10	0.17	17.2	15.0	7.5	7.37	11.0
4-Jul-11	297004	0.53	0.70	<1	<1	<10	0.13	16.2	10.0	1.0	7.41	10.6
12-Jul-11	297774	0.58	0.72	<1	<1	<10	0.19	20.2	6.0	NR[1]	7.33	10.3
18-Jul-11	298490	0.69	0.87	<1	<1	<10	0.24	17.4	5.0	0.5	7.39	10.1
25-Jul-11	299262	0.69	0.84	<1	<1	<10	0.18	21.7	5.0	2.5	7.44	10.7
2-Aug-11	299947	0.48	0.65	<1	<1	<10	0.18	21.6	5.0	0.5	7.50	10.3
8-Aug-11	300524	0.59	0.74	<1	<1	<10	0.39	18.6	5.0	1.0	7.51	11.1
15-Aug-11	301272	0.63	0.84	<1	<1	<10	0.37	19.9	6.0	2.0	7.51	10.2
22-Aug-11	301923	0.55	0.75	<1	<1	<10	0.13	18.7	5.0	2.0	7.51	10.0
29-Aug-11	302607	0.70	0.88	<1	<1	<10	0.16	18.3	5.0	2.0	7.38	10.6
6-Sep-11	303445	0.75	0.97	<1	<1	<10	0.18	18.0	5.0	1.0	7.30	10.5
12-Sep-11	304090	0.82	1.01	<1	<1	<10	0.19	18.0	5.0	1.0	7.46	10.2
19-Sep-11	304762	0.88	1.11	<1	<1	10	0.19	16.9	5.0	1.0	7.43	10.6
26-Sep-11	305524	0.92	1.12	<1	<1	<10	0.21	15.6	5.0	1.0	7.42	11.8

SE11_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290387	0.49	0.70	<1	<1	<10	0.27	5.5	2.5	0.5	7.33	12.1
9-May-11	291106	0.51	0.75	<1	<1	<10	0.20	6.4	2.5	0.5	7.39	11.5
16-May-11	291771	0.60	0.88	<1	<1	<10	0.23	9.7	2.5	0.5	7.38	12.3
24-May-11	292426	0.54	0.79	<1	<1	<10	0.20	8.3	7.0	0.5	7.45	11.9
30-May-11	293225	0.65	1.01	<1	<1	<10	0.22	9.5	13.0	2.5	7.79	11.6
6-Jun-11	294091	0.60	0.81	<1	<1	10	0.75	11.1	18.0	7.0	7.71	11.6
13-Jun-11	294919	0.53	0.74	<1	<1	<10	0.29	11.5	10.0	7.0	7.51	11.3
20-Jun-11	295625	0.45	0.72	<1	<1	350	0.18	13.8	11.0	5.0	7.33	10.4
27-Jun-11	296281	0.54	0.71	<1	<1	20	0.22	14.7	15.0	7.5	7.37	10.6
4-Jul-11	297005	0.48	0.69	<1	<1	<10	0.16	15.7	7.5	2.5	7.39	10.5
12-Jul-11	297775	0.47	0.63	<1	<1	<10	0.18	17.3	6.0	NR[1]	7.36	10.1
18-Jul-11	298491	0.44	0.60	<1	<1	<10	0.89	19.5	10.0	2.5	7.46	10.4
25-Jul-11	299263	0.43	0.55	<1	<1	<10	0.29	18.6	5.0	2.5	7.46	10.3
2-Aug-11	299948	0.44	0.62	<1	<1	50	0.27	19.2	7.5	0.5	7.48	10.4
8-Aug-11	300525	0.21	0.36	<1	<1	<10	0.26	19.2	5.0	1.0	7.50	10.6
15-Aug-11	301273	0.28	0.50	<1	<1	<10	0.20	19.6	5.0	1.0	7.51	10.2
22-Aug-11	301924	0.31	0.47	<1	<1	<10	0.20	19.5	6.0	2.0	7.54	10.3
29-Aug-11	302608	0.26	0.48	<1	<1	<10	0.23	19.2	6.0	2.0	7.39	10.4
6-Sep-11	303446	0.48	0.63	<1	<1	<10	0.23	19.4	5.0	1.0	7.32	10.0
12-Sep-11	304091	0.58	0.81	<1	<1	<10	0.27	19.0	5.0	1.0	7.51	10.2
19-Sep-11	304763	0.76	0.98	<1	<1	<10	0.22	18.0	6.0	1.0	7.50	10.5
26-Sep-11	305525	0.71	1.00	<1	<1	<10	0.21	17.1	5.0	1.0	7.35	11.2

SE13_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290388	0.50	0.77	<1	<1	<10	0.15	6.6	2.5	0.5	7.40	12.3
9-May-11	291107	0.53	0.80	<1	<1	<10	0.18	7.6	2.5	<0.5	7.36	11.5
16-May-11	291772	0.68	0.97	<1	<1	<10	0.18	8.5	1.5	0.5	7.39	12.7
24-May-11	292427	0.38	0.86	<1	<1	<10	0.24	7.6	5.5	0.5	7.48	11.8
30-May-11	293226	0.45	0.60	<1	<1	<10	0.19	8.2	13.0	1.0	7.81	11.5
6-Jun-11	294092	0.46	0.61	<1	<1	<10	0.31	9.2	13.0	5.0	7.73	11.4
14-Jun-11	294920	0.50	0.73	<1	<1	<10	0.25	11.2	13.0	6.0	7.33	10.7
20-Jun-11	295626	0.56	0.77	<1	<1	<10	0.17	12.7	10.0	2.5	7.37	10.5
27-Jun-11	296282	0.58	0.70	<1	<1	<10	0.16	16.5	16.0	7.5	7.40	10.7
4-Jul-11	297006	0.46	0.64	<1	<1	<10	0.14	16.2	7.5	2.0	7.33	10.5
12-Jul-11	297776	0.48	0.65	<1	<1	<10	0.22	19.4	5.0	NR[1]	7.40	10.1
18-Jul-11	298492	0.23	0.42	<1	<1	<10	0.39	19.1	5.0	0.5	7.36	10.2
25-Jul-11	299264	0.37	0.49	<1	<1	<10	0.22	19.3	5.0	2.5	7.43	10.4
2-Aug-11	299949	0.48	0.63	<1	<1	<10	0.19	20.2	5.0	1.0	7.46	10.2
8-Aug-11	300526	0.41	0.55	<1	<1	<10	0.20	20.8	5.0	1.0	7.66	9.4
15-Aug-11	301274	0.21	0.44	<1	<1	<10	0.20	21.0	5.0	1.0	7.51	10.1
22-Aug-11	301925	0.31	0.45	<1	<1	10	0.18	20.7	5.0	2.0	7.52	10.3
29-Aug-11	302609	0.38	0.61	1	<1	<10	0.18	18.8	6.0	2.0	7.47	10.1
1-Sep-11	303278*	0.51	0.70	<1	<1	<10	0.18	20.5	NA	NA	NA	NA
2-Sep-11	303578*	0.54	0.77	<1	<1	<10	0.16	20.3	NA	NA	NA	NA
6-Sep-11	303447	0.66	0.81	<1	<1	<10	0.19	20.4	5.0	1.0	7.31	9.9
12-Sep-11	304092	0.79	0.95	<1	<1	<10	0.23	19.7	5.0	1.0	7.47	10.1
19-Sep-11	304764	0.85	1.09	<1	<1	<10	0.23	18.1	5.0	1.0	7.42	10.0
26-Sep-11	305526	0.96	1.17	<1	<1	<10	0.21	16.6	5.0	1.0	7.33	11.1

*On September 1 and 2, the location was re-sampled due to a high total coliform of 1 MPNU/100mL on August 29. Apparent and true colour, pH and dissolved oxygen were not analysed for the re-sample.

WC12_

Date	Sample	Free (mg/L)	Total (mg/L)	Total (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Tr (acu)	ue (tcu)	pH (units)	Dissolved (mg/L)
2-May-11	290389	0.51	0.75	<1	<1	<10	0.21	5.9	2.5	0.5	7.40	12.2
9-May-11	291108	0.47	0.77	<1	<1	<10	0.25	7.3	1.5	<0.5	7.53	11.7
18-May-11	291773	0.49	0.78	<1	<1	<10	0.21	7.5	3.5	0.5	7.52	11.9
24-May-11	292428	0.67	0.85	<1	<1	<10	0.21	10.3	6.0	1.0	7.50	11.9
30-May-11	293227	0.46	0.77	<1	<1	<10	0.21	9.8	13.0	1.0	7.83	11.3
6-Jun-11	294093	0.39	0.56	<1	<1	10	0.22	10.7	13.0	6.0	7.76	11.3
14-Jun-11	294921	0.41	0.63	3	<1	<10	0.26	12.3	13.0	7.5	7.44	10.8
16-Jun-11	295415*	0.45	0.61	<1	<1	<10	0.24	11.2	NA	NA	NA	NA
20-Jun-11	295627	0.36	0.54	<1	<1	<10	0.19	12.8	10.0	2.5	7.37	10.4
27-Jun-11	296283	0.45	0.60	<1	<1	<10	0.15	14.6	16.0	7.5	7.42	10.2
4-Jul-11	297007	0.35	0.60	<1	<1	<10	0.28	15.6	10.0	0.5	7.44	10.0
12-Jul-11	297777	0.40	0.55	<1	<1	<10	0.36	17.4	5.0	NR[1]	7.39	9.9
18-Jul-11	298493	0.31	0.54	<1	<1	<10	0.45	19.0	7.5	0.5	7.41	10.0
25-Jul-11	299265	0.41	0.56	<1	<1	<10	0.29	18.6	7.5	2.5	7.50	9.9
2-Aug-11	299950	0.37	0.59	<1	<1	<10	0.33	19.5	7.5	2.5	7.48	9.9
8-Aug-11	300527	0.23	0.37	<1	<1	<10	0.32	20.0	7.5	1.0	7.50	10.1
15-Aug-11	301275	0.31	0.48	<1	<1	<10	0.39	19.6	7.5	2.0	7.54	10.4
22-Aug-11	301926	0.20	0.33	<1	<1	10	0.63	20.4	6.0	2.0	7.53	9.5
29-Aug-11	302610	0.23	0.34	<1	<1	10	0.35	19.6	7.5	2.0	7.45	8.9
6-Sep-11	303448	0.15	0.30	<1	<1	<10	0.22	19.4	6.0	1.0	7.37	10.1
12-Sep-11	304093	0.18	0.32	<1	<1	10	0.24	20.3	5.0	1.0	7.45	10.4
19-Sep-11	304765	0.28	0.48	<1	<1	10	0.27	19.2	6.0	1.0	7.48	9.6
26-Sep-11	305527	0.33	0.50	<1	<1	<10	0.23	19.2	5.0	1.0	7.42	10.8

*On June 16, the location was re-sampled due to a high total coliform of 3 MPNU/100mL on June 14. Apparent and true colour, pH and dissolved oxygen were not analysed for the re-sample.

NA: Not analysed NR: No result TNTC: Too numerous to count

1 - On July 12 there were no results for true colour due to lab error.

2012 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE08_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324570	0.67	0.90	<1	<1	20	0.25	9.9	1.0	7.43	NA[1]
14-May-12	325235	0.75	0.99	<1	<1	<10	0.30	11.6	1.0	7.47	NA[1]
23-May-12	325973	0.62	0.82	<1	<1	<10	0.21	12.4	1.0	7.46	11.2
31-May-12	326685	0.65	0.81	<1	<1	<10	0.36	12.9	1.5	7.56	10.9
5-Jun-12	327429	0.80	0.96	<1	<1	10	0.21	14.0	1.0	7.48	11.2
12-Jun-12	328203	0.63	0.83	<1	<1	<10	0.16	15.3	2.0	7.51	11.6
19-Jun-12	328910	0.71	0.86	<1	<1	<10	0.18	16.4	1.0	7.45	10.0
26-Jun-12	329637	0.75	0.89	<1	<1	<10	0.25	16.1	0.5	7.46	10.0
3-Jul-12	330429	0.65	0.79	<1	<1	<10	0.20	19.2	2.0	7.48	10.0
10-Jul-12	331110	0.74	0.96	<1	<1	<10	0.18	20.5	1.0	7.56	9.1
16-Jul-12	331840	0.61	0.83	<1	<1	<10	0.21	21.4	2.0	7.48	9.1
24-Jul-12	332627	0.64	0.80	<1	<1	10	0.19	21.4	1.0	7.45	9.2
31-Jul-12	333349	0.63	0.81	<1	<1	<10	0.29	21.2	1.0	7.52	9.4
8-Aug-12	333948	0.66	0.82	<1	<1	<10	0.23	21.4	1.5	7.47	NA[2]
14-Aug-12	334711	0.66	0.81	<1	<1	<10	0.24	20.8	0.5	7.52	9.9

SW04_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324579	0.77	0.95	<1	<1	30	0.31	7.9	1.5	7.45	NA[1]
14-May-12	325244	0.86	1.03	<1	<1	<10	0.14	9.2	1.0	7.29	NA[1]
22-May-12	325982	0.62	0.79	<1	<1	<10	0.17	10.3	1.0	7.41	11.3
31-May-12	326694	0.78	0.99	<1	<1	<10	0.15	11.4	2.0	7.52	11.1
5-Jun-12	327438	0.81	0.97	<1	<1	10	0.36	11.5	1.0	7.48	11.3
12-Jun-12	328212	0.74	0.93	<1	<1	<10	0.15	12.9	2.5	7.46	11.6
19-Jun-12	328919	0.79	0.94	<1	<1	<10	0.15	13.8	1.0	7.42	10.1
26-Jun-12	329646	0.78	0.94	<1	<1	<10	0.14	15.1	0.5	7.43	10.0
3-Jul-12	330422	0.74	0.95	<1	<1	<10	0.19	16.4	2.0	7.41	10.3
10-Jul-12	331103	0.83	1.02	<1	<1	<10	0.17	19.0	1.0	7.46	9.5
16-Jul-12	331833	0.74	0.89	<1	<1	<10	0.13	17.6	2.0	7.43	9.3
24-Jul-12	332620	0.76	0.90	<1	<1	<10	0.20	19.0	2.0	7.39	9.4
31-Jul-12	333342	0.76	0.90	<1	<1	10	0.19	19.1	1.0	7.45	9.5
8-Aug-12	333957	0.78	0.94	<1	<1	<10	0.32	18.9	1.0	7.45	9.3
14-Aug-12	334720	0.71	0.92	<1	<1	<10	0.19	19.8	1.0	7.47	10.2

SW06_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
1-May-12	323961	0.83	1.06	<1	<1	<10	0.16	8.3	1.0	7.47	NA[1]
8-May-12	324581	0.84	1.14	<1	<1	<10	0.19	10.1	1.0	7.47	NA[1]
15-May-12	325246	0.95	1.13	<1	<1	<10	0.15	12.6	1.0	7.56	11.9
22-May-12	325984	0.83	1.04	<1	<1	<10	0.14	14.2	1.0	7.41	11.2
28-May-12	326696	0.83	1.04	<1	<1	<10	0.15	14.7	2.0	7.52	11.0
4-Jun-12	327440	0.90	1.10	<1	<1	<10	0.16	14.8	1.0	7.40	11.5
12-Jun-12	328214	0.90	1.07	<1	<1	<10	0.14	17.5	2.0	7.48	10.6
18-Jun-12	328921	0.98	1.14	<1	<1	<10	0.15	18.2	1.0	7.42	10.3
26-Jun-12	329648	0.89	1.08	<1	<1	<10	0.15	18.7	1.0	7.45	10.2
3-Jul-12	330423	0.87	1.06	<1	<1	<10	0.16	21.5	2.0	7.44	10.2
9-Jul-12	331104	0.86	1.06	<1	<1	<10	0.17	22.7	1.0	7.46	9.5
16-Jul-12	331834	0.96	1.13	<1	<1	<10	0.20	23.9	2.0	7.39	9.5
24-Jul-12	332621	0.92	1.16	<1	<1	60	0.18	23.6	1.0	7.39	9.1
31-Jul-12	333343	0.99	1.20	<1	<1	<10	0.21	23.6	1.0	7.49	9.7
7-Aug-12	333959	0.80	0.99	<1	<1	<10	0.18	23.0	1.0	7.47	10.7
14-Aug-12	334722	0.96	1.11	<1	<1	<10	0.20	22.2	0.5	7.45	10.2

SW07_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324582	0.79	0.97	<1	<1	<10	0.19	10.3	1.0	7.33	NA[1]
14-May-12	325247	1.05	1.23	<1	<1	<10	0.22	11.7	1.0	7.46	NA[1]
22-May-12	325985	0.67	0.85	<1	<1	<10	0.14	10.2	1.0	7.41	11.3
31-May-12	326697	0.81	0.99	<1	<1	<10	0.18	11.6	1.5	7.56	11.1
5-Jun-12	327441	0.83	1.00	<1	<1	20	0.17	13.0	1.0	7.49	11.3
12-Jun-12	328215	0.72	0.91	<1	<1	<10	0.14	14.4	2.0	7.46	11.6
19-Jun-12	328922	0.73	0.89	<1	<1	<10	0.43	13.8	1.5	7.41	10.1
26-Jun-12	329649	0.87	1.05	<1	<1	10	0.24	15.5	1.0	7.52	9.9
3-Jul-12	330424	0.77	0.92	<1	<1	<10	0.25	16.8	2.0	7.43	10.0
10-Jul-12	331105	0.97	1.11	<1	<1	<10	0.19	19.4	1.0	7.49	9.4
16-Jul-12	331835	0.74	0.97	<1	<1	<10	0.21	19.0	2.0	7.43	9.4
24-Jul-12	332622	0.78	0.98	<1	<1	<10	0.15	21.1	2.0	7.38	9.4
31-Jul-12	333344	0.79	0.93	<1	<1	<10	0.24	19.5	1.0	7.44	9.4
8-Aug-12	333960	0.80	0.95	<1	<1	<10	0.21	18.8	1.5	7.44	9.4
14-Aug-12	334723	0.76	0.92	<1	<1	<10	0.23	19.9	1.5	7.46	10.0

SW08_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324583	0.50	0.66	<1	<1	<10	0.19	9.0	1.0	7.42	NA[1]
14-May-12	325248	0.83	0.99	<1	<1	<10	0.24	9.6	1.0	7.54	NA[1]
22-May-12	325986	0.64	0.83	<1	<1	<10	0.14	10.2	1.0	7.33	11.2
28-May-12	326698	0.52	0.69	<1	<1	<10	0.15	10.5	2.0	7.61	11.3
5-Jun-12	327442	0.64	0.79	<1	<1	20	0.14	10.7	1.0	7.54	11.4
11-Jun-12	328216	0.56	0.76	<1	<1	<10	0.13	12.1	1.0	7.50	10.7
19-Jun-12	328923	0.59	0.78	<1	<1	<10	0.18	12.4	1.0	7.42	10.1
26-Jun-12	329650	0.72	0.87	<1	<1	<10	0.13	13.2	1.0	7.44	10.1
3-Jul-12	330425	0.78	0.96	<1	<1	<10	0.35	15.0	2.0	7.48	10.1
9-Jul-12	331106	0.79	1.00	<1	<1	<10	0.31	15.9	1.0	7.48	9.6
16-Jul-12	331836	0.64	0.83	<1	<1	<10	0.34	16.8	2.0	7.43	9.3
24-Jul-12	332623	0.62	0.79	<1	<1	10	0.27	21.1	1.0	7.43	9.4
31-Jul-12	333345	0.54	0.74	<1	<1	<10	3.84	18.5	1.0	7.51	9.3
01-Aug-12*	333850	NA	NA	NA	NA	NA	0.31	NA	NA	NA	NA
8-Aug-12	333961	0.61	0.82	<1	<1	<10	0.25	19.1	1.5	7.47	NA[2]
13-Aug-12	334724	0.47	0.62	<1	<1	<10	0.28	18.0	0.5	7.52	10.3

*On August 1, the location was re-sampled due to a high turbidity of 3.84 NTU on July 31. Other parameters were not analysed for the re-sample.

SW14_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324588	0.77	0.92	<1	<1	<10	0.24	7.9	1.0	7.40	NA[1]
14-May-12	325253	0.84	1.01	<1	<1	<10	0.14	9.3	1.0	7.49	NA[1]
22-May-12	325991	0.59	0.77	<1	<1	<10	0.15	10.3	1.0	7.51	11.2
31-May-12	326703	0.55	0.71	<1	<1	<10	0.52	12.5	2.0	7.56	10.9
5-Jun-12	327447	0.68	0.85	<1	<1	<10	0.24	12.9	1.0	7.46	11.0
12-Jun-12	328221	0.51	0.67	<1	<1	<10	0.33	14.3	2.0	7.49	11.3
19-Jun-12	328928	0.53	0.72	<1	<1	<10	0.32	14.5	1.0	7.46	9.9
26-Jun-12	329655	0.58	0.79	<1	<1	<10	0.36	16.1	1.0	7.44	9.8
3-Jul-12	330427	0.54	0.72	<1	<1	<10	0.36	17.7	2.0	7.49	9.9
10-Jul-12	331108	0.54	0.68	<1	<1	<10	0.41	18.1	1.0	7.52	9.2
16-Jul-12	331838	0.54	0.71	<1	<1	10	0.31	19.0	2.0	7.44	9.0
24-Jul-12	332625	0.59	0.76	<1	<1	10	0.34	21.3	1.0	7.33	9.2
31-Jul-12	333347	0.55	0.73	<1	<1	<10	0.22	20.2	1.0	7.42	9.2
8-Aug-12	333966	0.46	0.58	<1	<1	<10	0.22	20.6	1.5	7.37	9.3
14-Aug-12	334729	0.54	0.70	<1	<1	<10	0.32	20.2	0.5	7.45	9.7

NA: Not analysed NR: No result

[1]Dissolved oxygen was not analysed prior to May 14, 2012.
[2]Dissolved oxygen was not analysed due to instrument error/malfunction.

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SW01_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356114	0 62	0 83	1	<1	<10	0.17	6 8	2 5	7 85	13.1
9-Apr-13	356637	0 87	1 05	<1	<1	<10	0 30	4 8	NA	NA	NA
16-Apr-13	356844	0 80	0 99	<1	<1	<10	0 30	4 0	4 0	7 52	13 0
23-Apr-13	357516	0 84	0 98	<1	<1	<10	0.15	6.1	2 0	7.49	13 0
29-Apr-13	358143	0 90	1 08	<1	<1	<10	0.19	7.1	1 0	7.46	13.1
6-May-13	358865	0 85	1 00	<1	<1	<10	0 20	7 0	2 0	7 50	12 8
14-May-13	359618	0 84	0 96	<1	<1	<10	0.18	6.7	2 0	7 50	12 3
21-May-13	360371	0 52	0 69	<1	<1	<10	0 27	7 3	2 0	7 50	10 9
27-May-13	361189	0 87	1 08	<1	<1	<10	0 20	8 3	2 0	7 55	11 5
3-Jun-13	362015	0 85	0 99	<1	<1	<10	0 25	10.9	1 0	7 62	10.1
10-Jun-13	362831	0 80	0 97	<1	<1	NR*	0 22	9 6	1 0	7 56	9.4
17-Jun-13	363613	0 68	0 84	<1	<1	<10	0 32	11.3	1 0	7 56	9.4
24-Jun-13	364384	0.70	0 88	<1	<1	<10	0 23	12.4	2 0	7 62	8.9
2-Jul-13	365116	0.78	0 93	<1	<1	<10	0 22	13.9	1 0	7 53	9.2
8-Jul-13	365853	0.72	0 96	<1	<1	<10	0 33	15.3	1 0	7 65	9.4
15-Jul-13	366540	0 68	0 83	<1	<1	<10	0 27	15.8	1 0	7 56	9.2
22-Jul-13	367420	0 67	0.79	<1	<1	<10	0.12	16.1	2 5	7 62	9.6
29-Jul-13	368098	0 63	0.78	<1	<1	<10	0 25	16.3	1 0	7 53	9.4
6-Aug-13	368778	0 65	0 82	<1	<1	<10	0.13	18.1	1 0	7 60	9.7
12-Aug-13	369489	0 67	0 88	<1	<1	<10	0 20	16.6	2 5	7 56	NR**
19-Aug-13	370161	0.79	0 92	<1	<1	<10	0 37	16.1	1 0	7 53	9.6

On April 9, 2013 the location was resampled due to a positive total coliform. The resample results were negative.

SW03_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356115	0 23	0 39	<1	<1	<10	0 26	5.7	2 5	7 99	12 6
16-Apr-13	356845	0 52	0 66	<1	<1	10	0.17	5.7	5 0	7 54	12 5
23-Apr-13	357517	0.48	0 63	<1	<1	<10	0 21	4.7	2 5	7 60	12 9
29-Apr-13	358144	0 39	0 60	<1	<1	<10	0 21	5.7	1 0	7 51	12 3
6-May-13	358866	0 66	0 86	<1	<1	<10	0 31	6 3	1 5	7 50	12.4
14-May-13	359619	0 56	0.71	<1	<1	<10	0 33	6 0	2 5	7 53	12 2
21-May-13	360372	0.43	0 56	<1	<1	<10	0.19	5 2	2 0	7.49	11.1
27-May-13	361190	0.49	0 67	<1	<1	<10	0.18	11.9	2 0	7 57	10 9
3-Jun-13	362016	0 59	0.76	<1	<1	<10	0.19	7 6	1 0	7 55	10 9
10-Jun-13	362832	0.73	0 89	<1	<1	NR*	0 26	10.1	1 0	7 58	9.6
17-Jun-13	363614	0.70	0 85	<1	<1	40	0 21	9 3	1 0	7.48	9.5
24-Jun-13	364385	0.70	0 89	<1	<1	<10	0 25	8.4	2 0	7 58	9.3
2-Jul-13	365117	0.78	0 95	<1	<1	<10	0 21	9 0	1 0	7 53	8.2
8-Jul-13	365854	0 80	0 99	<1	<1	<10	0 32	9 5	1 0	7 61	10 3
15-Jul-13	366541	0.70	0 84	<1	<1	<10	0 33	9 5	1 0	7 61	9.7
22-Jul-13	367421	0 60	0.71	<1	<1	NR	0.17	8.7	2 5	7 67	9.6
29-Jul-13	368099	0 67	0 80	<1	<1	<10	0.14	13.1	1 5	7 69	9.8
6-Aug-13	368779	0 61	0.74	<1	<1	<10	0.15	10.1	1 0	7 59	9.3
12-Aug-13	369490	0 64	0.74	<1	<1	<10	0.17	10.8	2 5	7 53	NR**
19-Aug-13	370162	0 54	0 80	<1	<1	20	0 20	10.8	1 0	7 54	10.1

On July 22, 2013 there were no results for HPC due to contract lab error.

SW17_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356119	0 63	0 82	<1	<1	10	0 28	6 5	2 0	7 93	12.7
16-Apr-13	356849	0.77	1 02	<1	<1	<10	0 38	5.1	5 0	7 54	12 9
23-Apr-13	357521	0 91	1 06	<1	<1	<10	0 20	4 9	2 5	7 61	12 9
29-Apr-13	358148	1 01	1.15	<1	<1	<10	0.18	5 9	1 0	7.42	13 3
6-May-13	358870	0 68	0 88	<1	<1	<10	0.15	6 3	1 5	7.46	12 6
14-May-13	359623	0.77	0 90	<1	<1	10	0 20	6 9	2 5	7.47	11 9
21-May-13	360376	0 67	0 84	<1	<1	<10	0.19	6 0	2 0	7 54	11 2
27-May-13	361194	0 83	0 98	<1	<1	<10	0 20	8 9	2 0	7 53	11.7
3-Jun-13	362020	0.75	0 98	<1	<1	10	0.19	8.1	1 0	7 59	10.4
10-Jun-13	362836	0.77	0 95	<1	<1	NR*	0 21	9 6	1 0	7 53	9.6
17-Jun-13	363618	0 68	0 85	<1	<1	30	0 21	9.4	1 0	7 59	9.6
24-Jun-13	364389	0.79	0 99	<1	<1	<10	0 26	9.7	2 0	7 56	9.3
2-Jul-13	365121	0 81	0 93	<1	<1	<10	0 22	9 5	1 0	7 59	7.9
8-Jul-13	365858	0.79	1 01	<1	<1	<10	0 33	11.2	1 0	7 53	9.5
15-Jul-13	366545	0 60	0.74	<1	<1	<10	0 23	12.4	1 0	7.47	9.3
22-Jul-13	367425	0.75	0 92	<1	<1	<10	0.17	12.2	2 0	7 61	9.5
29-Jul-13	368103	0 57	0.74	<1	<1	10	0.14	11.1	1 5	7 64	9.2
6-Aug-13	368783	0.72	0 88	<1	<1	<10	0.12	12.2	1 0	7 56	9.7
12-Aug-13	369494	0 53	0 69	<1	<1	<10	0.14	12.6	2 5	7 53	NR**
19-Aug-13	370166	0 26	0 39	<1	<1	<10	0 23	11.3	1 0	7.45	9.7

WC04_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356120	0 81	0 99	<1	<1	<10	0 22	5.7	2 0	7 89	13 0
16-Apr-13	356850	0 84	0 98	<1	<1	<10	0.17	4 0	3 0	7 51	12 8
23-Apr-13	357522	0 91	1 04	<1	<1	<10	0 32	4.7	2 5	7.45	13 0
29-Apr-13	358149	0 83	1 00	<1	<1	<10	0 20	6.1	1 5	7.47	12 9
6-May-13	358871	0 91	1 04	<1	<1	<10	0 33	6 5	1 5	7 58	12 6
14-May-13	359624	0 85	1 08	<1	<1	<10	0.19	8.7	2 5	7 53	11.7
21-May-13	360377	0 90	1 07	<1	<1	<10	0.16	7 5	2 0	7 57	10 9
27-May-13	361195	0 82	1 00	<1	<1	<10	0 27	9 0	2 0	7 62	11.4
3-Jun-13	362021	0.70	0 85	<1	<1	<10	0 20	10.8	1 0	7 66	10 3
10-Jun-13	362837	0.72	0 95	<1	<1	NR*	0.19	8 8	1 0	7 62	9.0
17-Jun-13	363619	0.79	0 97	<1	<1	50	0 36	12.4	1 0	7 62	9.9
24-Jun-13	364390	0 80	1 00	<1	<1	<10	0 25	13.5	2 0	7 56	8.7
2-Jul-13	365122	0.79	0 94	<1	<1	<10	0 20	15.0	1 0	7 56	9.0
8-Jul-13	365859	0.71	0 90	<1	<1	<10	0 22	16.5	1 0	7 65	9.2
15-Jul-13	366546	0.72	0 85	<1	<1	<10	0 28	17.0	1 0	7 66	9.4
22-Jul-13	367426	0.72	0 82	<1	<1	<10	0.15	17.9	2 5	7 66	9.3
29-Jul-13	368104	0.70	0 80	<1	<1	<10	0.14	18.5	1 0	7.78	9.1
6-Aug-13	368784	0 66	0 80	<1	<1	<10	0.14	18.2	1 0	7 68	9.4
12-Aug-13	369495	0.75	0 89	<1	<1	<10	0.16	17.4	2 5	7 63	9.3
19-Aug-13	370167	0.70	0 88	<1	<1	<10	0 24	18.0	1 0	7 67	9.7

WC05_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356116	0 66	0 89	<1	<1	<10	0.14	9 2	2 5	7 84	13.1
16-Apr-13	356846	0.78	0 96	<1	<1	<10	0.15	5 6	6 0	7 56	13.1
23-Apr-13	357518	0.70	0 95	<1	<1	<10	0.19	6 3	2 0	7.45	13 2
29-Apr-13	358145	0 90	1 07	<1	<1	<10	0 22	5 2	1 0	7 51	13 3
6-May-13	358867	0 81	0 95	<1	<1	<10	0 26	6 2	1 5	7 52	12.7
14-May-13	359620	0 59	0 82	<1	<1	<10	0 61	8 3	2 0	7 53	12 0
21-May-13	360373	0 63	0 80	<1	<1	<10	0.18	8.7	2 0	7.40	10 9
27-May-13	361191	0 64	0.78	<1	<1	<10	0 22	9 5	2 0	7 56	11.4
3-Jun-13	362017	0 60	0 80	<1	<1	<10	0 25	8 8	1 0	7 67	10 2
10-Jun-13	362833	0 62	0 80	<1	<1	NR*	0 21	8 9	1 0	7 62	9.7
17-Jun-13	363615	0 65	0 81	<1	<1	<10	0 25	10.1	1 0	7 60	9.5
24-Jun-13	364386	0 56	0.72	<1	<1	<10	0 28	15.4	2 0	7 54	8.9
2-Jul-13	365118	0 56	0 68	<1	<1	<10	0 22	17.1	1 0	7 59	8.9
8-Jul-13	365855	0 94	1 05	<1	<1	<10	1 84	13.6	1 0	7 58	9.4
9-Jul-13	366330	NA	NA	NA	NA	NA	0 25	NA	NA	NA	NA
15-Jul-13	366542	0.47	0 66	<1	<1	30	0 26	12.8	1 0	7 67	9.3
22-Jul-13	367422	0 60	0.72	<1	<1	<10	0.17	14.5	2 5	7 69	9.5
29-Jul-13	368100	0.49	0 59	<1	<1	<10	0 36	14.2	1 0	7.78	9.3
6-Aug-13	368780	0 39	0.49	<1	<1	<10	0 32	14.4	1 0	7 65	9.3
12-Aug-13	369491	0 50	0.71	<1	<1	<10	0.19	17.9	2 0	7 63	NR**
19-Aug-13	370163	0.41	0 57	<1	<1	<10	0 30	16.0	1 0	7 68	9.4

On July 9, 2013 the location was resampled due to a high turbidity result. The resample result was 0.25 ntu.

WC06_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356117	0 62	0 83	<1	<1	10	0 32	4 0	2 0	7 91	13 0
15-Apr-13	356847	0 86	1 03	<1	<1	<10	0 24	5 0	4 0	7.41	11.7
22-Apr-13	357519	0.71	0 92	<1	<1	10	0 22	4.4	2 5	7.45	10 9
29-Apr-13	358146	1 03	1 24	<1	<1	<10	0.47	4 2	1 0	7 54	11 6
6-May-13	358868	0 90	1.13	<1	<1	<10	0 67	4 9	2 5	7.48	11.1
13-May-13	359621	0.78	0 96	<1	<1	<10	0 34	5 5	2 0	7 53	11 6
21-May-13	360374	0 69	0 88	<1	<1	<10	0 25	6 9	2 0	7 52	10 3
27-May-13	361192	0 93	1 09	<1	<1	<10	0 32	7 9	2 0	7 56	11.7
3-Jun-13	362018	0 90	1 05	<1	<1	10	0 30	12.1	1 0	7 60	9.6
10-Jun-13	362834	0 94	1.10	<1	<1	NR*	0 29	12.5	1 0	7 51	9.5
17-Jun-13	363616	0.79	0 98	<1	<1	20	0 24	13.8	1 0	7 54	8.9
24-Jun-13	364387	0.76	0 96	<1	<1	<10	0 27	15.6	2 0	7.46	9.1
2-Jul-13	365119	0 90	1 05	<1	<1	<10	0 35	17.1	1 0	7.48	8.9
8-Jul-13	365856	0.71	0 88	<1	<1	<10	0 23	18.1	1 0	7 54	8.9
15-Jul-13	366543	0.70	0 83	<1	<1	<10	0 26	19.1	1 0	7 53	9.2
22-Jul-13	367423	0.75	0 90	<1	<1	NR	0 24	19.7	2 5	7 64	8.5
29-Jul-13	368101	0.77	0 90	<1	<1	<10	0.45	19.0	2 0	7 66	9.2
6-Aug-13	368781	0 61	0.76	<1	<1	<10	0 25	18.2	1 0	7 62	9.1
12-Aug-13	369492	0 81	0 90	<1	<1	<10	0.47	18.5	2 0	7 50	10 3
19-Aug-13	370164	0 68	0 90	<1	<1	<10	0 26	18.7	1 0	7 52	9.8

On July 22, 2013 there were no results for HPC due to contract lab error.

WC08_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356118	0 62	0.75	<1	<1	<10	0 37	6.1	2 0	7 85	12.7
16-Apr-13	356848	0.72	0 90	<1	<1	<10	0 23	6 6	5 0	7 55	13.1
23-Apr-13	357520	0 62	0.79	<1	<1	<10	0 23	12.8	2 5	7.46	12 8
29-Apr-13	358147	0 86	1 07	<1	<1	<10	0.40	8.1	1 5	7.43	13 2
6-May-13	358869	0 69	0 83	<1	<1	<10	0 23	11.2	1 0	7.41	12 8
14-May-13	359622	0 64	0 80	<1	<1	<10	0 25	8 3	2 0	7 55	12 2
21-May-13	360375	0 65	0 83	<1	<1	<10	0 24	8 6	2 0	7 36	11 0
27-May-13	361193	0 56	0.73	<1	<1	<10	0 28	12.3	2 0	7.49	11.7
3-Jun-13	362019	0.72	0 90	<1	<1	<10	0 28	9 0	1 0	7 68	10 2
10-Jun-13	362835	0.77	0 96	<1	<1	NR*	0 24	7.7	1 0	7 56	10.1
17-Jun-13	363617	0.76	0 88	<1	<1	20	0 33	10.3	1 0	7.46	9.5
24-Jun-13	364388	0 84	1 07	<1	<1	<10	0.71	10.4	2 0	7.49	8.7
2-Jul-13	365120	0 66	0 81	<1	<1	<10	0.17	13.7	1 0	7 50	8.8
8-Jul-13	365857	0 55	0 67	<1	<1	<10	0 26	12.1	1 0	7 54	9.4
15-Jul-13	366544	0 51	0 66	<1	<1	<10	0.46	15.0	1 0	7 57	9.5
22-Jul-13	367424	0 53	0 62	<1	<1	<10	0.16	15.7	2 5	7 54	9.5
29-Jul-13	368102	0 53	0 66	<1	<1	<10	0 35	15.4	1 0	7 54	9.2
6-Aug-13	368782	0 52	0 66	<1	<1	<10	0.16	18.6	1 0	7 57	9.3
12-Aug-13	369493	0 57	0.72	<1	<1	<10	0.18	15.2	2 5	7 52	NR**
19-Aug-13	370165	0 64	0 84	<1	<1	<10	0 30	16.3	1 5	7.41	9.6

WC10_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356113	0 55	0 69	<1	<1	10	0 50	7 2	2 0	7 91	12.1
16-Apr-13	356843	0 57	0.78	<1	<1	<10	0 32	6 6	3 0	7 60	12 8
23-Apr-13	357515	0.75	0 95	<1	<1	<10	0 31	7.1	2 5	7 56	12 3
29-Apr-13	358142	0 64	0 85	<1	<1	<10	0 20	7 8	1 5	7 53	12 6
6-May-13	358864	0.73	0 90	<1	<1	<10	0.40	6 5	1 0	7 56	12 6
14-May-13	359617	0.73	0 87	<1	<1	10	0 35	7 9	2 0	7 65	11 6
21-May-13	360370	0 59	0.79	<1	<1	<10	0 80	7 5	2 0	7 69	10 9
27-May-13	361188	0 60	0.78	<1	<1	<10	0.78	8 5	2 0	7 54	11 3
3-Jun-13	362014	0 62	0.75	<1	<1	<10	1 21	9.1	1 0	7.73	9.9
10-Jun-13	362830	0 60	0.75	<1	<1	NR*	0 54	9 6	1 0	7 63	9.5
17-Jun-13	363612	0 91	1.19	<1	<1	<10	2 02	13.4	1 0	7 57	9.5
18-Jun-13	363678	0 65	0 81	<1	<1	NR	0 89	10.6	0 5	7.70	9.5
19-Jun-13	363679	0.77	0 91	<1	<1	<10	1 36	11.5	0 5	7 64	9.4
20-Jun-13	363680	0.79	0 98	<1	<1	<10	2 01	12.6	1 0	7 57	9.2
21-Jun-13	363681	0 61	0.79	<1	<1	<10	0 60	12.2	1 0	7 62	9.4
24-Jun-13	364383	0 59	0.77	<1	<1	<10	0 60	9 9	2 0	7 58	8.4
2-Jul-13	365115	0 55	0.70	<1	<1	<10	0 33	14.7	1 0	7 58	8.0
8-Jul-13	365852	0 60	0.76	<1	<1	<10	0 38	16.5	1 0	7 66	9.3
15-Jul-13	366539	0 50	0 64	<1	<1	10	0 96	16.4	1 0	7 61	9.1
22-Jul-13	367419	0 57	0 69	<1	<1	<10	0 95	17.4	2 5	7.74	9.1
29-Jul-13	368097	0 61	0.75	<1	<1	<10	0 52	17.3	1 0	7.76	9.3
6-Aug-13	368777	0 55	0 68	<1	<1	<10	0 58	17.4	1 0	7 69	9.2
12-Aug-13	369488	0 59	0.76	<1	<1	<10	0.70	17.5	2 0	7 61	9.4
19-Aug-13	370160	0 55	0 69	<1	<1	<10	0 63	17.8	1 0	7.71	9.6

On June 18, 2013 there were no results for HPC due to contract lab error.

WC11_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356121	0 54	0.75	<1	<1	<10	0 67	12.6	2 0	7 94	12 9
16-Apr-13	356851	0.77	0 93	<1	<1	<10	0 20	6 0	6 0	7 55	12 9
23-Apr-13	357523	0 63	0 81	<1	<1	<10	0 29	4.7	2 5	7.49	13.1
29-Apr-13	358150	0 69	0 82	<1	<1	<10	0.48	4.7	1 0	7.43	12.7
6-May-13	358872	0 62	0 85	<1	<1	<10	0 36	5.4	1 0	7.48	13 0
14-May-13	359625	0 85	0 99	<1	<1	<10	0 35	5.7	2 5	7 59	11 8
21-May-13	360378	0 55	0 69	<1	<1	<10	0 37	7 3	2 0	7.45	10 6
27-May-13	361196	0.46	0 63	<1	<1	10	0 27	7 2	2 0	7 54	11.1
3-Jun-13	362022	0 68	0 82	<1	<1	<10	0 31	7 5	1 0	7 52	9.6
10-Jun-13	362838	0 59	0.77	<1	<1	NR*	0.46	9.1	1 0	7 52	9.0
17-Jun-13	363620	0 62	0.76	<1	<1	30	0 20	8 5	1 0	7.48	9.8
24-Jun-13	364391	0 60	0.72	<1	<1	<10	0 31	11.1	2 0	7.45	8.7
2-Jul-13	365123	0.71	0 91	21	<1	<10	0 29	14.7	1 0	7.49	8.7
5-Jul-13	365759	0 37	0 52	<1	<1	<10	0 30	15.2	NA	NA	NA
5-Jul-13	365760	0 52	0.70	<1	<1	<10	0 28	16.7	NA	NA	NA
5-Jul-13	365761	0 84	1 05	<1	<1	<10	0 31	20.0	NA	NA	NA
8-Jul-13	365860	0 52	0.71	<1	<1	<10	0 34	16.0	1 0	7 56	8.9
15-Jul-13	366547	0.44	0 61	<1	<1	<10	0.45	16.7	1 0	7 51	8.7
22-Jul-13	367427	0 37	0 55	<1	<1	<10	0 25	17.7	2 5	7 53	8.7
29-Jul-13	368105	0 69	0.79	<1	<1	<10	0 33	17.8	1 0	7 62	9.5
6-Aug-13	368785	0 55	0 67	<1	<1	<10	0 22	17.9	1 0	7 51	9.0
12-Aug-13	369496	0 39	0 58	<1	<1	<10	0 23	17.9	2 0	7 51	9.2
19-Aug-13	370168	0 60	0.75	<1	<1	<10	0 55	18.1	1 0	7 54	9.4

On July 5, 2013 the location was resampled, as well as upstream and downstream, due to a positive total coliform. The resample results were all negative.

NOTE: *On June 10, 2013 there were no results for HPC at all the locations due to contract lab error.
**On August 12, 2013 there were no results for dissolved oxygen, for some locations, due to an instrument malfunction.

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

NE01_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399427	0.77	0.98	<1	<1	<10	0.11	9.7	0.5	7.57	10.5
23-Jun-14	400090	0.84	1.08	<1	<1	NR	0.12	8.7	1.0	7.57	10.6
30-Jun-14	400834	0.87	1.09	<1	<1	<10	0.18	11.0	1.0	7.59	10.4
7-Jul-14	401504	0.82	1.00	<1	<1	<10	0.18	9.6	1.0	7.64	10.6
14-Jul-14	402290	0.66	0.83	<1	<1	<10	0.20	11.9	0.5	7.79	10.1
21-Jul-14	403078	0.75	1.02	<1	<1	10	0.10	15.2	1.5	7.74	9.9
28-Jul-14	403820	0.86	0.99	<1	<1	<10	0.16	14.3	2.0	7.61	9.8
5-Aug-14	404741	0.96	1.16	<1	<1	<10	0.23	18.5	2.5	7.54	8.9
11-Aug-14	405554	0.83	0.90	<1	<1	<10	0.21	14.3	1.5	7.67	9.7
18-Aug-14	406425	0.76	0.94	<1	<1	<10	0.15	18.6	0.5	7.46	9.4
25-Aug-14	407222	0.68	0.85	<1	<1	<10	0.15	17.5	1.0	7.64	9.1
2-Sep-14	407959	0.86	1.00	<1	<1	<10	0.14	18.0	1.0	7.58	9.2
8-Sep-14	408639	0.83	1.05	<1	<1	<10	0.17	16.6	0.5	7.68	9.8
15-Sep-14	409348	0.91	1.13	<1	<1	<10	0.16	16.3	0.5	7.63	10.3
22-Sep-14	410085	0.77	0.95	<1	<1	<10	0.20	14.7	1.0	7.72	10.4
29-Sep-14	410790	0.75	0.92	<1	<1	<10	0.21	15.0	4.0	7.79	9.9
6-Oct-14	411637	0.85	1.10	<1	<1	<10	0.21	14.3	0.5	7.69	8.8
14-Oct-14	412207	0.89	1.05	<1	<1	<10	0.14	12.9	1.0	7.66	9.9
20-Oct-14	412999	0.90	1.11	<1	<1	<10	0.21	12.5	1.0	7.54	10.9
27-Oct-14	413678	0.90	1.09	<1	<1	10	0.12	12.6	0.5	7.72	9.3
3-Nov-14	414365	0.92	1.17	<1	<1	<10	0.17	12.1	0.5	7.78	11.2

On June 23rd, there was no result for HPC due to contract lab error.

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

NW_FM1

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399436	0.94	1.17	<1	<1	<10	0.18	10.5	2.0	7.40	10.6
23-Jun-14	400099	0.84	1.05	<1	<1	<10	0.30	11.9	1.5	7.41	10.7
30-Jun-14	400843	0.88	1.06	<1	<1	<10	0.15	13.8	1.0	7.43	10.2
7-Jul-14	401513	1.05	1.26	<1	<1	<10	0.19	14.7	2.0	7.48	10.6
14-Jul-14	402299	0.85	1.08	<1	<1	<10	0.19	15.8	1.0	7.64	9.8
21-Jul-14	403087	0.95	1.17	<1	<1	<10	0.15	16.9	1.0	7.61	10.1
28-Jul-14	403829	0.75	0.95	<1	<1	<10	0.13	18.2	1.0	7.60	10.0
5-Aug-14	404750	0.78	0.93	<1	<1	<10	0.14	19.1	3.0	7.54	10.0
11-Aug-14	405563	0.74	0.94	<1	<1	<10	0.13	19.3	1.0	7.47	9.8
18-Aug-14	406434	0.83	1.03	<1	<1	<10	0.11	19.4	0.5	7.44	9.9
25-Aug-14	407231	0.71	0.90	<1	<1	<10	0.12	19.0	1.0	7.46	9.4
2-Sep-14	407968	0.69	0.95	<1	<1	<10	0.19	19.1	1.0	7.47	10.1
8-Sep-14	408648	0.65	0.90	<1	<1	<10	0.17	18.5	0.5	7.43	10.1
15-Sep-14	409357	0.74	0.90	<1	<1	<10	0.38	18.2	0.5	7.41	10.4
22-Sep-14	410094	0.62	0.80	<1	<1	<10	0.25	20.7	0.5	7.48	11.0
29-Sep-14	410799	0.57	0.77	<1	<1	<10	0.26	17.6	3.0	7.61	10.9
6-Oct-14	411646	0.70	0.84	<1	<1	<10	0.34	18.9	0.5	7.54	9.0
14-Oct-14	412216	0.83	1.03	<1	<1	<10	0.16	15.5	0.5	7.65	11.6
20-Oct-14	413008	0.74	0.91	<1	<1	<10	0.22	15.5	2.0	7.30	11.8
27-Oct-14	413687	0.67	0.88	<1	<1	20	0.17	18.5	1.0	7.67	9.5
3-Nov-14	414374	0.71	0.90	<1	<1	<10	0.23	16.3	1.0	7.61	11.5

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

NW01_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399435	0.98	1.12	<1	<1	<10	0.14	10.9	2.5	7.41	10.6
23-Jun-14	400098	1.13	1.30	<1	<1	<10	0.13	10.5	1.0	7.43	10.8
30-Jun-14	400842	0.88	1.12	<1	<1	10	0.14	12.6	2.0	7.47	10.4
7-Jul-14	401512	1.15	1.35	<1	<1	<10	0.15	13.6	2.5	7.54	10.6
14-Jul-14	402298	0.85	1.02	<1	<1	<10	0.14	13.8	0.5	7.60	10.0
21-Jul-14	403086	1.13	1.28	<1	<1	<10	0.16	15.0	2.0	7.59	10.1
28-Jul-14	403828	0.95	1.13	<1	<1	20	0.10	15.5	1.0	7.52	10.1
5-Aug-14	404749	0.86	1.04	<1	<1	10	0.15	17.6	2.5	7.55	9.7
11-Aug-14	405562	1.05	1.28	<1	<1	<10	0.15	17.3	1.0	7.45	9.7
18-Aug-14	406433	1.18	1.37	<1	<1	<10	0.17	17.9	0.5	7.59	9.6
25-Aug-14	407230	1.27	1.41	<1	<1	<10	0.15	18.5	1.0	7.57	9.0
2-Sep-14	407967	1.05	1.24	<1	<1	<10	0.13	17.8	2.5	7.44	9.5
8-Sep-14	408647	1.02	1.23	<1	<1	<10	0.17	17.3	0.5	7.44	9.8
15-Sep-14	409356	0.90	1.10	<1	<1	<10	0.20	16.8	0.5	7.44	10.3
22-Sep-14	410093	0.94	1.09	<1	<1	<10	0.24	15.7	1.0	7.54	10.5
29-Sep-14	410798	0.92	1.12	<1	<1	<10	0.22	15.6	1.0	7.59	10.5
6-Oct-14	411645	0.93	1.14	<1	<1	<10	0.21	15.3	0.5	7.55	10.1
14-Oct-14	412215	0.95	1.13	<1	<1	<10	0.57	14.3	1.5	7.51	11.0
20-Oct-14	413007	0.98	1.13	<1	<1	50	0.16	13.6	1.0	7.64	10.3
27-Oct-14	413686	0.84	1.06	<1	<1	20	0.15	12.4	0.5	7.69	9.4
3-Nov-14	414373	0.86	1.06	<1	<1	<10	0.18	12.5	0.5	7.70	11.7

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE01_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399424	1.12	1.32	<1	<1	<10	0.17	17.8	0.5	7.31	10.7
23-Jun-14	400087	1.16	1.35	<1	<1	<10	0.23	17.9	1.0	7.36	10.8
30-Jun-14	400831	1.37	1.58	<1	<1	<10	0.23	19.6	2.0	7.36	10.4
7-Jul-14	401501	1.19	1.39	<1	<1	<10	0.21	19.4	1.0	7.47	10.6
14-Jul-14	402287	1.11	1.36	<1	<1	<10	0.18	20.5	1.0	7.60	10.3
21-Jul-14	403075	1.11	1.31	<1	<1	<10	0.19	20.7	2.5	7.60	10.1
28-Jul-14	403817	1.16	1.33	<1	<1	<10	0.20	21.5	2.0	7.67	9.9
5-Aug-14	404738	1.16	1.31	<1	<1	<10	0.25	22.0	3.0	7.48	10.0
11-Aug-14	405551	1.18	1.37	<1	<1	<10	0.23	22.9	1.0	7.42	9.7
18-Aug-14	406422	1.16	1.34	<1	<1	<10	0.25	22.8	1.0	7.41	9.8
25-Aug-14	407219	1.12	1.28	<1	<1	<10	0.22	22.4	2.0	7.31	9.4
2-Sep-14	407956	1.05	1.25	<1	<1	<10	0.21	20.4	2.0	7.38	10.0
8-Sep-14	408636	0.98	1.21	<1	<1	<10	0.23	19.5	0.5	7.30	10.5
15-Sep-14	409345	1.13	1.31	<1	<1	<10	0.24	17.4	0.5	7.52	11.1
22-Sep-14	410082	1.13	1.36	NR	NR	NR	0.31	15.6	1.0	7.43	11.2
25-Sep-14	410677	1.10	1.37	<1	<1	<10	0.27	16.3	NA	NA	NA
29-Sep-14	410787	1.11	1.30	<1	<1	<10	0.23	17.2	3.0	7.62	11.0
6-Oct-14	411634	1.15	1.38	<1	<1	<10	0.19	13.6	1.0	7.43	9.6
14-Oct-14	412204	1.14	1.35	<1	<1	10	0.20	10.5	0.5	7.40	9.5
20-Oct-14	412996	1.19	1.35	<1	<1	<10	0.18	10.4	1.0	7.48	12.1
27-Oct-14	413675	1.12	1.32	<1	<1	<10	0.17	10.0	0.5	7.71	10.4
3-Nov-14	414362	1.29	1.51	<1	<1	<10	0.18	7.9	0.5	7.60	12.9

On September 22nd, there was no result for coliforms due to contract lab error. Resample was taken September 25th.

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE02_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399428	0.84	1.01	<1	<1	<10	0.34	11.1	2.0	7.32	10.7
23-Jun-14	400091	0.86	1.06	<1	<1	<10	0.20	11.9	2.0	7.44	10.8
30-Jun-14	400835	0.87	1.08	<1	<1	30	0.20	11.7	1.0	7.41	10.4
7-Jul-14	401505	0.85	1.00	<1	<1	<10	0.27	12.1	2.0	7.52	10.3
14-Jul-14	402291	0.80	0.99	<1	<1	<10	0.26	13.5	1.5	7.64	10.0
21-Jul-14	403079	0.84	1.01	<1	<1	<10	0.15	14.4	0.5	7.55	9.8
28-Jul-14	403821	0.79	0.95	<1	<1	<10	0.16	15.4	1.0	7.46	9.8
5-Aug-14	404742	0.85	1.03	<1	<1	<10	0.23	17.1	3.0	7.44	9.8
11-Aug-14	405555	0.83	1.04	<1	<1	<10	0.20	17.8	1.0	7.48	9.5
18-Aug-14	406426	0.75	0.92	<1	<1	<10	0.25	18.1	0.5	7.32	9.7
25-Aug-14	407223	0.76	0.94	<1	<1	<10	0.21	18.0	0.5	7.46	8.9
2-Sep-14	407960	0.75	0.91	<1	<1	<10	0.20	16.9	1.0	7.42	9.6
8-Sep-14	408640	0.75	0.94	<1	<1	<10	0.27	16.9	1.0	7.54	9.3
15-Sep-14	409349	0.72	0.87	<1	<1	<10	0.26	15.7	0.5	7.51	10.0
22-Sep-14	410086	0.84	1.01	<1	<1	<10	0.31	16.2	1.0	7.62	9.8
29-Sep-14	410791	0.75	0.86	<1	<1	<10	0.33	16.2	6.0	7.71	9.9
6-Oct-14	411638	0.96	1.09	<1	<1	<10	0.21	15.7	0.5	7.69	8.3
14-Oct-14	412208	0.90	1.08	<1	<1	<10	0.24	13.2	0.5	7.53	10.3
20-Oct-14	413000	0.95	1.14	<1	<1	<10	0.22	12.7	2.0	7.81	10.6
27-Oct-14	413679	0.85	1.06	<1	<1	20	0.21	12.7	0.5	7.63	9.1
3-Nov-14	414366	1.05	1.31	<1	<1	<10	0.26	11.0	0.5	7.62	11.6

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE05_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399429	0.88	1.04	<1	<1	<10	0.12	13.0	1.0	7.40	9.9
23-Jun-14	400092	0.94	1.13	<1	<1	<10	0.14	16.0	1.0	7.52	9.8
30-Jun-14	400836	0.95	1.18	<1	<1	10	0.19	13.7	1.5	7.51	10.2
7-Jul-14	401506	0.89	1.04	<1	<1	<10	0.22	15.1	0.5	7.59	9.8
14-Jul-14	402292	0.86	1.04	<1	<1	<10	0.24	16.1	0.5	7.80	9.4
21-Jul-14	403080	0.86	1.02	<1	<1	<10	0.21	17.8	0.5	7.68	9.1
28-Jul-14	403822	0.80	0.97	<1	<1	<10	0.15	18.0	2.0	7.57	9.3
5-Aug-14	404743	0.92	1.08	<1	<1	<10	0.21	19.2	0.5	7.56	9.0
11-Aug-14	405556	0.90	1.07	<1	<1	10	0.14	20.5	1.0	7.56	8.8
18-Aug-14	406427	0.77	0.91	<1	<1	<10	0.17	19.4	0.5	7.48	8.8
25-Aug-14	407224	0.60	0.88	<1	<1	<10	0.17	18.8	2.0	7.47	8.9
2-Sep-14	407961	0.89	1.06	<1	<1	<10	0.26	18.1	1.0	7.57	9.0
8-Sep-14	408641	0.90	1.09	<1	<1	<10	0.72	18.0	0.5	7.45	8.9
15-Sep-14	409350	0.87	0.99	<1	<1	<10	0.31	16.7	0.5	7.55	9.6
22-Sep-14	410087	0.87	1.13	<1	<1	<10	0.67	16.0	1.0	7.61	9.8
29-Sep-14	410792	0.70	0.92	<1	<1	<10	0.25	15.8	2.5	7.67	9.8
6-Oct-14	411639	0.89	1.09	<1	<1	<10	0.17	14.4	0.5	7.63	8.6
14-Oct-14	412209	0.78	1.05	<1	<1	<10	0.23	12.8	1.0	7.56	9.5
20-Oct-14	413001	0.88	1.10	<1	<1	<10	0.23	12.3	1.0	7.54	11.9
27-Oct-14	413680	0.83	1.06	<1	<1	<10	0.15	13.2	0.5	7.64	9.1
3-Nov-14	414367	0.98	1.18	<1	<1	<10	0.17	12.3	1.0	7.64	10.8

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE11_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
17-Jun-14	399430	0.91	1.11	<1	<1	<10	0.20	12.4	1.0	7.40	10.5
23-Jun-14	400093	0.90	1.08	<1	<1	<10	0.35	14.1	0.5	7.49	10.6
30-Jun-14	400837	0.97	1.18	<1	<1	<10	0.28	15.1	1.5	7.87	10.4
7-Jul-14	401507	0.88	1.05	<1	<1	<10	0.30	15.9	1.0	7.46	10.3
14-Jul-14	402293	0.74	0.94	<1	<1	<10	0.27	17.3	1.0	7.72	9.7
21-Jul-14	403081	0.80	1.00	<1	<1	<10	0.31	17.6	2.5	7.55	9.7
28-Jul-14	403823	0.84	1.04	<1	<1	<10	0.44	18.5	2.0	7.54	9.7
5-Aug-14	404744	0.92	1.09	<1	<1	<10	0.96	18.8	0.5	7.43	9.7
11-Aug-14	405557	0.92	1.07	<1	<1	<10	0.43	19.6	1.0	7.48	9.4
18-Aug-14	406428	0.80	1.03	<1	<1	<10	0.22	19.9	0.5	7.33	9.5
25-Aug-14	407225	0.88	0.98	<1	<1	<10	0.32	19.8	1.5	7.39	9.1
2-Sep-14	407962	0.82	1.02	<1	<1	<10	0.72	19.4	1.0	7.43	9.7
8-Sep-14	408642	0.89	1.09	<1	<1	<10	0.38	19.0	0.5	7.35	9.4
15-Sep-14	409351	0.85	1.00	<1	<1	10	0.33	18.2	0.5	7.51	10.5
22-Sep-14	410088	0.92	1.13	<1	<1	<10	0.37	16.8	1.0	7.53	11.0
29-Sep-14	410793	0.83	0.97	<1	<1	<10	0.33	17.6	5.0	7.59	10.5
6-Oct-14	411640	0.65	0.76	<1	<1	<10	0.26	17.4	1.0	7.64	9.3
14-Oct-14	412210	0.86	1.16	<1	<1	<10	0.27	16.1	1.5	7.50	11.3
20-Oct-14	413002	0.78	0.98	<1	<1	<10	0.26	15.7	1.0	7.63	10.1
27-Oct-14	413681	0.52	0.70	<1	<1	20	0.27	15.3	0.5	7.77	8.4
3-Nov-14	414368	0.97	1.07	<1	<1	20	0.39	14.2	2.5	7.70	10.6

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SE14_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
17-Jun-14	399431	0.77	1.00	<1	<1	<10	0.15	8.7	1.0	7.37	11.0
24-Jun-14	400094	0.78	0.99	<1	<1	<10	0.17	10.7	NR	7.66	11.0
2-Jul-14	400838	0.80	0.96	<1	<1	10	0.25	9.7	2.0	7.74	10.4
8-Jul-14	401508	0.70	0.84	<1	<1	<10	0.21	9.9	1.5	7.46	10.8
15-Jul-14	402294	0.59	0.82	<1	<1	10	0.31	13.1	0.5	7.65	10.0
22-Jul-14	403082	0.68	0.87	<1	<1	<10	0.29	11.7	0.5	7.51	10.3
29-Jul-14	403824	0.64	0.82	<1	<1	<10	0.26	12.5	1.5	7.49	9.0
6-Aug-14	404745	0.78	0.92	<1	<1	<10	0.29	12.2	1.0	7.81	9.9
12-Aug-14	405558	0.73	0.91	<1	<1	<10	0.22	14.4	1.0	7.56	9.7
19-Aug-14	406429	0.60	0.81	<1	<1	<10	0.24	14.3	0.5	7.59	9.9
26-Aug-14	407226	0.62	0.78	<1	<1	10	0.26	13.6	2.5	7.43	9.1
3-Sep-14	407963	0.68	0.92	<1	<1	<10	0.25	14.4	1.0	7.49	9.5
9-Sep-14	408643	0.65	0.76	<1	<1	<10	0.26	18.1	2.5	7.40	10.4
16-Sep-14	409352	0.58	0.76	<1	<1	<10	0.34	19.0	0.5	7.61	10.7
23-Sep-14	410089	0.64	0.83	<1	<1	<10	0.31	14.0	10.0	7.58	10.7
30-Sep-14	410794	0.72	0.90	<1	<1	<10	0.58	14.9	0.5	7.84	10.6
7-Oct-14	411641	0.65	0.84	<1	<1	<10	0.31	17.1	0.5	7.50	11.0
15-Oct-14	412211	0.77	1.01	<1	<1	<10	0.19	13.5	0.5	7.62	10.1
21-Oct-14	413003	0.83	1.00	<1	<1	10	0.18	13.5	1.0	7.54	11.3
28-Oct-14	413682	0.69	0.92	<1	<1	<10	0.20	13.0	1.0	7.80	11.4
4-Nov-14	414369	0.78	0.99	<1	<1	<10	0.23	13.2	0.5	7.60	11.8

On June 24th, there was no result for true colour due to technician error.

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SW04_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399433	0.95	1.19	<1	<1	<10	0.16	15.4	1.0	7.35	10.9
23-Jun-14	400096	0.98	1.23	<1	<1	<10	0.15	15.3	1.0	7.40	10.5
30-Jun-14	400840	0.97	1.10	<1	<1	100	0.16	16.1	1.0	7.42	10.1
7-Jul-14	401510	1.05	1.25	<1	<1	<10	0.17	17.6	2.0	7.50	10.9
14-Jul-14	402296	0.99	1.18	<1	<1	<10	0.15	18.1	1.0	7.65	10.0
21-Jul-14	403084	1.05	1.24	<1	<1	<10	0.13	18.4	1.0	7.82	10.0
28-Jul-14	403826	0.88	1.10	<1	<1	<10	0.11	16.8	2.0	7.50	10.0
5-Aug-14	404747	1.00	1.12	<1	<1	<10	0.09	17.1	2.5	7.46	9.7
11-Aug-14	405560	0.79	0.99	<1	<1	<10	0.12	18.1	1.5	7.50	9.8
18-Aug-14	406431	0.69	0.88	<1	<1	<10	0.14	20.1	0.5	7.36	9.8
25-Aug-14	407228	0.84	1.04	<1	<1	<10	0.15	18.5	1.0	7.39	9.4
2-Sep-14	407965	0.77	0.91	<1	<1	<10	0.15	18.1	1.0	7.40	10.1
8-Sep-14	408645	0.58	0.71	<1	<1	<10	0.27	18.0	NR	7.54	10.1
15-Sep-14	409354	0.64	0.76	<1	<1	<10	0.28	17.8	0.5	7.48	10.6
22-Sep-14	410091	0.75	0.91	<1	<1	<10	0.27	17.8	1.0	7.56	11.0
29-Sep-14	410796	0.80	0.93	<1	<1	<10	0.24	16.9	5.0	7.61	10.6
6-Oct-14	411643	0.84	1.05	<1	<1	<10	0.16	15.5	1.0	7.42	10.2
14-Oct-14	412213	1.04	1.21	<1	<1	<10	0.29	14.7	0.5	7.54	11.9
20-Oct-14	413005	1.03	1.25	<1	<1	<10	0.20	13.3	1.0	7.48	12.0
27-Oct-14	413684	0.79	0.99	<1	<1	<10	0.17	13.9	0.5	7.60	8.8
3-Nov-14	414371	0.95	1.18	<1	<1	<10	0.37	10.4	1.0	7.58	12.8

On September 8th, there was no result for true color due to technician error.

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

SW06_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399426	0.95	1.14	<1	<1	<10	0.13	17.3	1.0	7.29	11.1
23-Jun-14	400089	1.06	1.20	<1	<1	<10	0.16	17.9	1.0	7.40	10.9
30-Jun-14	400833	1.04	1.14	<1	<1	20	0.15	19.0	1.5	7.43	9.7
7-Jul-14	401503	0.95	1.25	<1	<1	10	0.17	19.4	1.5	7.48	11.0
14-Jul-14	402289	1.04	1.23	<1	<1	<10	0.15	20.4	0.5	7.59	10.2
21-Jul-14	403077	1.04	1.24	<1	<1	10	0.15	20.3	1.5	7.57	10.3
28-Jul-14	403819	1.02	1.21	<1	<1	<10	0.16	21.5	1.5	7.41	10.0
5-Aug-14	404740	1.01	1.15	<1	<1	<10	0.16	21.7	3.0	7.43	10.0
11-Aug-14	405553	1.01	1.20	<1	<1	<10	0.17	22.8	1.5	7.48	9.9
18-Aug-14	406424	1.02	1.21	<1	<1	<10	0.18	22.6	0.5	7.45	9.9
25-Aug-14	407221	0.89	1.08	<1	<1	<10	0.16	22.2	1.0	7.33	9.5
2-Sep-14	407958	1.01	1.19	<1	<1	<10	0.17	20.1	1.0	7.35	10.2
8-Sep-14	408638	1.01	1.12	<1	<1	<10	0.19	19.2	0.5	7.33	10.1
15-Sep-14	409347	1.04	1.12	<1	<1	<10	0.22	16.6	0.5	7.42	10.9
22-Sep-14	410084	0.98	1.19	<1	<1	<10	0.22	15.3	1.0	7.50	11.4
29-Sep-14	410789	1.04	1.16	<1	<1	10	0.21	16.2	0.5	7.60	10.9
6-Oct-14	411636	0.96	1.11	<1	<1	<10	0.16	14.5	1.0	7.78	9.7
14-Oct-14	412206	1.17	1.35	<1	<1	<10	0.20	10.4	1.0	7.42	11.9
20-Oct-14	412998	1.29	1.45	<1	<1	<10	0.17	10.4	1.0	7.48	12.4
27-Oct-14	413677	1.06	1.14	<1	<1	<10	0.15	9.8	0.5	7.46	9.6
3-Nov-14	414364	1.01	1.21	<1	<1	<10	0.41	7.8	0.5	7.53	11.8

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

WC01_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399425	1.20	1.33	<1	<1	<10	0.13	17.0	1.0	7.32	10.9
23-Jun-14	400088	0.98	1.13	<1	<1	<10	0.14	17.0	0.5	7.39	10.9
30-Jun-14	400832	1.01	1.20	<1	<1	10	0.16	18.5	2.0	7.35	10.4
7-Jul-14	401502	1.04	1.21	<1	<1	<10	0.17	18.6	1.0	7.52	10.9
14-Jul-14	402288	0.88	1.06	<1	<1	<10	0.17	20.2	0.5	7.60	9.9
21-Jul-14	403076	1.01	1.18	<1	<1	10	0.17	19.9	2.0	7.51	10.2
28-Jul-14	403818	1.15	1.29	<1	<1	<10	0.16	21.1	2.0	7.40	9.9
5-Aug-14	404739	1.09	1.23	<1	<1	<10	0.13	21.3	2.5	7.42	9.7
11-Aug-14	405552	1.05	1.26	<1	<1	<10	0.17	22.3	2.0	7.43	9.5
18-Aug-14	406423	1.07	1.22	<1	<1	<10	0.16	22.5	0.5	7.49	10.0
25-Aug-14	407220	1.17	1.27	<1	<1	<10	0.15	22.1	1.5	7.30	9.5
2-Sep-14	407957	1.06	1.20	<1	<1	<10	0.16	20.5	1.0	7.33	9.7
8-Sep-14	408637	1.01	1.15	<1	<1	<10	0.18	19.5	0.5	7.33	10.2
15-Sep-14	409346	1.02	1.24	<1	<1	<10	0.18	17.6	0.5	7.38	10.7
22-Sep-14	410083	1.03	1.25	<1	<1	<10	0.23	15.7	1.0	7.38	11.1
29-Sep-14	410788	1.04	1.26	<1	<1	<10	0.20	16.0	1.0	7.54	11.2
6-Oct-14	411635	1.02	1.21	<1	<1	<10	0.17	15.5	0.5	7.76	11.1
14-Oct-14	412205	1.02	1.18	<1	<1	<10	0.21	12.0	1.0	7.45	12.3
20-Oct-14	412997	1.09	1.24	<1	<1	<10	0.17	10.9	1.0	7.46	12.4
27-Oct-14	413676	1.00	1.16	<1	<1	<10	0.14	10.5	0.5	7.46	10.5
3-Nov-14	414363	0.98	1.20	<1	<1	<10	0.18	9.2	0.5	7.47	12.6

2014 Water Main Cleaning Program

Laboratory Analysis Report Regional Monitoring

WC12_

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399432	0.78	0.99	<1	<1	<10	0.14	14.2	1.0	7.37	10.7
23-Jun-14	400095	0.83	1.02	<1	<1	<10	0.13	14.7	1.5	7.45	10.7
30-Jun-14	400839	0.79	0.94	<1	<1	10	0.15	17.3	1.0	7.45	10.0
7-Jul-14	401509	0.82	1.03	<1	<1	<10	0.19	16.9	0.5	7.50	10.4
14-Jul-14	402295	0.82	1.00	<1	<1	<10	0.14	17.6	1.0	7.63	9.9
21-Jul-14	403083	0.80	0.98	<1	<1	<10	0.15	17.9	1.0	7.61	10.0
28-Jul-14	403825	0.83	1.04	<1	<1	<10	0.20	18.5	1.0	7.49	9.8
5-Aug-14	404746	0.95	1.11	<1	<1	10	0.17	19.0	2.5	7.47	9.7
11-Aug-14	405559	0.71	0.91	<1	<1	<10	0.15	19.9	2.5	7.46	9.6
18-Aug-14	406430	0.71	0.89	<1	<1	<10	0.15	20.1	0.5	7.43	9.5
25-Aug-14	407227	0.77	0.96	<1	<1	<10	0.15	19.9	1.5	7.39	9.3
2-Sep-14	407964	0.79	0.99	<1	<1	<10	0.32	19.4	1.0	7.39	9.9
8-Sep-14	408644	0.83	0.96	<1	<1	<10	0.32	19.2	0.5	7.40	10.1
15-Sep-14	409353	0.80	0.95	<1	<1	<10	0.25	18.5	NR	7.41	9.7
22-Sep-14	410090	0.66	0.82	<1	<1	<10	0.26	18.3	1.0	7.56	11.0
29-Sep-14	410795	0.62	0.89	<1	<1	50	0.26	17.5	0.5	7.72	10.9
6-Oct-14	411642	0.85	1.06	<1	<1	<10	0.25	16.0	0.5	7.41	10.4
14-Oct-14	412212	0.89	1.04	<1	<1	<10	0.19	15.2	0.5	7.54	11.5
20-Oct-14	413004	0.90	1.08	<1	<1	10	0.35	12.4	1.0	7.64	12.3
27-Oct-14	413683	0.79	0.92	<1	<1	<10	0.17	13.9	1.0	7.57	9.4
3-Nov-14	414370	0.81	0.94	<1	<1	10	0.24	16.0	0.5	6.42	11.6

On September 15th, there was no result for true color due to technician error.

E4e Sensitive Users Monitoring Reports 2011-2014

Winnipeg

2011 Water Main Cleaning Program

Laboratory Analysis Report Sensitive Users Monitoring

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	Apparent Colour (acu)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
2-May-11	290379	0.62	0.90	<1	<1	<10	0.32	6.9	2.5	0.5	7.40	12.2
9-May-11	291098	0.61	0.88	<1	<1	<10	0.25	9.2	1.5	<0.5	7.33	11.5
16-May-11	291763	0.65	0.93	<1	<1	<10	0.41	10.5	7.5	1.5	7.40	10.6
24-May-11	292418	0.72	0.93	<1	<1	<10	0.34	12.1	6.0	1.0	7.43	11.8
30-May-11	293217	0.64	0.98	<1	<1	<10	0.28	13.0	13 0	1.0	7.78	11.7
6-Jun-11	294083	0.93	1.16	<1	<1	<10	2.38	13.9	75 0	7.5	7.73	11.4
7-Jun-11	294556	0.67	0.88	<1	<1	<10	1.20	13.8	25 0	7.5	7.56	11.3
7-Jun-11	294595	0.61	0.79	<1	<1	<10	0.77	13.7	25 0	6.0	7.43	11.2
8-Jun-11	294621	0.61	0.83	<1	<1	<10	0.74	14.7	15 0	0.5	7.33	11.1
9-Jun-11	294732	0.64	0.91	<1	<1	<10	0.35	14.2	3.0	1.0	7.80	11.3
10-Jun-11	294769	0.68	0.99	<1	<1	<10	0.34	14.5	15 0	5.0	7.35	12.3
14-Jun-11	294911	0.60	0.76	<1	<1	<10	0.30	15.5	13 0	7.5	7.41	11.1
20-Jun-11	295617	0.62	0.85	<1	<1	<10	0.38	15.3	13 0	2.5	7.33	10.7
27-Jun-11	296273	0.64	0.78	<1	<1	<10	0.26	18.6	15 0	2.5	7.40	11.0
4-Jul-11	296997	0.57	0.80	<1	<1	<10	0.27	20.1	10 0	2.0	7.38	10.6
12-Jul-11	297767	0.53	0.66	<1	<1	<10	0.31	21.5	5.0	NR	7 37	10.1
18-Jul-11	298483	0.75	0.89	<1	<1	<10	0.54	21.3	13 0	2.5	7 35	10.3
25-Jul-11	299255	0.61	0.79	<1	<1	<10	0.79	22.7	16 0	5.0	7.49	10.4
2-Aug-11	299940	0.58	0.73	<1	<1	<10	0.26	22.4	10 0	0.5	7.44	10.5
8-Aug-11	300517	0.49	0.61	<1	<1	20	0.30	23.0	5.0	1.0	7 54	10.2
16-Aug-11	301265	0.53	0.72	<1	<1	<10	0.25	22.5	5.0	1.0	7 54	10.3
23-Aug-11	301916	0.45	0.71	<1	<1	<10	0.32	22.1	5.0	1.0	7.42	10.3
29-Aug-11	302600	0.76	0.92	<1	<1	<10	0.39	22.3	5.0	1.0	7 53	8.4
6-Sep-11	303438	0.88	1.11	<1	<1	<10	0.26	21.5	6.0	2.0	7.45	10.4
12-Sep-11	304083	0.84	0.99	<1	<1	10	0.31	21.5	13 0	1.0	7 51	10.5
21-Sep-11	304755	0.98	1.16	<1	<1	10	0.24	17.9	5.0	1.0	7.43	10.2
27-Sep-11	305517	0.97	1.25	<1	<1	<10	0.29	17.4	6.0	1.0	7 37	11.3

NA: Not analysed NR: No result

NOTE: Flushing within 2 blocks of began on June 6. A high turbidity of 2.38 NTU was reported on June 6.
The location was resampled twice on June 7 to ensure turbidity levels returned to normal levels.
On July 12 there were no results for true colour due to lab error.

2012 Water Main Cleaning Program

Laboratory Analysis Report Sensitive Users Monitoring

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
1-May-12	324028	0.69	0.86	<1	<1	<10	0.31	8.0	1.0	7.46	NA[1]
7-May-12	324530	0.58	0.73	<1	<1	<10	0.19	8.4	1.0	7.58	NA[1]
14-May-12	325307	0.66	0.84	<1	<1	<10	0.21	9.0	2.0	7.32	12.1
22-May-12	326041	0.53	0.74	<1	<1	<10	0.17	9.1	1.0	7.39	11.3
31-May-12	326739	0.67	0.89	<1	<1	<10	0.42	10.4	1.0	7.59	11.1
5-Jun-12	327501	0.66	0.85	<1	<1	<10	0.15	10.8	1.0	7.30	11.5
12-Jun-12	328257	0.63	0.79	<1	<1	<10	0.16	11.8	2.0	7.45	12.0
19-Jun-12	328982	0.71	0.90	<1	<1	<10	0.18	14.1	1.0	7.46	10.2
26-Jun-12	329709	0.72	0.91	<1	<1	<10	0.26	13.2	1.0	7.44	10.0
3-Jul-12	330421	0.76	0.95	<1	<1	<10	0.16	14 8	2.0	7 38	10.4
9-Jul-12	331126	0.51	0.66	<1	<1	<10	0 29	16 5	1.0	7.62	9.5
10-Jul-12	331102	0.78	0.98	<1	<1	<10	0.78	15 3	1.0	7.45	9.5
10-Jul-12	331127	0.78	0.98	<1	<1	<10	0.78	15 3	1.0	7.45	9.5
11-Jul-12	331128	0.74	0.95	<1	<1	<10	0 34	16 9	1.0	7 38	9.6
12-Jul-12	331129	0.86	1.03	<1	<1	<10	0 30	15 9	1.0	7 39	9.6
13-Jul-12	331130	0.77	0.93	<1	<1	<10	0 23	16 5	1.0	7.44	9.3
16-Jul-12	331832	0.79	0.94	<1	<1	<10	0 26	16.4	2.5	7.44	9.4
24-Jul-12	332619	0.85	1.03	<1	<1	<10	0 87	20 2	1.0	7 37	9.5
31-Jul-12	333341	0.79	0.96	<1	<1	<10	0 36	17.7	1.0	7.44	9.3
8-Aug-12	334016	0.56	0.73	<1	<1	<10	0 25	18.4	1.0	7.43	NA[2]
14-Aug-12	334795	0.66	0.93	<1	<1	<10	0 25	19 5	1.0	7.43	10.0

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
1-May-12	324027	0.64	0.86	<1	<1	<10	0.25	8.1	1.0	7.48	NA[1]
7-May-12	324529	0.67	0.82	<1	<1	<10	0.21	8.5	1.0	7.57	NA[1]
14-May-12	325306	0.79	0.99	<1	<1	<10	0.24	9.1	1.0	7.36	11.8
22-May-12	326040	0.71	0.88	<1	<1	<10	0.21	10.1	1.0	7.37	11.2
31-May-12	326738	0.63	0.85	<1	<1	<10	0.18	11.3	2.0	7.51	11.1
5-Jun-12	327500	0.76	0.91	<1	<1	<10	0.18	12.1	1.0	7.23	11.3
12-Jun-12	328256	0.62	0.77	<1	<1	<10	0.18	13.3	2.0	7.47	11.5
20-Jun-12	328981	0.59	0.75	<1	<1	NR[3]	0.27	14.8	0.5	7.43	9.9
26-Jun-12	329708	0.74	0.91	<1	<1	<10	0.32	15.3	1.0	7.43	10.0
3-Jul-12	330420	0.69	0.89	<1	<1	<10	0.41	18.0	2.0	7.38	10.1
9-Jul-12	331122	0.56	0.71	<1	<1	<10	1.14	18.0	2.0	7.51	9.5
9-Jul-12	331121	0.56	0.71	<1	<1	<10	0.20	18.0	1.0	7.58	9.5
10-Jul-12	331101	0.71	0.89	<1	<1	<10	0.28	15.4	1.0	7.44	9.4
11-Jul-12	331123	0.72	0.89	<1	<1	<10	0.25	20.5	1.0	7.35	9.5
12-Jul-12	331124	0.72	0.95	<1	<1	<10	0.22	19.5	1.0	7.37	9.5
13-Jul-12	331125	0.71	0.88	<1	<1	<10	0.31	20.5	1.0	7.40	9.1
16-Jul-12	331831	0.67	0.87	<1	<1	<10	0.31	19.1	2.0	7.39	9.3
24-Jul-12	332618	0.76	0.92	<1	<1	<10	0.33	20.3	1.0	7.50	9.4
31-Jul-12	333340	0.76	0.93	<1	<1	<10	0.30	20.7	1.0	7.48	9.4
8-Aug-12	334015	0.67	0.87	<1	<1	<10	0.35	20.2	1.0	7.44	NA[2]
14-Aug-12	334794	0.79	0.93	<1	<1	<10	0.41	20.0	1.0	7.46	9.9

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324590	0.78	1.03	<1	<1	<10	0.20	8.6	1.0	7.51	NA[1]
14-May-12	325255	0.90	1.09	<1	<1	<10	0.21	9.4	1.0	7.53	NA[1]
22-May-12	325993	0.71	0.86	<1	<1	<10	0.15	9.8	1.0	7.46	11.2
31-May-12	326705	0.61	0.78	<1	<1	<10	0.17	11.4	2.0	7.64	10.8
5-Jun-12	327449	0.84	1.00	<1	<1	10	0.22	12.4	1.0	7.53	11.1
12-Jun-12	328223	0.65	0.81	<1	<1	<10	0.24	12.9	2.0	7.50	11.6
18-Jun-12	328930	0.68	0.84	<1	<1	<10	1.37	14.7	2.0	7 52	9.7
19-Jun-12	329093	0.77	0.96	<1	<1	<10	0 56	15 3	1.0	7 52	10.1
19-Jun-12	329092	0.74	0.89	<1	<1	<10	0.49	14.1	1.0	7.45	10.1
20-Jun-12	329094	0.80	0.95	<1	<1	NR[3]	1 21	15 2	1.0	7.63	9.9
21-Jun-12	329096	0.70	0.86	<1	<1	<10	0 39	15.7	1.0	7.60	9.9
21-Jun-12	329095	0.62	0.80	<1	<1	<10	0 97	14.1	1.0	7 52	10.1
26-Jun-12	329657	0.71	0.91	<1	<1	<10	0.19	15.3	1.0	7.43	9.9
3-Jul-12	330428	0.73	0.95	<1	<1	<10	0.24	16.8	2.0	7.53	10.1
10-Jul-12	331109	0.68	0.84	<1	<1	10	0.17	20.4	1.0	7.61	9.3
16-Jul-12	331839	0.60	0.81	<1	<1	<10	0.24	18.4	2.0	7.50	9.1
24-Jul-12	332626	0.87	1.02	<1	<1	130	0.18	21.6	1.0	7.42	9.1
31-Jul-12	333348	0.60	0.75	<1	<1	<10	0.20	19.5	1.0	7.48	9.1
8-Aug-12	333968	0.54	0.70	<1	<1	20	0.24	20.1	1.5	7.57	9.0
14-Aug-12	334731	0.72	0.88	<1	<1	<10	0.28	20.1	0.5	7.68	9.0

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform E (MPNU/ 100mL)	. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
7-May-12	324585	0.59	0.80	<1	<1	<10	0.33	12.1	1.0	7.43	NA[1]
14-May-12	325250	0.79	1.03	<1	<1	<10	0.91	12.1	1.0	7.54	NA[1]
22-May-12	325988	0.67	0.87	<1	<1	<10	0.66	12 0	1.0	7.41	11.2
31-May-12	326700	0.67	0.86	<1	<1	<10	0 28	11.7	1.0	7.60	11.0
5-Jun-12	327444	0.79	1.00	<1	<1	<10	0 29	14.4	1.0	7 52	11.2
12-Jun-12	328218	0.41	0.62	<1	<1	<10	1 36	14.7	2.5	7 50	11.4
14-June-12*	328878	NA	NA	NA	NA	NA	0 59	NA	NA	NA	NA
19-Jun-12	328925	0.60	0.79	<1	<1	<10	0 28	13 3	1.0	7.46	10.0
26-Jun-12	329652	0.72	0.87	<1	<1	<10	0.73	16.1	1.0	7.49	9.9
3-Jul-12	330426	0.61	0.80	<1	<1	<10	0.48	19 0	2.5	7.45	10.1
9-Jul-12	331131	0.66	0.85	<1	<1	<10	0.60	18.6	1.5	7 52	9.4
10-Jul-12	331107	0.78	0.96	<1	<1	<10	0 59	20.7	1.0	7.47	9.4
10-Jul-12	331132	0.78	0.96	<1	<1	<10	0.49	20.7	1.0	7.44	9.4
11-Jul-12	331133	0.80	0.95	<1	<1	<10	0.66	20 9	1.0	7.41	9.4
12-Jul-12	331134	0.84	1.00	<1	<1	<10	0.77	20 0	1.0	7.43	9.5
13-Jul-12	331135	0.65	0.82	<1	<1	<10	0 50	20 2	1.0	7.42	9.0
16-Jul-12	331797	0.59	0.79	<1	<1	20	0.42	21.7	2.5	7 51	9.1
24-Jul-12	332566	0.61	0.76	<1	<1	40	0 58	21 8	1.0	7 39	9.1
31-Jul-12	333288	0.65	0.78	<1	<1	<10	0 38	22.1	1.0	7.44	9.3
8-Aug-12	333963	0.52	0.69	<1	<1	<10	0.44	22 0	1.5	7.47	NA[2]
14-Aug-12	334726	0.70	0.82	<1	<1	<10	0 37	20 8	0.5	7 52	9.9

*On June 14, the location was re-sampled due to a high turbidity of 1.36 NTU on June 12. Other parameters were not analysed for the re-sample.

NA: Not analysed NR: No result

NOTE:

[1]Dissolved oxygen was not analysed prior to May 14, 2012.

[2]Dissolved oxygen was not analysed due to instrument error/malfunction.

[3]No HPC result reported by the contract lab.

2013 Water Main Cleaning Program

Laboratory Analysis Report Sensitive Users Monitoring

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
8-Apr-13	356113	0.55	0.69	<1	<1	10	0.50	7.2	2.0	7.91	12.1
16-Apr-13	356843	0.57	0.78	<1	<1	<10	0.32	6.6	3.0	7.60	12.8
23-Apr-13	357515	0.75	0.95	<1	<1	<10	0.31	7.1	2.5	7.56	12.3
29-Apr-13	358142	0.64	0.85	<1	<1	<10	0.20	7.8	1.5	7.53	12.6
6-May-13	358864	0.73	0.90	<1	<1	<10	0.40	6.5	1.0	7.56	12.6
14-May-13	359617	0.73	0.87	<1	<1	10	0.35	7.9	2.0	7.65	11.6
21-May-13	360370	0.59	0.79	<1	<1	<10	0.80	7.5	2.0	7.69	10.9
27-May-13	361188	0.60	0.78	<1	<1	<10	0.78	8.5	2.0	7.54	11.3
3-Jun-13	362014	0.62	0.75	<1	<1	<10	1.21	9.1	1.0	7.73	9.9
10-Jun-13	362830	0.60	0.75	<1	<1	NR	0.54	9.6	1.0	7.63	9.5
17-Jun-13	363612	0.91	1.19	<1	<1	<10	0.60	13.4	1.0	7.57	9.5
18-Jun-13	363678	0.65	0.81	<1	<1	NR	0.89	10.6	0.5	7.70	9.5
19-Jun-13	363679	0.77	0.91	<1	<1	<10	1.36	11.5	0.5	7.64	9.4
20-Jun-13	363680	0.79	0.98	<1	<1	<10	2.01	12.6	1.0	7.57	9.2
21-Jun-13	363681	0.61	0.79	<1	<1	<10	0.60	12.2	1.0	7.62	9.4
24-Jun-13	364383	0.59	0.77	<1	<1	<10	0.67	9.9	2.0	7.58	8.4
2-Jul-13	365115	0.55	0.70	<1	<1	<10	0.33	14.7	1.0	7.58	8.0
8-Jul-13	365852	0.60	0.76	<1	<1	<10	0.38	16.5	1.0	7.66	9.3
15-Jul-13	366539	0.50	0.64	<1	<1	10	0.96	16.4	1.0	7.61	9.1
22-Jul-13	367419	0.57	0.69	<1	<1	<10	0.95	17.4	2.5	7.74	9.1
29-Jul-13	368097	0.61	0.75	<1	<1	<10	0.52	17.3	1.0	7.76	9.3
6-Aug-13	368777	0.55	0.68	<1	<1	<10	0.58	17.4	1.0	7.69	9.2
12-Aug-13	369488	0.59	0.76	<1	<1	<10	0.70	17.5	2.0	7.61	9.4
19-Aug-13	370160	0.55	0.69	<1	<1	<10	0.63	17.8	1.0	7.71	9.6

NOTE: On June 10, and 18, 2013 there were no results for HPC due to contract lab error.

2013 Water Main Cleaning Program

Laboratory Analysis Report Sensitive Users Monitoring

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
10-Apr-13	356112	0.70	0.87	<1	<1	<10	0.19	4.0	2.5	7.46	12.9
16-Apr-13	356842	0.76	0.91	<1	<1	<10	0.19	5.0	2.5	7.55	12.9
23-Apr-13	357514	0.72	0.89	<1	<1	<10	0.19	5.7	2.5	7.51	13.1
29-Apr-13	358141	0.84	1.09	<1	<1	<10	0.20	4.3	1.0	7.44	13.1
6-May-13	358863	0.80	1.02	<1	<1	<10	0.55	6.3	1.5	7.53	12.8
14-May-13	359616	0.62	0.83	<1	<1	<10	0.25	5.5	2.5	7.51	12.4
21-May-13	360369	0.65	0.81	<1	<1	<10	0.20	7.6	2.0	7.52	10.9
27-May-13	361187	0.72	0.85	<1	<1	<10	0.22	7.7	2.5	7.57	11.4
3-Jun-13	362013	0.72	0.90	<1	<1	<10	0.25	9.3	1.0	7.63	9.9
10-Jun-13	362829	0.71	0.95	<1	<1	NR	0.21	9.6	1.0	7.54	9.7
17-Jun-13	363611	0.64	0.88	<1	<1	30	0.28	10.5	1.0	7.53	9.4
24-Jun-13	364382	0.70	0.89	<1	<1	<10	0.22	13.4	2.0	7.59	9.0
2-Jul-13	365114	0.62	0.81	<1	<1	<10	0.20	14.2	1.0	7.56	8.9
3-Jul-13	365572	0.62	0.79	<1	<1	<10	0.20	15.1	0.5	7.57	9.3
3-Jul-13	365573	0.75	0.99	<1	<1	<10	0.92	13.7	0.5	7.57	9.4
4-Jul-13	365574	0.69	0.87	<1	<1	<10	0.22	14.5	1.0	7.55	9.3
5-Jul-13	365575	0.70	0.90	<1	<1	<10	0.27	14.7	0.5	7.50	9.4
8-Jul-13	365851	0.62	0.79	<1	<1	<10	0.30	15.6	1.0	7.60	9.3
15-Jul-13	366538	0.54	0.71	<1	<1	<10	0.36	15.9	1.0	7.60	9.2
22-Jul-13	367418	0.51	0.66	<1	<1	NR	0.30	16.1	2.5	7.65	9.3
29-Jul-13	368096	0.47	0.58	<1	<1	<10	0.21	16.6	1.0	7.69	9.0
6-Aug-13	368776	0.45	0.58	<1	<1	20	0.35	18.2	1.0	7.58	9.3
12-Aug-13	369487	0.40	0.64	<1	<1	<10	0.22	16.8	2.5	7.57	NR
19-Aug-13	370159	0.60	0.74	<1	<1	<10	0.97	18.4	1.0	7.57	9.7

NOTE: On June 10, and July 22, 2013 there were no results for HPC due to contract lab error.
On August 12, 2013 there was no result for dissolved oxygen due to instrument malfunction.

2014 Water Main Cleaning Program

Laboratory Analysis Report Sensitive Users Monitoring

Date Sampled	Sample Number	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Total Coliform (MPNU/ 100mL)	E. Coli (MPNU/ 100mL)	Heterotrophic Plate Count (cfu/mL)	Turbidity (ntu)	Temperature (ºC)	True Colour (tcu)	pH (units)	Dissolved Oxygen (mg/L)
16-Jun-14	399423	0.99	1.15	<1	<1	<10	0.21	13.4	1.0	7.43	10.3
23-Jun-14	400086	1.03	1.22	<1	<1	<10	0.14	13.4	1.5	7.51	10.4
30-Jun-14	400830	0.88	1.08	<1	<1	980	0.19	14.5	1.0	7.51	10.4
7-Jul-14	401500	1.07	1.29	<1	<1	<10	0.18	15.2	0.5	7.59	10.4
14-Jul-14	402286	0.90	1.12	<1	<1	<10	0.15	16.3	0.5	7.67	9.8
21-Jul-14	403074	1.06	1.25	<1	<1	<10	NR	17.0	1.5	7.67	9.8
28-Jul-14	403816	0.84	1.08	<1	<1	<10	0.12	18.0	2.0	7.55	9.8
5-Aug-14	404737	0.94	1.12	<1	<1	<10	0.22	18.6	5.0	7.56	9.6
11-Aug-14	405550	1.05	1.22	<1	<1	10	0.16	19.0	1.0	7.51	9.6
18-Aug-14	406421	1.16	1.36	<1	<1	<10	0.15	20.0	1.0	7.45	9.4
25-Aug-14	407218	1.11	1.25	<1	<1	<10	0.17	19.9	3.0	7.50	9.2
2-Sep-14	407955	0.96	1.15	<1	<1	<10	0.15	19.2	1.0	7.45	9.4
8-Sep-14	408635	1.12	1.31	<1	<1	<10	0.22	18.8	0.5	7.41	9.8
15-Sep-14	409344	0.93	1.11	<1	<1	<10	0.21	17.4	0.5	7.47	10.1
22-Sep-14	410081	0.86	1.07	<1	<1	<10	0.26	16.3	1.0	7.55	10.6
29-Sep-14	410786	0.87	1.09	<1	<1	<10	0.22	16.0	0.5	7.65	10.5
6-Oct-14	411633	0.90	1.12	<1	<1	<10	0.20	15.5	0.5	7.62	10.2
14-Oct-14	412283	1.09	1.20	<1	<1	<10	1.87	13.3	2.5	7.87	NA
14-Oct-14	412284	0.97	1.15	<1	<1	10	0.36	13.7	0.5	7.82	NA
15-Oct-14	412771	0.83	1.05	<1	<1	<10	0.19	13.3	0.5	7.62	NA
16-Oct-14	412772	0.88	1.10	<1	<1	<10	0.34	13.1	4.0	7.66	NA
17-Oct-14	412773	0.86	1.03	<1	<1	<10	0.27	13.0	1.0	7.60	NA
20-Oct-14	412995	1.00	1.12	<1	<1	<10	0.21	12.5	1.0	7.66	11.4
27-Oct-14	413674	0.85	1.06	<1	<1	<10	0.20	12.2	1.0	7.61	9.5
3-Nov-14	414361	0.87	1.07	<1	<1	<10	0.27	11.2	0.5	7.62	11.6

NOTE: On June 30th, a high HPC was reported. No resample was taken because the contract lab did not contact us prior to the following routine weekly sampling.

On July 21st, there was no result for turbidity due to technician error.

On October 14, 15, 16, and 17, the dissolved oxygen was not analysed due to technician error.

E5 Distribution System Water Quality Data and Analysis (Appendix D5 is stored separately as an Excel file)

E6 Chlorine and Turbidity Readings

E6a Chlorine and Turbidity Readings - Main Repair Activity 1 Jan 12-26

Date	Number	Street	Final Turbidity Reading	Final Residual Chlorine Reading	Notes
12-Jan-15	[redacted]	McCalman	3.45	0.85	
12-Jan-15	[redacted]	ShoreView	-	-	No Notes
12-Jan-15	[redacted]	Dalhousie	2.32	0.31	
12-Jan-15	[redacted]	Grosvenor / Waverley	1.39	0.67	
12-Jan-15	[redacted]	Eagleridge	-	-	Main was not Operated
13-Jan-15	[redacted]	Prevette	4.59	1.01	
13-Jan-15	[redacted]	Ashford	4	1.23	
13-Jan-15	[redacted]	Fidler	1.02	0.66	
13-Jan-15	[redacted]	Goswell	-	-	No Notes
13-Jan-15	[redacted]	Eagleridge	0.37	0.94	
14-Jan-15	[redacted]	Lyndale	2.2	0.43	
14-Jan-15	[redacted]	Ingelwood	4.9	0.54	
14-Jan-15	[redacted]	Parkview	4.95	0.17	
15-Jan-15	[redacted]	Southboine	3.11	0.23	
15-Jan-15	[redacted]	Winchester	2.03	0.45	
15-Jan-15	[redacted]	Valleyview / Heritage	-	-	No Notes
15-Jan-15	[redacted]	Kingsford	1.1	0.32	
15-Jan-15	[redacted]	Washington / Watt	-	-	No Notes
15-Jan-15	[redacted]	Jim Smith	-	-	No Notes
15-Jan-15	[redacted]	Main	-	-	Watermain Still off. No Test taken
16-Jan-15	[redacted]	Lipton	1.33	0.55	
16-Jan-15	[redacted]	Lipton	1.53	0.55	
16-Jan-15	[redacted]	Parkville Bay / Parkville Dr	-	-	No Notes
16-Jan-15	[redacted]	Hoka	2.83	0.47	
16-Jan-15	[redacted]	Washington	2.98	0.17	
16-Jan-15	[redacted]	Main	1.34	0.76	
17-Jan-15	[redacted]	Panet	-	-	No Notes
17-Jan-15	[redacted]	Centennial	6.59	0.94	
17-Jan-15	[redacted]	Henderson Hwy / Bowman	-	-	No Notes
17-Jan-15	[redacted]	St Annes	9.19	0.66	
17-Jan-15	[redacted]	Lincrest	-	-	No Test, renewed sbox
17-Jan-15	[redacted]	Higgins / Lizzie	-	-	No test taken. Set up to complete next day
18-Jan-15	[redacted]	Panet	2.82	0.52	
18-Jan-15	[redacted]	Henderson Hwy / Bowman	-	-	No Notes
18-Jan-15	[redacted]	St James / Saskatchewan	-	-	No Notes
19-Jan-15	[redacted]	Home	4.62	0.39	
19-Jan-15	[redacted]	Berwyn	4.75	0.63	
19-Jan-15	[redacted]	Beaverhill	4.05	0.6	
19-Jan-15	[redacted]	St James / Saskatchewan	-	-	No Notes

19-Jan-15		Higgins / Lizzie	2.27	0.1	
20-Jan-15		Grant	-	-	No test. Main was left on full.
20-Jan-15		Golf	-	-	No test required, main left on
20-Jan-15		Whittier Ave W / Hoka	4.9	0.67	
20-Jan-15		Bushnell	3.6	0.81	
20-Jan-15		Dumbarton	-	-	Main was not turned off. No readings
20-Jan-15		Thompson	-	-	Did not turn main off. No readings
21-Jan-15		Woodlawn	0.9	0.25	
21-Jan-15		Nassau	0.79	0.41	
21-Jan-15		Grant	2.03	0.86	
21-Jan-15		Golf	0.91	0.85	
21-Jan-15		Eagle	-	-	No notes
21-Jan-15		Mosselle	3.81	0.37	
21-Jan-15		Bushnell	4.01	0.61	
21-Jan-15		Thompson	3.24	0.08	
22-Jan-15		Hennessey	1.03	0.48	
22-Jan-15		Hampton	4.4	0.47	
22-Jan-15		Eagle	3.36	0.56	
22-Jan-15		Home	3.89	0.47	
23-Jan-15		Redwood	-	-	No notes
23-Jan-15		Hennessey	3.52	0.52	
23-Jan-15		Oxford	1.4	0.91	
23-Jan-15		Campbell	4.39	0.78	
23-Jan-15		Balcom	2.28	0.5	
23-Jan-15		Whitehall	-	-	No Leak, No Main Control
24-Jan-15		Higgens / Henry	1.1	0.54	
24-Jan-15		Redwood	-	-	Did not shut off main
24-Jan-15		Thorn	2.47	0.76	
24-Jan-15		Wildwood C	4.8	0.73	
24-Jan-15		Springfield	1.46	0.46	
24-Jan-15		Clarence	-	-	Renewed Box, no test taken
25-Jan-15		Mason	2.76	0.51	
25-Jan-15		Strathcona / Sargent	9.41	0.25	
25-Jan-15		Pembina	3.62	0.64	
25-Jan-15		Mountain	-	-	No test. Task not Complete
25-Jan-15		Mountain / Bentall	4.48	0.55	
26-Jan-15		Budden	3.34	0.56	
26-Jan-15		Inkster / McPhillips	-	-	No notes
26-Jan-15		Inkster	3.51	0.56	
26-Jan-15		Langside	4.39	0.51	

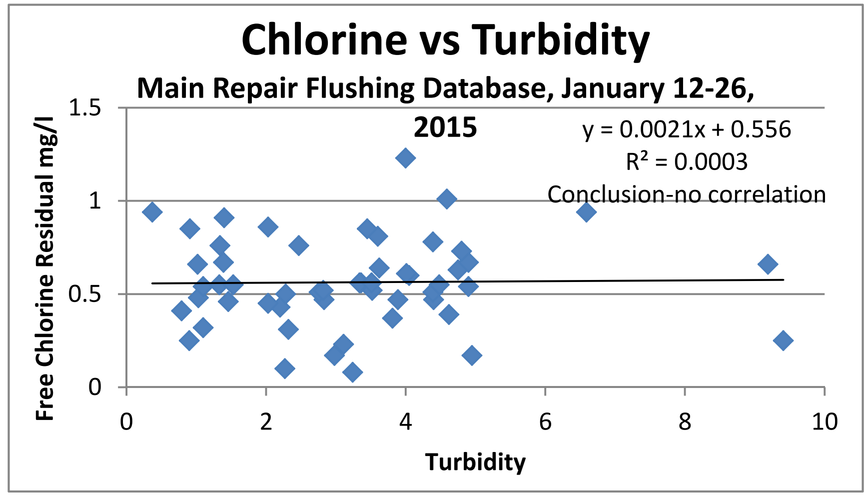
E6b Chlorine and Turbidity Readings - Main Repair Activity 2 Jan 12-26

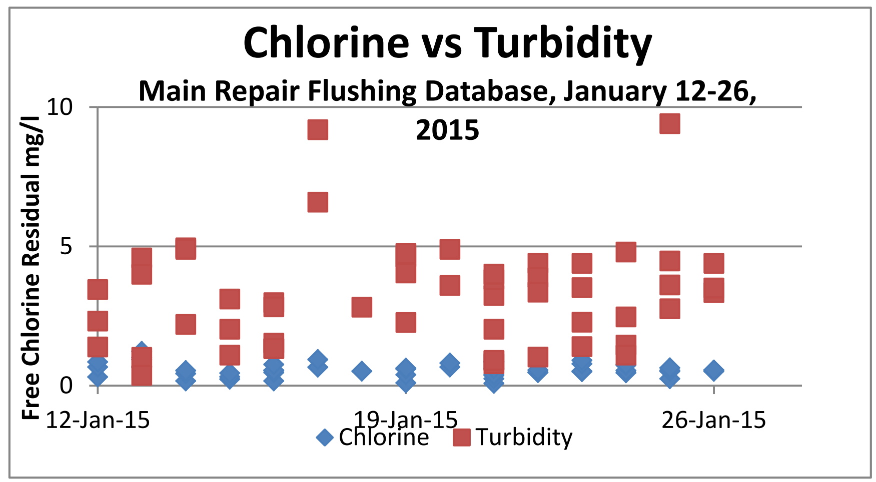
Date	Number	Street	Final Turbidity Reading	Final Residual Chlorine Reading	Notes
12-Jan-15		McCalman	3.45	0.85	
12-Jan-15		ShoreView	-	-	No Notes
12-Jan-15		Dalhousie	2.32	0.31	
12-Jan-15		Grosvenor / Waverley	1.39	0.67	
12-Jan-15		Eagleridge	-	-	Main was not Operated
13-Jan-15		Prevette	4.59	1.01	
13-Jan-15		Ashford	4	1.23	
13-Jan-15		Fidler	1.02	0.66	
13-Jan-15		Goswell	-	-	No Notes
13-Jan-15		Eagleridge	0.37	0.94	
14-Jan-15		Lyndale	2.2	0.43	
14-Jan-15		Ingelwood	4.9	0.54	
14-Jan-15		Parkview	4.95	0.17	
15-Jan-15		Southboine	3.11	0.23	
15-Jan-15		Winchester	2.03	0.45	
15-Jan-15		Valleyview / Heritage	-	-	No Notes
15-Jan-15		Kingsford	1.1	0.32	
15-Jan-15		Washington / Watt	-	-	No Notes
15-Jan-15		Jim Smith	-	-	No Notes
15-Jan-15		Main	-	-	Watermain Still off. No Test taken
16-Jan-15		Lipton	1.33	0.55	
16-Jan-15		Lipton	1.53	0.55	
16-Jan-15		Parkville Bay / Parkville Dr	-	-	No Notes
16-Jan-15		Hoka	2.83	0.47	
16-Jan-15		Washington	2.98	0.17	
16-Jan-15		Main	1.34	0.76	
17-Jan-15		Panet	-	-	No Notes
17-Jan-15		Centennial	6.59	0.94	
17-Jan-15		Henderson Hwy / Bowman	-	-	No Notes
17-Jan-15		St Annes	9.19	0.66	
17-Jan-15		Lincrest	-	-	No Test, renewed sbox
17-Jan-15		Higgins / Lizzie	-	-	No test taken. Set up to complete next day

18-Jan-15		Panet	2.82	0.52	
18-Jan-15		Henderson Hwy / Bowman	-	-	No Notes
18-Jan-15		St James / Saskatchewan	-	-	No Notes
19-Jan-15		Home	4.62	0.39	
19-Jan-15		Berwyn	4.75	0.63	
19-Jan-15		Beaverhill	4.05	0.6	
19-Jan-15		St James / Saskatchewan	-	-	No Notes
19-Jan-15		Higgins / Lizzie	2.27	0.1	
20-Jan-15		Grant	-	-	No test. Main was left on full.
20-Jan-15		Golf	-	-	No test required, main left on
20-Jan-15		Whittier Ave W / Hoka	4.9	0.67	
20-Jan-15		Bushnell	3.6	0.81	
20-Jan-15		Dumbarton	-	-	Main was not turned off. No readings
20-Jan-15		Thompson	-	-	Did not turn main off. No readings
21-Jan-15		Woodlawn	0.9	0.25	
21-Jan-15		Nassau	0.79	0.41	
21-Jan-15		Grant	2.03	0.86	
21-Jan-15		Golf	0.91	0.85	
21-Jan-15		Eagle	-	-	No notes
21-Jan-15		Mosselle	3.81	0.37	
21-Jan-15		Bushnell	4.01	0.61	
21-Jan-15		Thompson	3.24	0.08	
22-Jan-15		Hennessey	1.03	0.48	
22-Jan-15		Hampton	4.4	0.47	
22-Jan-15		Eagle	3.36	0.56	
22-Jan-15		Home	3.89	0.47	
23-Jan-15		Redwood	-	-	No notes
23-Jan-15		Hennessey	3.52	0.52	
23-Jan-15		Oxford	1.4	0.91	
23-Jan-15		Campbell	4.39	0.78	
23-Jan-15		Balcom	2.28	0.5	
23-Jan-15		Whitehall	-	-	No Leak, No Main Control
24-Jan-15		Higgens / Henry	1.1	0.54	
24-Jan-15		Redwood	-	-	Did not shut off main
24-Jan-15		Thorn	2.47	0.76	

24-Jan-15		Wildwood C	4.8	0.73	
24-Jan-15		Springfield	1.46	0.46	
24-Jan-15		Clarence	-	-	Renewed Box, no test taken
25-Jan-15		Mason	2.76	0.51	
25-Jan-15		Strathcona / Sargent	9.41	0.25	
25-Jan-15		Pembina	3.62	0.64	
25-Jan-15		Mountain	-	-	No test. Task not Complete
25-Jan-15		Mountain / Bentall	4.48	0.55	
26-Jan-15		Budden	3.34	0.56	
26-Jan-15		Inkster / McPhillips	-	-	No notes
26-Jan-15		Inkster	3.51	0.56	
26-Jan-15		Langside	4.39	0.51	
		MAX	9.41	1.23	
		MIN	0.37	0.08	
			9.19	1.23	

Date	Number	Street	Final Turbidity Reading	Final Residual Chlorine Reading
21-Jan-15		Thompson	3.24	0.08
19-Jan-15		Higgins / Lizzie	2.27	0.1
14-Jan-15		Parkview	4.95	0.17
16-Jan-15		Washington	2.98	0.17
15-Jan-15		Southboine	3.11	0.23
21-Jan-15		Woodlawn	0.9	0.25
25-Jan-15		Strathcona / Sargent	9.41	0.25
12-Jan-15		Dalhousie	2.32	0.31
15-Jan-15		Kingsford	1.1	0.32
21-Jan-15		Mosselle	3.81	0.37
19-Jan-15		Home	4.62	0.39
21-Jan-15		Nassau	0.79	0.41
14-Jan-15		Lyndale	2.2	0.43
15-Jan-15		Winchester	2.03	0.45
24-Jan-15		Springfield	1.46	0.46
16-Jan-15		Hoka	2.83	0.47
22-Jan-15		Hampton	4.4	0.47
22-Jan-15		Home	3.89	0.47
22-Jan-15		Hennessey	1.03	0.48
23-Jan-15		Balcom	2.28	0.5
25-Jan-15		Mason	2.76	0.51
26-Jan-15		Langside	4.39	0.51
18-Jan-15		Panet	2.82	0.52
23-Jan-15		Hennessey	3.52	0.52
14-Jan-15		Ingelwood	4.9	0.54
24-Jan-15		Higgens / Henry	1.1	0.54
16-Jan-15		Lipton	1.33	0.55
16-Jan-15		Lipton	1.53	0.55
25-Jan-15		Mountain / Bentall	4.48	0.55
22-Jan-15		Eagle	3.36	0.56
26-Jan-15		Budden	3.34	0.56
26-Jan-15		Inkster	3.51	0.56





19-Jan-15		Beaverhill	4.05	0.6
21-Jan-15		Bushnell	4.01	0.61
19-Jan-15		Berwyn	4.75	0.63
25-Jan-15		Pembina	3.62	0.64
13-Jan-15		Fidler	1.02	0.66
17-Jan-15		St Annes	9.19	0.66
12-Jan-15		Grosvenor / Waverley	1.39	0.67
20-Jan-15		Whittier Ave W / Hoka	4.9	0.67
24-Jan-15		Wildwood C	4.8	0.73
16-Jan-15		Main	1.34	0.76
24-Jan-15		Thorn	2.47	0.76
23-Jan-15		Campbell	4.39	0.78
20-Jan-15		Bushnell	3.6	0.81
12-Jan-15		McCalman	3.45	0.85
21-Jan-15		Golf	0.91	0.85
21-Jan-15		Grant	2.03	0.86
23-Jan-15		Oxford	1.4	0.91
13-Jan-15		Eagleridge	0.37	0.94
17-Jan-15		Centennial	6.59	0.94
13-Jan-15		Prevette	4.59	1.01
13-Jan-15		Ashford	4	1.23
26-Jan-15		MAX	9.41	1.23
12-Jan-15		MIN	0.37	0.08
			9.19	1.23

E6c Hach Certificate of Performance 6 Jan 2015

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 14040E245171	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

Hach Sales & Service Canada Ltd. atteste que votre instrument a été entretenu, calibré et vérifié selon les normes en vigueur. Ses spécifications actuelles sont équivalentes à celles d'un produit neuf.

Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 14040E244850.	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 14040E244816.	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

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Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 14040E244474.	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 12070E203469	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

Hach Sales & Service Canada Ltd. atteste que votre instrument a été entretenu, calibré et vérifié selon les normes en vigueur. Ses spécifications actuelles sont équivalentes à celles d'un produit neuf.

Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 12010E190610	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

Hach Sales & Service Canada Ltd. atteste que votre instrument a été entretenu, calibré et vérifié selon les normes en vigueur. Ses spécifications actuelles sont équivalentes à celles d'un produit neuf.

Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 11030E170116	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte : [redacted]

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 5870000	rr POCKET CLRMTR II CHLORINE SYSTEM
Serial Number / No. de série : 11030E169133	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte : [redacted]

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 14080C033096	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 14050C032929	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte : [redacted]

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 14050C032854	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

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Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 14040C032167	
External Reference / Référence externe :	

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 14040C032150	
External Reference / Référence externe :	

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 13100C028684	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 12060C018564	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte :

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 12060C018563	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte : [redacted]

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 11020C007217	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

Hach Sales & Service Canada Ltd. atteste que votre instrument a été entretenu, calibré et vérifié selon les normes en vigueur. Ses spécifications actuelles sont équivalentes à celles d'un produit neuf.

Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

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Certificate of Instrument Performance
Certificat de Conformité

Company Name / Nom de la Compagnie : CITY OF WINNIPEG- CORPORATE FINANCE

Account Number / No. de compte : [redacted]

Certification Number / Numéro du Certificat : 4106652

Part Number / No. de pièce : 2100Q01	rr 2100Q PORTABLE TURBIDIMETER
Serial Number / No. de série : 11010C007121	
External Reference / Référence externe :	

Hach Sales & Service Canada Ltd. certifies that your instrument has been serviced, calibrated, verified with standards and now meets new product specifications.

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Certified by / Certifié par :
Demkiw, Michael

Certification Date / Date de certification :
06-JAN-15

E6d Jan 2015 Pumping Station Chlorine

This section has been intentionally removed.

E7 Distribution System Sampling Time Log for January 26 2015

Sample Name	Sample Number	Date Sampled	Chlorine, Free (mg/L)	Chlorine, Total (mg/L)	Temperature (ºC)	Turbidity (ntu)	E. Coli-QT (MPNU/100 mL)	Total Coliform-QT (MPNU/100 mL)	HPC (cfu/mL)	TimeSpled (hrs)	Sampler
NE01	421674	26-Jan-15	0.49	0.63	8.5	0.26	1	5	<10	8:42	
NE02	421675	26-Jan-15	0.76	0.99	6.0	0.25	<1	<1	<10	8:54	
NE05	421678	26-Jan-15	0.63	0.84	4.8	0.28	<1	<1	<10	9:10	
NE06	421679	26-Jan-15	0.95	1.18	6.0	0.31	<1	1	<10	9:20	
NE07	421680	26-Jan-15	0.96	1.18	5.0	0.19	9	53	<10	9:38	
NE09	421682	26-Jan-15	0.51	0.80	6.1	0.37	<1	<1	<10	9:55	
SE01	421693	26-Jan-15	1.12	1.32	3.1	0.24	<1	<1	<10	10:18	
SE02	421694	26-Jan-15	0.85	1.04	5.6	0.20	<1	<1	<10	10:37	
SE11	421703	26-Jan-15	0.72	0.90	7.1	0.23	<1	<1	<10	10:52	
SE13	421705	26-Jan-15	0.90	1.05	5.2	0.26	<1	<1	<10	11:12	
SW1	421718	26-Jan-15	0.73	0.98	4.7	0.28	<1	<1	<10	11:46	
SW0	421712	26-Jan-15	0.95	1.17	3.2	0.21	<1	<1	<10	12:20	
SW0	421713	26-Jan-15	0.74	0.99	5.7	0.17	1	1	<10	12:44	
SW1	421717	26-Jan-15	0.80	1.02	5.3	0.23	<1	<1	<10	12:56	
SW0	421714	26-Jan-15	0.62	0.82	6.4	0.40	<1	<1	<10	13:10	
SW1	421716	26-Jan-15	0.65	0.86	7.9	0.33	<1	<1	<10	13:34	
SE08	421700	26-Jan-15	0.58	0.90	6.1	0.23	<1	<1	<10	13:56	
SE07	421699	26-Jan-15	0.69	0.88	7.9	0.19	<1	<1	<10	14:15	
SE05	421697	26-Jan-15	0.78	1.04	4.8	0.17	<1	<1	<10	14:28	
SE04	421696	26-Jan-15	0.78	1.05	8.7	0.31	1	3	<10	14:45	
SE03	421695	26-Jan-15	0.76	0.91	8.3	0.25	1	4	<10	15:04	
NW0	421689	26-Jan-15	1.09	1.34	7.1	0.27	<1	<1	<10	8:58	
NW0	421684	26-Jan-15	0.88	1.02	6.5	0.18	<1	<1	<10	9:13	
NW0	421688	26-Jan-15	0.81	1.01	5.5	0.23	<1	<1	<10	9:32	
WC0	421724	26-Jan-15	0.77	0.95	7.4	0.24	<1	<1	<10	9:45	
WC0	421726	26-Jan-15	0.61	0.80	9.5	0.25	<1	<1	<10	10:00	
WC1	421731	26-Jan-15	0.74	0.88	7.8	1.02	<1	<1	<10	10:16	
WC0	421727	26-Jan-15	0.42	0.52	9.3	0.24	<1	<1	10	10:37	
WC0	421728	26-Jan-15	0.77	0.93	5.5	0.30	<1	<1	<10	10:55	
SW0	421707	26-Jan-15	0.70	0.96	6.8	0.35	<1	<1	<10	11:06	
SW0	421709	26-Jan-15	0.35	0.47	8.3	0.42	<1	<1	<10	11:30	
SW1	421722	26-Jan-15	0.80	0.92	7.7	0.26	<1	<1	<10	12:00	
SW1	421721	26-Jan-15	0.75	0.92	5.7	0.20	<1	<1	<10	12:35	

SW14_	421719	26-Jan-15	0.75	0.95	9.7	0.21	<1	<1	<10	12:45
SW04_	421710	26-Jan-15	0.79	0.95	6.5	0.18	<1	<1	<10	12:58
SW05_	421711	26-Jan-15	0.90	1.11	5.7	0.33	<1	<1	<10	13:08
WC08	421730	26-Jan-15	0.49	0.72	10.5	0.20	<1	<1	<10	13:22
WC11	421732	26-Jan-15	0.50	0.66	7.7	0.31	<1	<1	<10	13:43
WC01	421723	26-Jan-15	0.95	1.10	2.7	0.18	<1	<1	<10	13:55
WC12	421733	26-Jan-15	0.81	0.93	11.1	0.19	<1	<1	<10	14:25
NW03	421686	26-Jan-15	0.52	0.69	6.2	0.35	<1	<1	<10	14:46
NW09	421692	26-Jan-15	0.87	1.06	6.7	0.18	<1	<1	<10	14:57

E8 Pumping Station Maintenance Records

E8a Hurst Work Orders since 2013

This section has been intentionally removed.

E8b MacLean Work Orders since 2013

This section has been intentionally removed.

E9 Rainfall Reports

E9a 13-09-28 Rainfall Report

Water and Waste Department ♦ Service des Eaux et des Déchets

RAINFALL REPORT

September 28, 2013 Rainstorm

Prepared by:

Sam Brask, C.E.T. – Land Drainage and Flood Protection Technologist II

This report is distributed to various recipients at the following:

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Winnipeg

Water and Waste Department

RAINFALL ACCUMULATION LOG - SUMMER 2013

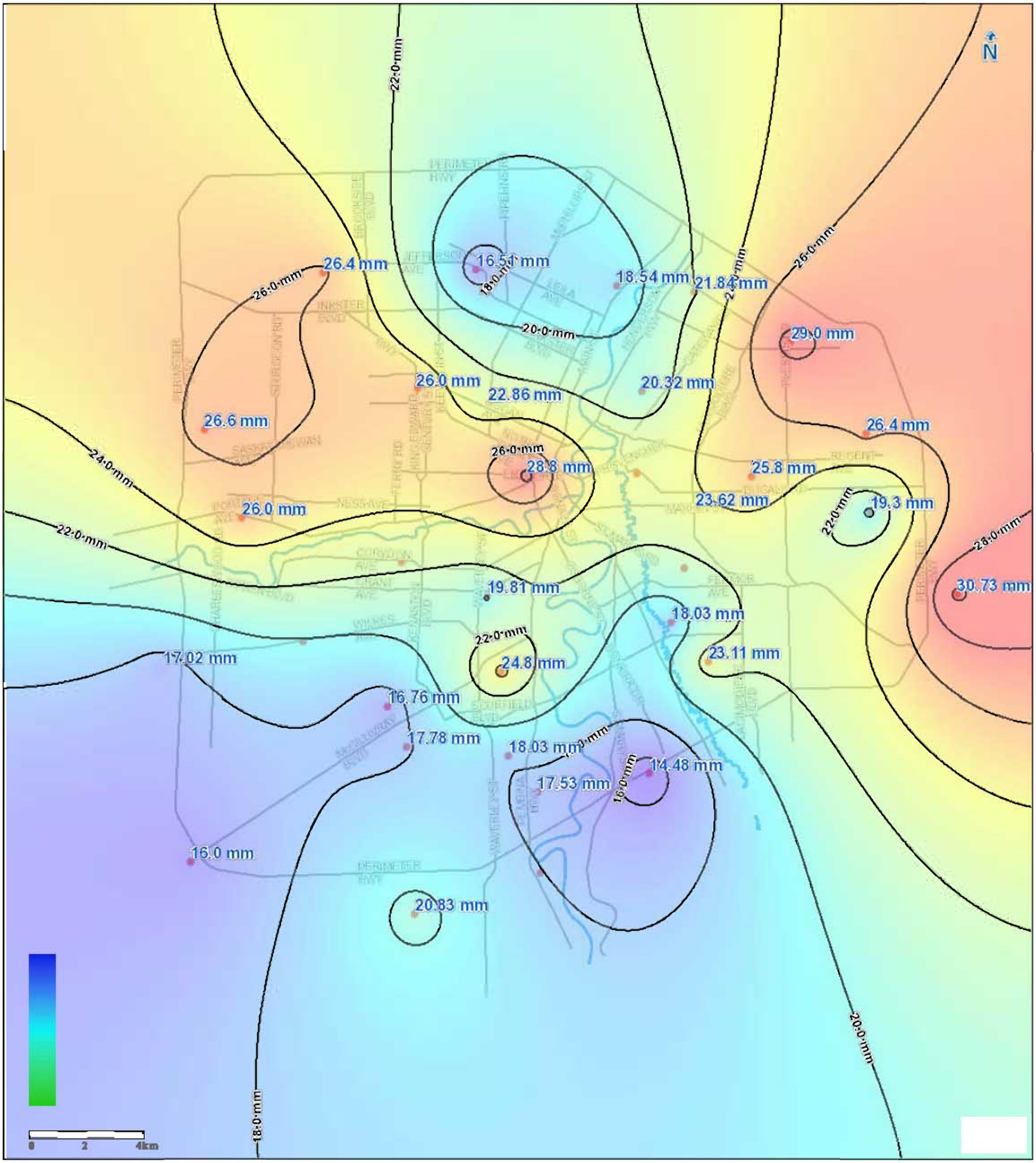
Accumulations in millimeters

NA............................ Not Available
NO............................Not Operational
+............................... Incomplete raingauge data

Rain Gauge Station Locations

PR - Parks and Rec Building
KE - King Edward Lift Station
AW - Arthur E. Wright School
NE - North End Treatment Plant
FS - Fire Station No. 24
WW - Westwood Lift Station
JW - Jameswood School
MC - McPhillips Pumping Statio
SB - St. Boniface Shops
BW - Bernie Wolfe School
PM - Perimeter Lift Station
CL - Clarence Lift Station
WN - Windsor Park Generator
FR - Fort Richmond Collegiate
IL - Island Lakes School
EN - Ecole Noel Ritchot
AD - Arthur Day School
SE - South End Pollution Control Center
EG - Ecole Guyot
CE - Chancellor Elementary School
HI - Henry G. Izatt Middle School
KP - Kilcona Park
BP - Buhler Recreational Park
BL - Brady Road Landfill
LM - Little Mountain Park
FW - Fort Whyte Alive
OP - Optimist Park
RB - River Bend Lift Station
HD - Headingley (CWB)
OB - Oak Bluff
PAP - Pan Am Pool
ML - MacLean Pumping Station
ET - Ecole Tuxedo Park
DW - Deacon Water Treatment Plant
WE - West End Pollution Control Center
OB2 - Oak Bluff 2
UW - University of Winnipeg (Lockhart Hall)

RAINSTORM DATE	APPROXIMATE RAINSTORM START TIME	APPROXIMATE RAINSTORM STOP TIME	TELEMETRY RAINFALL MONITORING STATIONS																											WEATHERBUG WEATHER MONITORING STATIONS									AVERAGE
			PR	KE	AW	NE	FS	WW	MC	SB	BW	PM	CL	WN	FR	IL	EN	AD	SE	EG	CE	HI	KP	BP	BL	LM	FW	OP	RB	HD	OB	PAP	ML	ET	DW	WE	OB2	UW	
May 18-19, 2013	05 18 13 8:30 AM	05 19 13 3:00 AM	6.8	4.3	4.0	4.8	NA	4.1	5.1	NA	6.9	8.6	NA	NA	3.6	3.8	4.6	6.1	3.6	3.8	5.0	4.6	5.3	5.3	5.8	3.6	3.6	5.3	5.6	4.8	4.6	NA	NA	3.8	5.1	3.8	NA	NA	**4.9**
May 19-21, 2013	05 19 13 1:30 PM	05 21 13 7:00 AM	19.6	13.0	15.5	20.8	NA	17.8	22.9	NA	21.8	23.4	NA	NA	40.1	24.2	52.1	18.3	38.1	25.9	27.2	25.4	24.1	20.8	30.0	15.0	30.2	24.6	18.8	16.3	52.3	NA	NA	26.9	33.8	20.1	NA	NA	**25.7**
May 28, 2013	10:00 AM	2:00 PM	4.4	2.3	3.1	4.3	NA	1.8	4.1	NA	4.1	1.3	5.2	5.0	5.8	4.1	5.3	3.6	4.1	4.3	5.1	3.8	NA	2.8	6.1	1.1	4.6	2.5	4.0	NA	2.5	NA	NA	3.8	3.3	2.0	NA	NA	**3.7**
May 30-31, 2013	05 30 13 10:00AM	05 31 13 8:00PM	51.2	41.4	42.2	46.7	NA	38.9	47.0	46.0	36.8	37.9	41.0	38.2	52.8	30.2	57.2	27.9	50.3	35.6	38.1	35.3	35.8	32.8	43.4	35.1	42.2	46.7	42.4	34.8	68.1	NA	NA	46.0	42.7	32.3	NA	NA	**41.8**
June 7, 2013	4:00 AM	8:00 PM	0.8	1.0	0.8	0.4	NA	8.6	0.5	0.8	0.2	4.4	2.4	NA	7.2	2.0	7.9	NA	3.1	1.4	6.4	3.7	NA	0.3	3.8	3.8	4.0	8.9	1.2	2.0	2.5	NA	NA	1.3	NA	3.6	NA	NA	**3.1**
June 10, 2013	10:00 AM	7:00 PM	5.6	5.1	3.6	2.3	NA	0.0	7.9	7.4	4.6	0.0	0.0	4.2	0.0	0.0	0.3	2.5	0.0	0.8	0.0	0.3	0.8	8.6	0.3	3.1	0.0	0.0	0.2	NA	0.0	0.0	NA	0.0	14.2	6.6	NA	NA	**2.5**
June 20, 2013	6:00 PM	10:00 PM	6.4	10.4	1.5	0.8	NA	34.0	NA	0.8	NA	1.0	33.8	3.4	6.6	5.3	9.4	3.8	3.3	3.6	9.1	31.5	1.0	1.0	6.1	2.6	50.3	15.4	NA	NA	1.3	54.1	NA	55.1	0.8	13.2	2.5	9.6	**13.1**
June 23-24, 2013	06 23 13 12:00 PM	06 24 13 4:00 AM	27.8	24.8	20.3	24.6	NA	24.8	18.0	28.4	27.2	NA	23.0	24.6	22.9	23.4	24.6	NA	18.5	20.3	23.4	22.6	24.0	19.6	22.9	25.0	25.4	27.8	24.2	NA	22.6	27.2	NA	25.2	14.5	37.3	18.6	NA	**24.0**
June 25-26, 2013	06 25 13 10:00 PM	06 26 13 4:00 AM	19.0	18.2	10.4	10.9	NA	24.8	13.0	26.0	26.8	NA	27.2	26.6	14.0	30.0	15.0	17.4	11.4	27.2	16.8	16.3	17.8	13.7	21.6	17.4	23.1	16.6	14.8	NO	19.8	25.9	NA	18.0	28.2	44.2	15.7	20.8	**20.4**
June 28, 2013	10:00 AM	9:00 PM	0.4	2.2	1.8	0.0	NA	4.2	3.3	0.4	1.0	2.6	7.8	0.0	2.5	0.0	1.8	0.2	0.0	0.0	2.8	4.3	0.4	0.0	18.5	3.2	4.8	1.0	9.4	NO	0.5	5.8	NA	5.3	0.0	2.0	1.0	1.2	**2.8**
July 9-10, 2013	07 09 13 7:00 PM	07 10 13 3:00 AM	3.4	6.8	1.8	1.8	NA	7.8	3.3	4.0	2.0	2.0	8.2	2.6	10.4	3.1	8.1	1.6	3.8	3.6	10.4	9.9	2.0	1.8	8.6	6.0	8.4	11.6	9.2	NO	2.0	4.1	NA	11.7	2.0	NA	4.6	4.4	**5.4**
July 18-19, 2013	07 18 13 8:00 PM	07 19 13 1:00 AM	5.4	15.0	8.6	11.2	NA	6.0	5.3	11.4	10.0	4.0	12.6	NA	5.6	9.7	5.3	3.8	4.1	8.4	6.9	8.1	13.8	10.2	5.6	12.4	NA	8.8	11.6	NO	6.6	11.9	NA	9.9	13.5	NA	4.6	22.0	**8.8**
July 21-22, 2013	07 21 13 4:00 PM	07 22 13 12:00 AM	32.0	35.0	26.2	30.7	NA	32.0	20.8	23.2	26.0	9.0	19.2	19.0	15.2	14.0	10.9	19.8	12.7	11.2	14.0	14.0	21.8	13.2	8.6	35.8	NA	35.0	24.4	NO	9.9	18.8	NA	22.1	15.5	NA	12.0	25.2	**20.3**
July 25, 2013	5:00 AM	10:00 PM	17.2	15.8	13.0	13.0	NA	6.0	14.7	13.4	8.2	7.0	9.0	7.8	12.7	6.4	11.4	8.6	8.9	6.9	8.1	5.8	19.2	6.4	13.0	19.8	NA	14.0	11.2	NO	14.2	6.9	NA	6.4	8.6	NA	11.7	14.6	**10.8**
July 29-30, 2013	07 29 13 10:00 PM	07 30 13 6:00 AM	4.5	4.0	7.4	4.8	NA	5.2	7.6	4.6	3.6	NA	1.6	4.8	0.8	1.8	0.8	2.8	1.3	2.5	0.8	1.3	4.2	1.5	1.0	6.0	NA	3.4	11.4	NO	1.8	3.3	4.6	5.8	0.5	NA	1.8	4.4	**3.6**
August 4-5, 2013	08 04 13 2:00 PM	08 05 13 4:00 AM	5.6	6.2	6.6	5.1	NA	5.8	5.6	5.6	5.4	8.0	7.6	NA	8.4	5.8	6.4	4.6	6.9	6.1	5.6	5.6	6.8	3.8	7.9	6.4	6.4	6.4	7.0	NO	5.6	8.1	5.6	6.4	8.9	NA	6.6	5.4	**6.3**
August 10-11, 2013	08 10 13 4:00 PM	08 11 13 4:00 AM	3.2	5.6	3.8	2.8	NA	4.6	4.1	3.4	3.4	5.8	3.8	NA	2.3	1.0	1.8	3.6	2.0	1.5	2.5	3.0	3.8	2.0	3.6	6.4	3.3	7.2	4.4	NO	4.6	3.6	2.3	4.1	2.5	3.0	5.3	3.6	**3.5**
August 18, 2013	08 18 13 9:00 AM	08 18 13 12:00 PM	33.3	38.2	45.2	36.6	NA	30.8	26.4	28.8	21.2	NA	21.8	18.2	12.2	12.2	12.2	12.2	10.7	15.5	15.8	21.1	25.6	9.1	19.8	67.0	27.9	26.0	30.8	NO	28.5	25.7	21.6	29.0	16.5	36.6	26.7	38.0	**25.0**
################	2:00 AM	6:00 PM	20.32	26	16.76	18.79	21.84	26	22.86		26		24.8		17.53	23.11	2.29	26.6	14.73	18.28	18.03	18.03	29.2	19.55	20.83	26.6	17.01	26.6			16	19.81	23.62		31.24	17.02	20.06	28.8	**21.1**
Total			**266.9**	**275.3**	**232.4**	**240.4**	**21.8**	**283.1**	**232.4**	**204.2**	**235.2**	**114.9**	**249.0**	**154.4**	**240.6**	**199.9**	**237.3**	**163.4**	**197.3**	**196.7**	**215.9**	**234.6**	**235.6**	**172.4**	**247.4**	**296.2**	**251.1**	**287.9**	**230.6**	**57.9**	**263.4**	**215.1**	**57.7**	**280.7**	**241.8**	**221.8**	**131.1**	**178.0**	**246.7**



Rainfall Gauge Station Location

—8mm— Isohyetal Line

3.55mm Accumulation

ALL MEASUREMENTS ARE METRIC

IT IS HEREBY EXPRESSLY UNDERSTOOD that any calculation, or information provided to private property owners, their agents and contractors with respect to the information provided shall be accepted by such persons at their own risk, and the CITY shall assume no responsibility for the information contained therein. The records of the CITY will be supplied on the basis that they are the best knowledge of the CITY and that persons requesting such information must interpret the same for their own needs and/or requirements.

Winnipeg

THE CITY OF WINNIPEG

Water and Waste Department

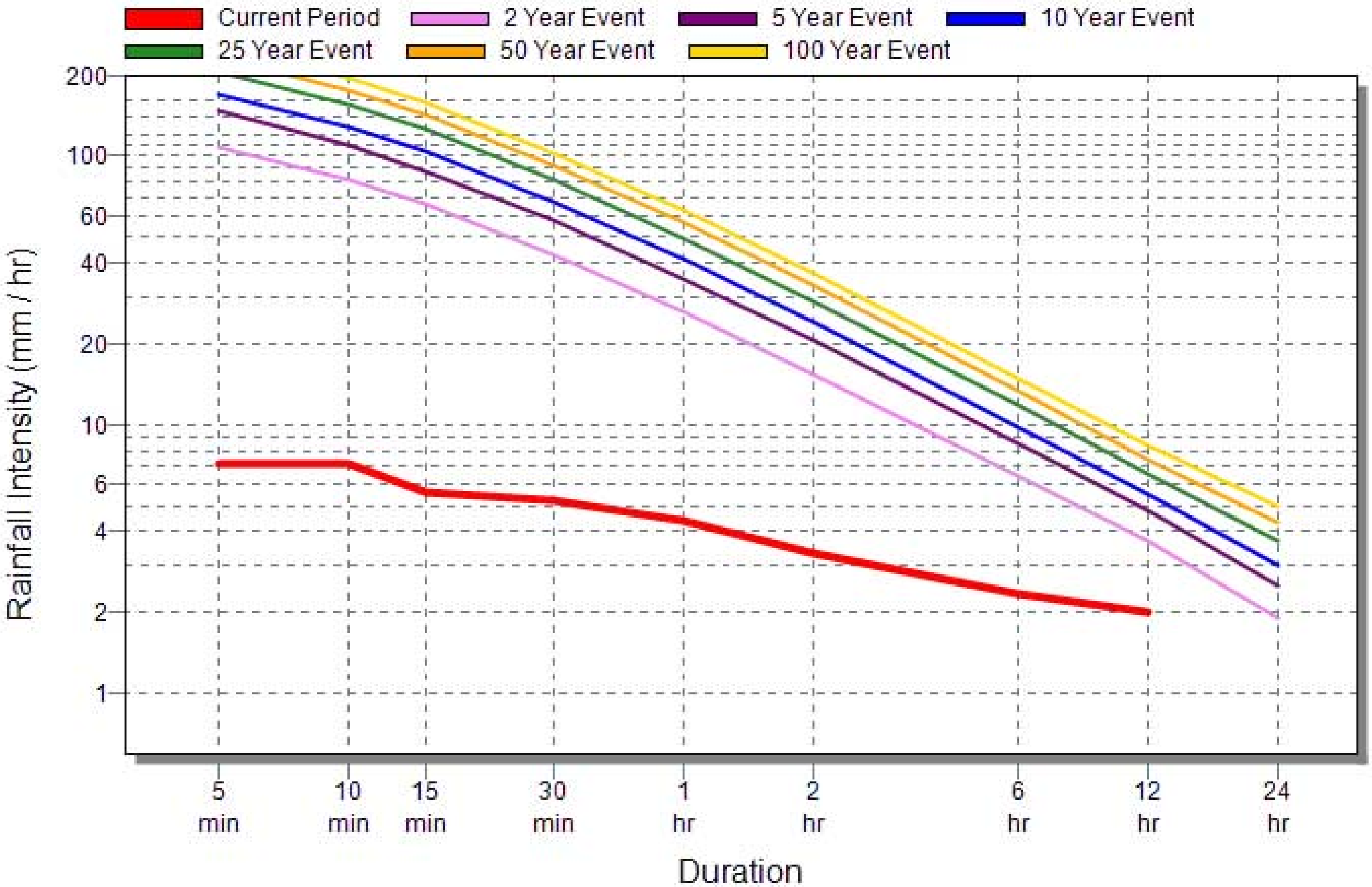
Monday, September 30, 2013

Rainfall Accumulation with Isohyetal for 2013-09-28 00:00 to 2013-09-28 23:59

Intensity Duration Frequency Analysis

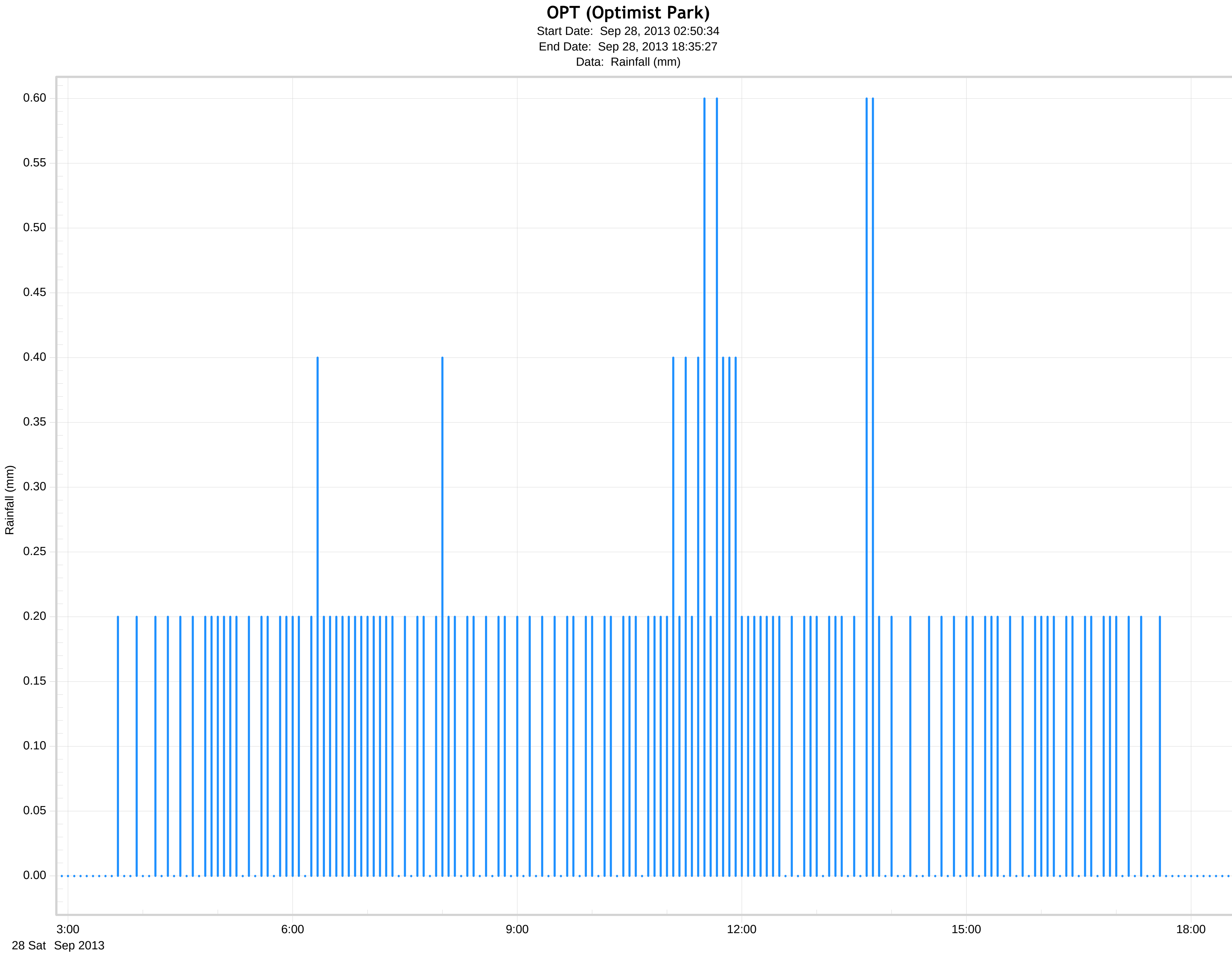
OPT (Optimist Park)

Rainfall Period: 2013-09-28 00:00 to 2013-09-28 23:55
Historical Data: 5-min to 12 hour duration based on MacLaren Drainage Criteria Manual
24 hour duration based on AECOM (2012)



Total Rainfall During Period	26.6 mm
Hours in Period	23.9 hrs

	5 min	10 min	15 min	30 min	1 hr	2 hrs	6 hrs	12 hrs	24 hrs
Current Period	7.2	7.2	5.6	5.2	4.4	3.3	2.3	2.0	0.0
2 Year Event	108.8	81.5	65.9	42.8	26.2	15.4	6.4	3.7	1.9
5 Year Event	146.4	109.5	88.3	57.3	34.9	20.5	8.5	4.8	2.5
10 Year Event	168.8	128.0	103.9	67.8	41.3	24.1	9.8	5.5	3.0
25 Year Event	204.0	154.5	125.4	81.7	49.7	29.0	11.8	6.6	3.7
50 Year Event	231.2	175.1	142.0	92.5	56.3	32.8	13.3	7.4	4.3
100 Year Event	258.4	195.6	158.6	103.2	62.7	36.5	14.8	8.3	5.0


OPT (Optimist Park)
Start Date: Sep 28, 2013 02:50:34
End Date: Sep 28, 2013 18:35:27
Data: Rainfall (mm)
Rainfall (mm)
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
3:00
6:00
9:00
12:00
15:00
18:00
28 Sat Sep 2013

CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
STORM LOG SUMMER 2013

DATE OF STORM	MAXIMUM ACCUMULATION (mm)	STATION WHERE MAX. OCCURRED	MINIMUM ACCUMULATION (mm)	STATION WHERE MIN. OCCURRED	MAXIMUM STATION RETURN PERIOD (30 min. interval)	BASEMENT FLOODING
May 18 - 19, 2013	8.6	Perimeter Lift Station	3.6	Fort Richmond Collegiate	Less than 1 year	No
May 19 - 21, 2013	52.3	Oak Bluff	13.0	Parklane Lift Station	Less than 1 year	No
May 28, 2013	6.1	Brady Road Landfill	1.1	Little Mountain Park	Less than 1 year	No
May 30-31, 2013	68.1	Oak Bluff	27.7	Arthur Day School	Less than 1 year	No
June 7, 2013	8.9	Optimist Park	0.2	Bernie Wolfe School	Less than 1 year	No
June 10, 2013	14.2	Deacon Water Treatment Plant	0.2	River Bend LS	Almost 1 year	No
June 20, 2013	55.1	Ecole Tuxedo Park	0.8	North End Treatment Plant	100 year	Yes
June 23-24, 2013	37.3	West End Pollution Centre	14.5	Deacon Water Treatment Plant	2 year	No
June 25-26, 2013	44.2	West End Pollution Centre	10.4	Arthur E. Wright School	10 year	Yes
June 28, 2013	18.5	Brady Road Landfill	0.2	Arthur Day School	Less than 1 year	No
July 9-10, 2013	11.7	Ecole Tuxedo Park	1.6	Arthur Day School	Less than 1 year	No
July 18-19, 2013	22.0	University of Winnipeg	3.8	Arthur Day School	2 year	No
July 21-22, 2013	35.8	Little Mountain Park	8.6	Brady Road Landfill	1 year	No
July 25, 2013	19.8	Little Mountain Park	5.8	Henry G. Izatt School	1 Year	No
July 29-30, 2013	11.4	River Bend Lift Station	0.5	Deacon Water Treatment Plant	Less than 1 year	No
August 4-5, 2013	8.9	Deacon Water Treatment Plant	3.8	Buhler Recreational Park	Less than 1 year	No
August 10-11, 2013	7.2	Optimist Park	1.0	Island Lakes School	Less than 1 year	No
August 18, 2013	67.0	Little Mountain Park	9.1	Buhler Recreational Park	Between 25 and 50 years	Yes
Day on which the storm event begins. (6 hour separation between individual events)	Maximum total rain at any of the telemetry stations.	Station with maximum total rainfall.	Minimum total rainfall at any of the telemetry stations.	Station with minimum total rainfall.	Greatest return period over the 30 minute duration. (Location is not necessarily the same as the maximum accumulation)	If basement flood--ing has been reported to WWD or District offices.

CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
STORM LOG SUMMER 2013

DATE OF STORM	MAXIMUM ACCUMULATION (mm)	STATION WHERE MAX. OCCURRED	MINIMUM ACCUMULATION (mm)	STATION WHERE MIN. OCCURRED	MAXIMUM STATION RETURN PERIOD (30 min. interval)	BASEMENT FLOODING
September 28, 2013	31.2	Deacon Water Treatment Plant	2.3	Ecole Noel Ritchot	Less than 1 year	Yes
Day on which the storm event begins. (6 hour separation between individual events)	Maximum total rain at any of the telemetry stations.	Station with maximum total rainfall.	Minimum total rainfall at any of the telemetry stations.	Station with minimum total rainfall.	Greatest return period over the 30 minute duration. (Location if not same as maximum accumulation)	If basement flood--ing has been reported to WWD or District offices.

E9b 14-05-12 Rainfall Report

Water and Waste Department ♦ Service des Eaux et des Déchets

RAINFALL REPORT

May 12, 2014 Rainstorm

Prepared by:

Shenaz Ahmed. – Land Drainage and Flood Protection Technical Assistant

(Note: There is an error creating the isohyetal lines on the map that we are currently working on, this should be resolved shortly. The map in this report displays total accumulation only.)

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Fort Whyte Alive Centre
Buhler Recreational Park
Lakewood Systems Ltd
Ducks Unlimited Canada
Canadian Wheat Board
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Winnipeg

Water and Waste Department
RAINFALL ACCUMULATION LOG - SUMMER 2014

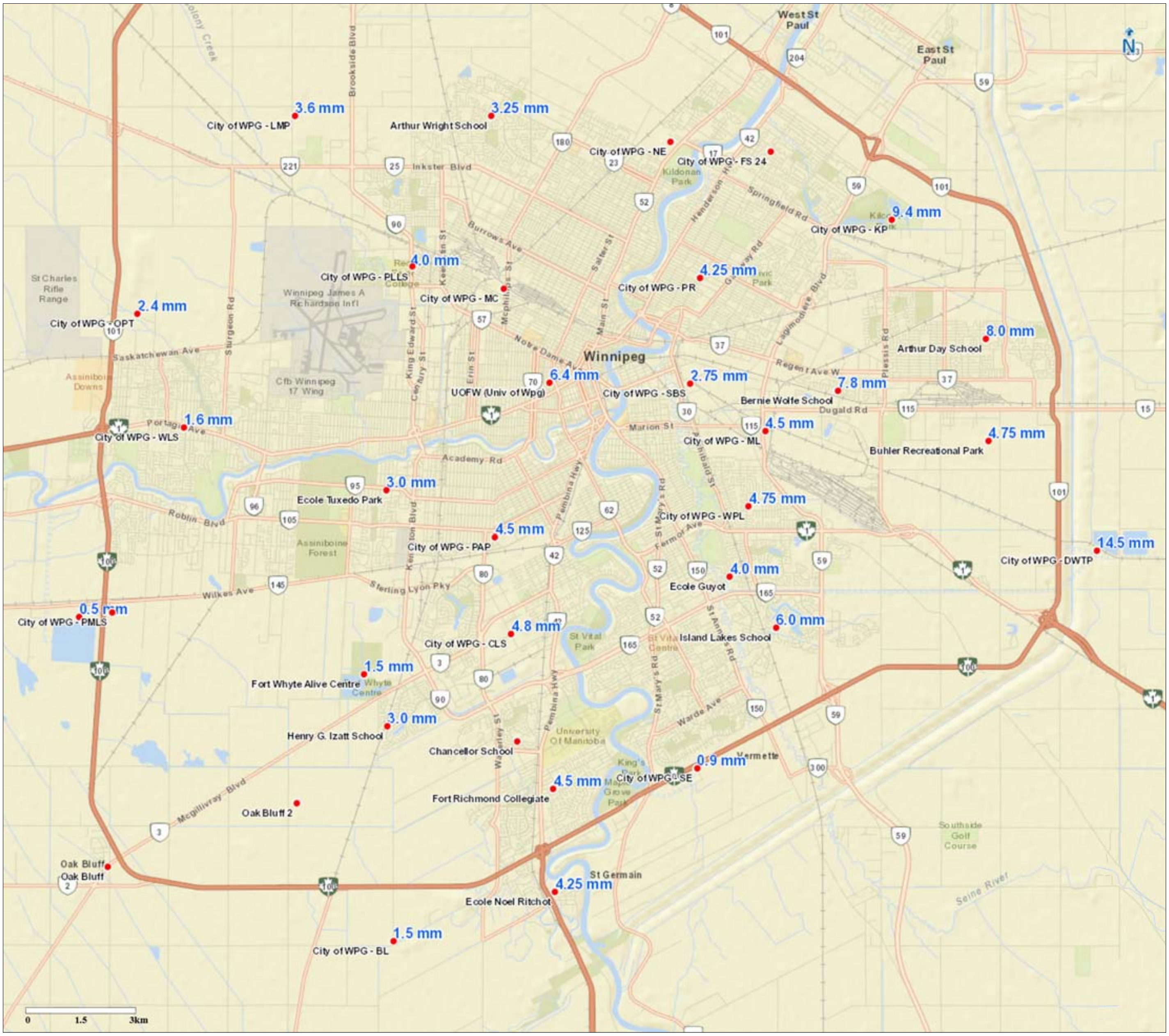
Accumulations in millimeters

NA............................Not Available
NO............................Not Operational
+...............................Incomplete raingauge data

Rain Gauge Station Locations

PR - Parks and Rec Building
KE - King Edward Lift Station
AW - Arthur E. Wright School
NE - North End Treatment Plant
FS - Fire Station No. 24
WW - Westwood Lift Station
JW - Jameswood School
MC - McPhillips Pumping Statio
SB - St. Boniface Shops
BW - Bernie Wolfe School
PM - Perimeter Lift Station
CL - Clarence Lift Station
WN - Windsor Park Library
FR - Fort Richmond Collegiate
IL - Island Lakes School
EN - Ecole Noel Ritchot
AD - Arthur Day School
SE - South End Pollution Control Center
EG - Ecole Guyot
CE - Chancellor Elementary School
HI - Henry G. Izatt Middle School
KP - Kilcona Park
BP - Buhler Recreational Park
BL - Brady Road Landfill
LM - Little Mountain Park
FW - Fort Whyte Alive
OP - Optimist Park
RB - River Bend Lift Station
HD - Headingley (CWB)
OB - Oak Bluff
PAP - Pan Am Pool
ML - MacLean Pumping Station
ET - Ecole Tuxedo Park
DW - Deacon Water Treatment Plant
WE - West End Pollution Control Center
OB2 - Oak Bluff 2
UW - University of Winnipeg (Lockhart Hall)

RAINSTORM DATE	APPROXIMATE RAINSTORM START TIME	APPROXIMATE RAINSTORM STOP TIME	RAINFALL MONITORING STATIONS																																	AVERAGE
			WN	AD A	W	BP	BW	CE	MC	NE	CL	EG	ET	FR	FW	HI	IL	KE	KP	LM	OB	OB2	OP	UW	WW	SB	WE	FS	BL	SE	DW	PAP	ML	EN	PR				
April 23-25 2014	4/23/2014 20:00	4/25/2014 12:00	17.3	18.2	17.2	12.4	19.8				19.8	14.8	18.0				10.8	19.8	17.6	16.6		15.8	19.8	19.6	18.2	9.8	8.5		19.0	18.5	19.3	21.8	20.0	19.0	15.8				**17.1**
April 28, 2014	3:00 AM	21:00	9.9	9.0	9.4		9.6				11.2							11.0	8.4	10.2		12.7	10.4	11.2	11.2	4.8	6.8		12.5	5.4	11.0	12.8	8.5	11.3	6.8				**9.7**
May 7, 2014	15:00	21:00	2.3	4.4	5.0	2.5	3.8	2.3			3.0	2.0	3.5	2.3	1.0	3.0	2.3	5.8	4.4	6.4		2.8	5.2	5.0	5.0	2.3	4.3		2.0	0.8	3.3	3.0	2.5	2.0	2.8				**3.3**
May 12, 2014	8:30	9:00 PM	4.8	8.0	3.3	4.8	7.8	4.0			4.8	4.0	3.0	4.5	1.5	3.0	6.0	4.0	3.4	3.6			2.4	6.4	1.6	2.8	0.5		1.5	0.9	14.5	4.5	4.5	4.3	4.3				**4.2**
		Total	**34.3**	**39.6**	**34.9**	**19.7**	**41.0**	**6.3**	**0.0**	**0.0**	**38.8**	**20.8**	**24.5**	**6.8**	**2.5**	**6.0**	**19.1**	**40.6**	**33.8**	**36.8**	**0.0**	**31.3**	**37.8**	**42.2**	**36.0**	**19.6**	**20.0**	**0.0**	**35.0**	**25.6**	**48.0**	**42.1**	**35.5**	**36.6**	**29.6**	**0.0**	**0.0**	**0.0**	**34.3**



● Rainfall Gauge Station Location

3.55mm Accumulation

ALL MEASUREMENTS ARE METRIC

IT IS HEREBY EXPRESSLY UNDERSTOOD that any calculat on, or nformat on provided to private property owners, their agents and contractors with respect to the information provided shall be accepted by such persons at the r own risk, and the CITY shall assume no responsibility for the information conta ned therein. The records of the CITY w ll be supplied on the basis that they are the best knowledge of the CITY and that persons requesting such nformat on must interpret the same for their own needs and/or requirements.

Winnipeg

THE CITY OF WINNIPEG

Water and Waste Department

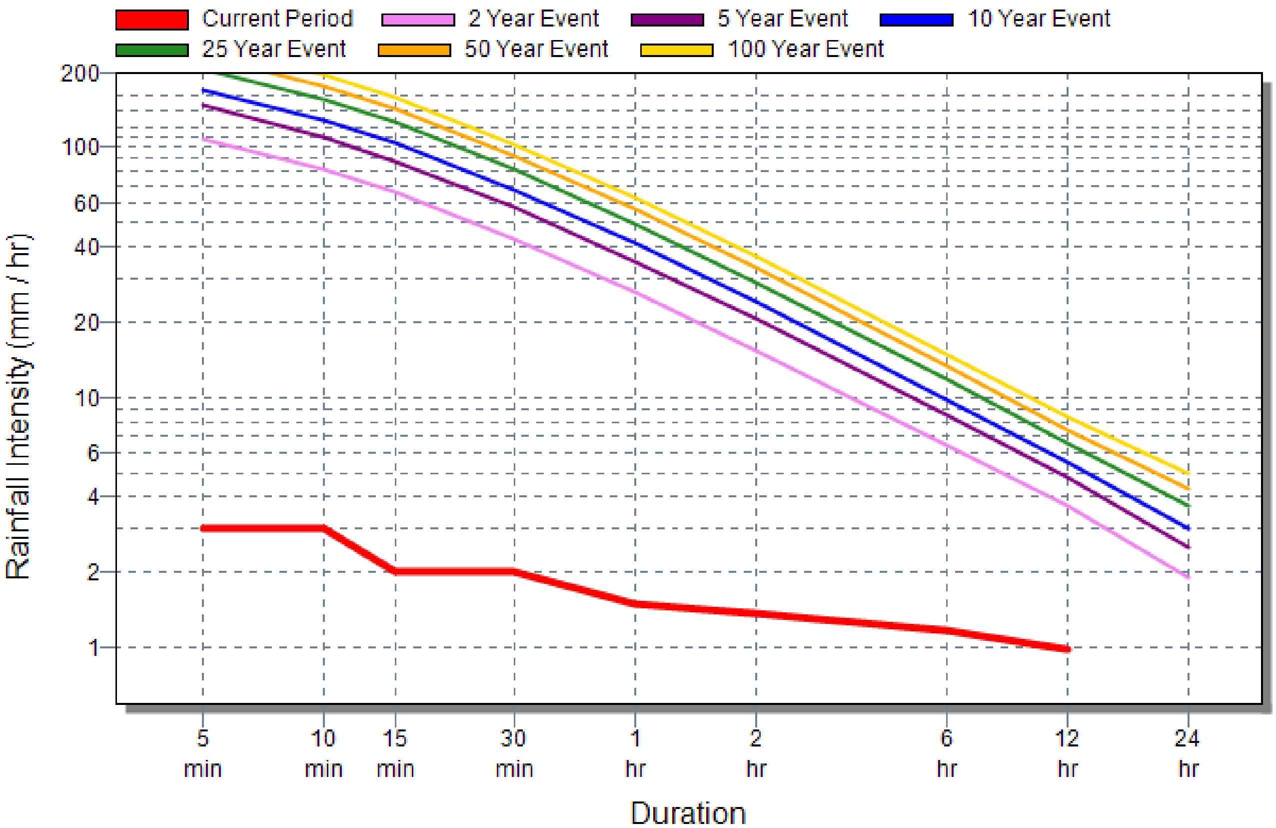
Tuesday, May 13, 2014

Rainfall Accumulation for
2014-05-12 00:00
to
2014-05-12 23:59

Intensity Duration Frequency Analysis

City of WPG - DWTP

Rainfall Period: 2014-05-12 08:30 to 2014-05-12 21:00
Historical Data: 5-min to 12 hour duration based on MacLaren Drainage Criteria Manual
24 hour duration based on AECOM (2012)

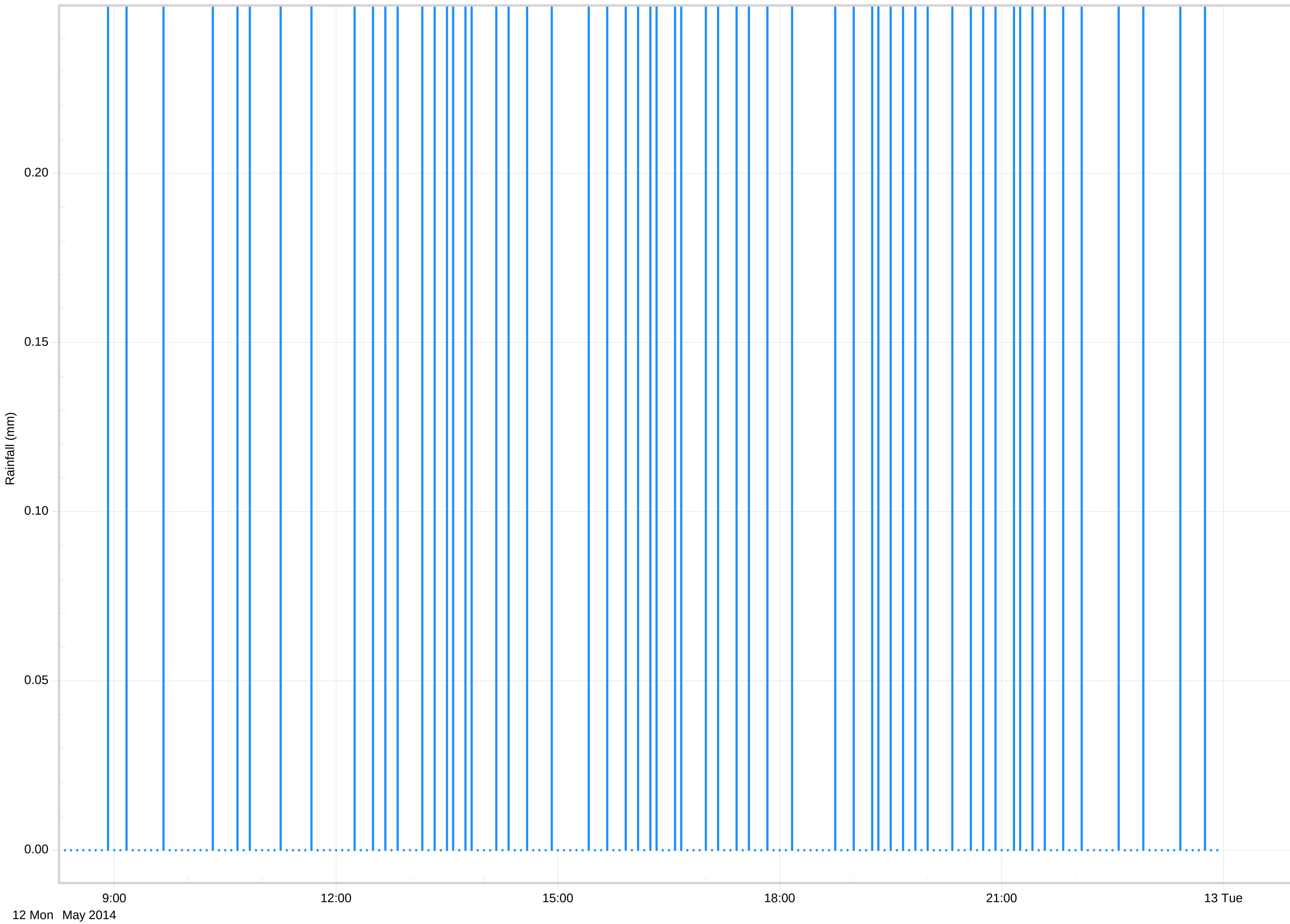


Total Rainfall During Period	12.0 mm
Hours in Period	12.5 hrs

	5 min	10 min	15 min	30 min	1 hr	2 hrs	6 hrs	12 hrs	24 hrs
Current Period	3.0	3.0	2.0	2.0	1.5	1.4	1.2	1.0	0.0
2 Year Event	108.8	81.5	65.9	42.8	26.2	15.4	6.4	3.7	1.9
5 Year Event	146.4	109.5	88.3	57.3	34.9	20.5	8.5	4.8	2.5
10 Year Event	168.8	128.0	103.9	67.8	41.3	24.1	9.8	5.5	3.0
25 Year Event	204.0	154.5	125.4	81.7	49.7	29.0	11.8	6.6	3.7
50 Year Event	231.2	175.1	142.0	92.5	56.3	32.8	13.3	7.4	4.3
100 Year Event	258.4	195.6	158.6	103.2	62.7	36.5	14.8	8.3	5.0

City of WPG - DWTP

Start Date: May 12, 2014 08:15:10
End Date: May 13, 2014 00:57:51
Data: Rainfall (mm)



CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
STORM LOG SUMMER 2014

DATE OF STORM	MAXIMUM ACCUMULATION (mm)	STATION WHERE MAX. OCCURRED	MINIMUM ACCUMULATION (mm)	STATION WHERE MIN. OCCURRED	MAXIMUM STATION RETURN PERIOD (30 min. interval)	BASEMENT FLOODING
April 23-25, 2014	22.5	Deacon Water Treatment Plant	8.5	West End Pollution Control Centre	Less than 1 year	Yes
April 28	12.8	Pan Am Pool	4.8	St Boniface Shops	Less than 1 year	Yes
May 7, 2014	6.4	Little Mountain Park	0.8	South End Plant	Less than 1 year	No
May 12	14.5	Deacon Water Treatment Plant	0.5	West End Pollution Control Centre	Less than 1 year	No
Day on which the storm event begins. (6 hour separation between individual events)	Maximum total rain at any of the telemetry stations.	Station with maximum total rainfall.	Minimum total rainfall at any of the telemetry stations.	Station with minimum total rainfall.	Greatest return period over the 30 minute duration. (Location is not necessarily the same as the maximum accumulation)	If basement flood--ing has been reported to WWD or District offices.

E9c 14-05-20 Rainfall Report

Water and Waste Department ♦ Service des Eaux et des Déchets

RAINFALL REPORT

May 19-20, 2014 Rainstorm

Prepared by:

Shenaz Ahmed. – Land Drainage and Flood Protection Technical Assistant

This report is distributed to various recipients at the following:

City of Winnipeg, Water and Waste Department
City of Winnipeg, Planning, Property and Development Department
City of Winnipeg CAO office
City of Winnipeg, Insect Control Branch
Manitoba Water Stewardship
Environment Canada
Manitoba Organization of Disc Sports
Fort Whyte Alive Centre
Buhler Recreational Park
Lakewood Systems Ltd
Ducks Unlimited Canada
Canadian Wheat Board
AECOM

Embrace the Spirit • Vivez l'esprit

1199 Pacific Avenue • 1199 Avenue Pacific • Winnipeg • Manitoba R3E 3S8
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Winnipeg

Water and Waste Department

RAINFALL ACCUMULATION LOG - SUMMER 2014

Accumulations in millimeters

NA.......................... Not Available
NO.......................... Not Operational
+............................ Incomplete raingauge data

Rain Gauge Station Locations

PR - Parks and Rec Building
KE - King Edward Lift Station
AW - Arthur E. Wright School
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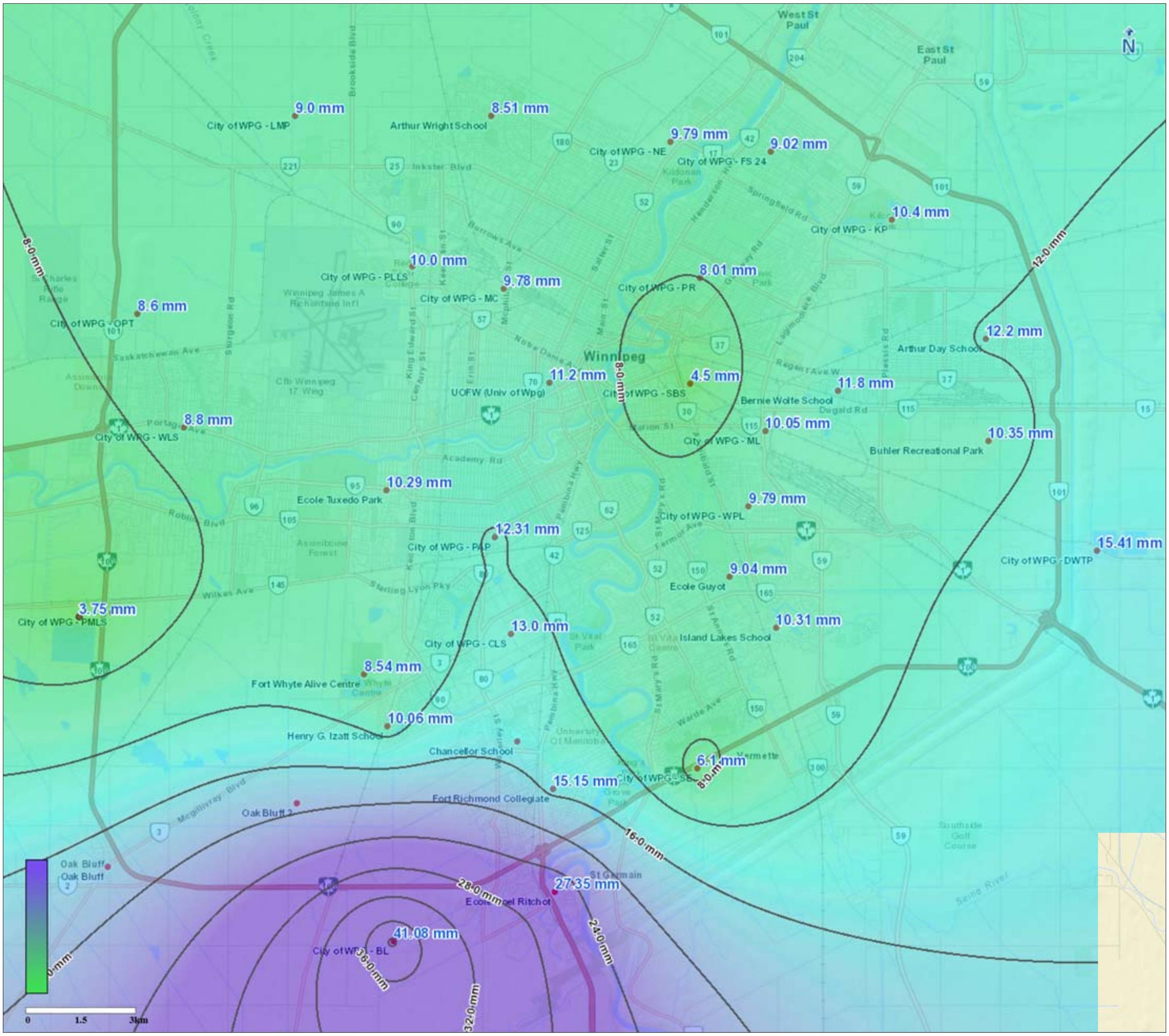
DW - Deacon Water Treatment Plant
WE - West End Pollution Control Center
OB2 - Oak Bluff 2
UW - University of Winnipeg (Lockhart Hall)

RAINSTORM DATE	APPROXIMATE RAINSTORM START TIME	APPROXIMATE RAINSTORM STOP TIME	RAINFALL MONITORING STATIONS																																		AVERAGE
			WN	AD	AW	BP	BW	CE	MC	NE	CL	EG	ET	FR	FW	HI	IL	KE	KP	LM	OB	OB2	OP	UW	WW	SB	WE	FS	BL	SE	DW	PAP	ML	EN	PR				
April 23-25 2014	4/23/2014 20:00	4/25/2014 12:00	17.3	18.2	17.2	12.4	19.8				19.8	14.8	18.0				10.8	19.8	17.6	16.6		15.8	19.8	19.6	18.2	9.8	8.5		19.0	18.5	19.3	21.8	20.0	19.0	15.8				**17.1**
April 28, 2014	3:00 AM	21:00	9.9	9.0	9.4		9.6				11.2							11.0	8.4	10.2		12.7	10.4	11.2	11.2	4.8	6.8		12.5	5.4	11.0	12.8	8.5	11.3	6.8				**9.7**
May 7, 2014	15:00	21:00	2.3	4.4	5.0	2.5	3.8	2.3			3.0	2.0	3.5	2.3	1.0	3.0	2.3	5.8	4.4	6.4		2.8	5.2	5.0	5.0	2.3	4.3		2.0	0.8	3.3	3.0	2.5	2.0	2.8				**3.3**
May 12, 2014	8:30	21:00	4.8	8.0	3.3	4.8	7.8	4.0			4.8	4.0	3.0	4.5	1.5	3.0	6.0	4.0	3.4	3.6			2.4	6.4	1.6	2.8	0.5		1.5	0.9	14.5	4.5	4.5	4.3	4.3				**4.2**
May 19-20. 2014	5/19/2014 10:30	5/20/2014 4:00	9.8	12.4	8.5	10.4	11.8	11.3	9.8	9.8	13	9	10.3	15.2	8.5	10.1	10.3	10	10.4	9			8.6	11.2	8.8	4.5	3.8	9	41.3	6.1	15.4	12.3	10.1	27.6	8.3				**11.5**
		Total	**44.1**	**52.0**	**43.4**	**30.1**	**52.8**	**17.6**	**9.8**	**9.8**	**51.8**	**29.8**	**34.8**	**22.0**	**11.0**	**16.1**	**29.4**	**50.6**	**44.2**	**45.8**	**0.0**	**31.3**	**46.4**	**53.4**	**44.8**	**24.1**	**23.8**	**9.0**	**76.3**	**31.7**	**63.4**	**54.4**	**45.6**	**64.2**	**37.9**	**0.0**	**0.0**	**0.0**	**45.8**



- Rainfall Gauge Station Location
- —8mm— Isohyetal Line
- 3.55mm Accumulation

ALL MEASUREMENTS ARE METRIC

Winnipeg

THE CITY OF WINNIPEG

Water and Waste Department

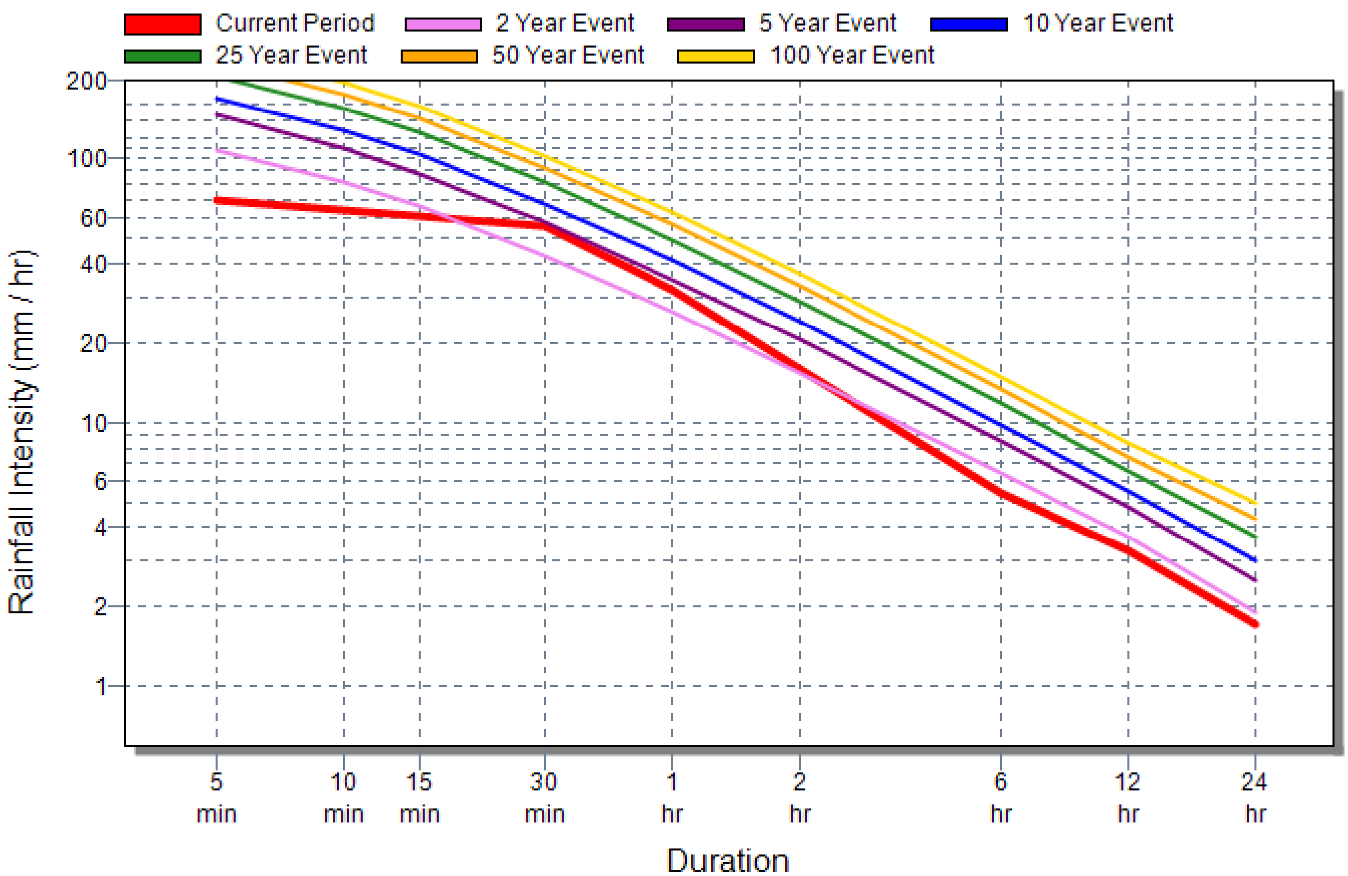
Tuesday, May 20, 2014

Rainfall Accumulation with Isohyetal for 2014-05-19 10:30 to 2014-05-20 04:00

Intensity Duration Frequency Analysis

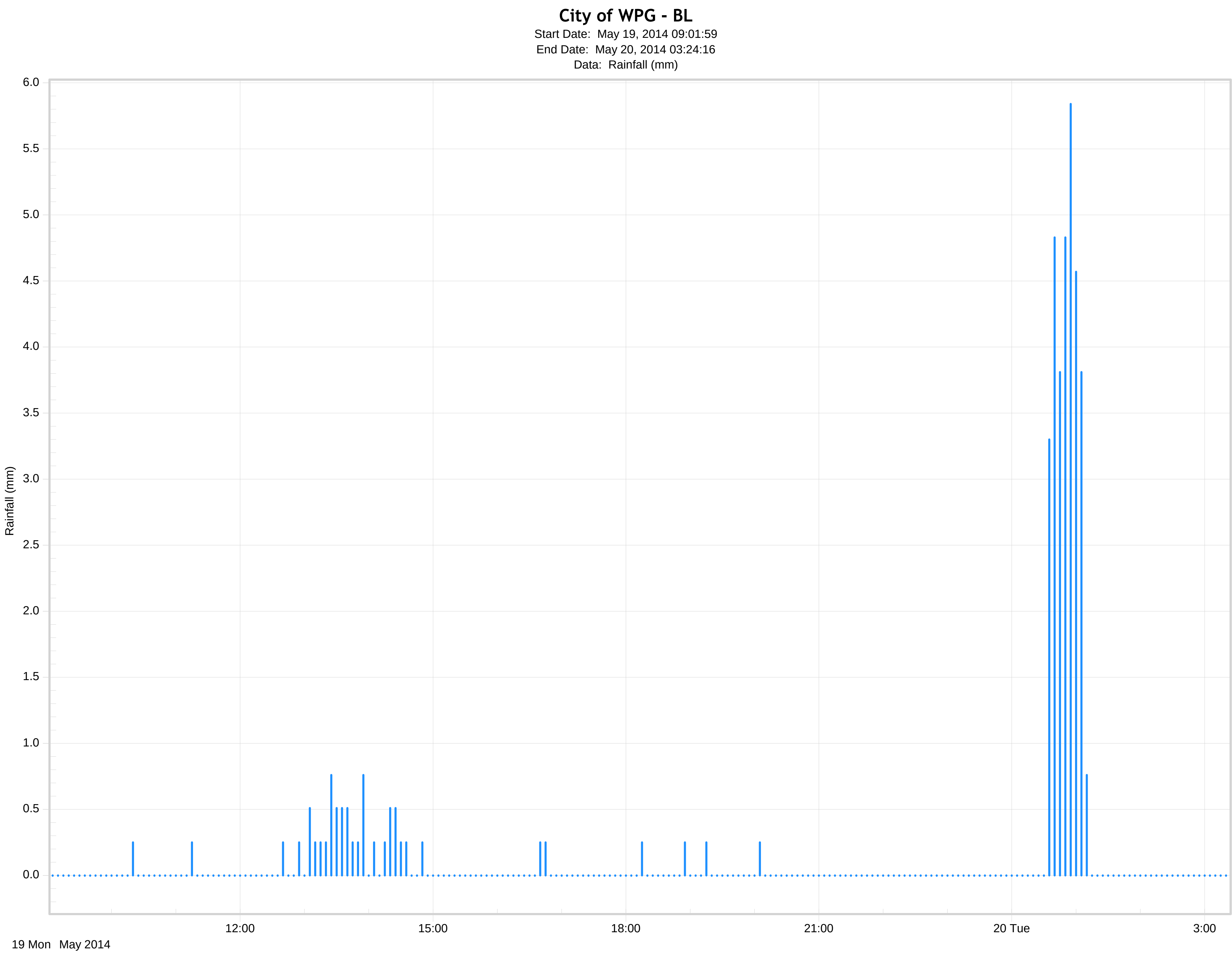
City of WPG - BL

Rainfall Period: 2014-05-19 00:00 to 2014-05-21 00:00
Historical Data: 5-min to 12 hour duration based on MacLaren Drainage Criteria Manual
24 hour duration based on AECOM (2012)



Total Rainfall During Period	41.3 mm
Hours in Period	48.0 hrs

	5 min	10 min	15 min	30 min	1 hr	2 hrs	6 hrs	12 hrs	24 hrs
Current Period	70.1	64.0	61.0	55.4	31.8	15.9	5.4	3.3	1.7
2 Year Event	108.8	81.5	65.9	42.8	26.2	15.4	6.4	3.7	1.9
5 Year Event	146.4	109.5	88.3	57.3	34.9	20.5	8.5	4.8	2.5
10 Year Event	168.8	128.0	103.9	67.8	41.3	24.1	9.8	5.5	3.0
25 Year Event	204.0	154.5	125.4	81.7	49.7	29.0	11.8	6.6	3.7
50 Year Event	231.2	175.1	142.0	92.5	56.3	32.8	13.3	7.4	4.3
100 Year Event	258.4	195.6	158.6	103.2	62.7	36.5	14.8	8.3	5.0


City of WPG - BL
Start Date: May 19, 2014 09:01:59
End Date: May 20, 2014 03:24:16
Data: Rainfall (mm)
Rainfall (mm)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
12:00
15:00
18:00
21:00
20 Tue
3:00
19 Mon May 2014

CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
STORM LOG SUMMER 2014

DATE OF STORM	MAX MUM ACCUMULATION (mm)	STATION WHERE MAX. OCCURRED	MINIMUM ACCUMULATION (mm)	STATION WHERE MIN. OCCURRED	MAXIMUM STATION RETURN PERIOD (30 min. interval)	BASEMENT FLOODING
April 23-25, 2014	22.5	Deacon Water Treatment Plant	8.5	West End Pollution Control Centre	Less than 1 year	Yes
April 28	12.8	Pan Am Pool	4.8	St Boniface Shops	Less than 1 year	Yes
May 7, 2014	6.4	Little Mountain Park	0.8	South End Plant	Less than 1 year	No
May 12	14.5	Deacon Water Treatment Plant	0.5	West End Pollution Control Centre	Less than 1 year	No
May 19-20, 2014	41.1	Brady Road Landfill	3.8	West End Pollution Control Centre	Approximately a 5 year	Yes
Day on which the storm event begins. (6 hour separation between individual	Maximum total rain at any of the telemetry stations.	Station with maximum total rainfall.	Minimum total rainfall at any of the telemetry stations.	Station with minimum total rainfall.	Greatest return period over the 30 minute duration. (Location is not necessarily the same as the	If basement flood--ing has been reported to WWD or District

E9d 14-05-24 Rainfall Report

Water and Waste Department ♦ Service des Eaux et des Déchets

RAINFALL REPORT

May 24, 2014 Rainstorm

Prepared by:

Shenaz Ahmed. – Land Drainage and Flood Protection Technical Assistant

This report is distributed to various recipients at the following:

City of Winnipeg, Water and Waste Department
City of Winnipeg, Planning, Property and Development Department
City of Winnipeg CAO office
City of Winnipeg, Insect Control Branch
Manitoba Water Stewardship
Environment Canada
Manitoba Organization of Disc Sports
Fort Whyte Alive Centre
Buhler Recreational Park
Lakewood Systems Ltd
Ducks Unlimited Canada
Canadian Wheat Board
AECOM

Winnipeg

Water and Waste Department

RAINFALL ACCUMULATION LOG - SUMMER 2014

Accumulations in millimeters

NA.......................... Not Available
NO.......................... Not Operational
+............................. Incomplete raingauge data

Rain Gauge Station Locations

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ET - Ecole Tuxedo Park
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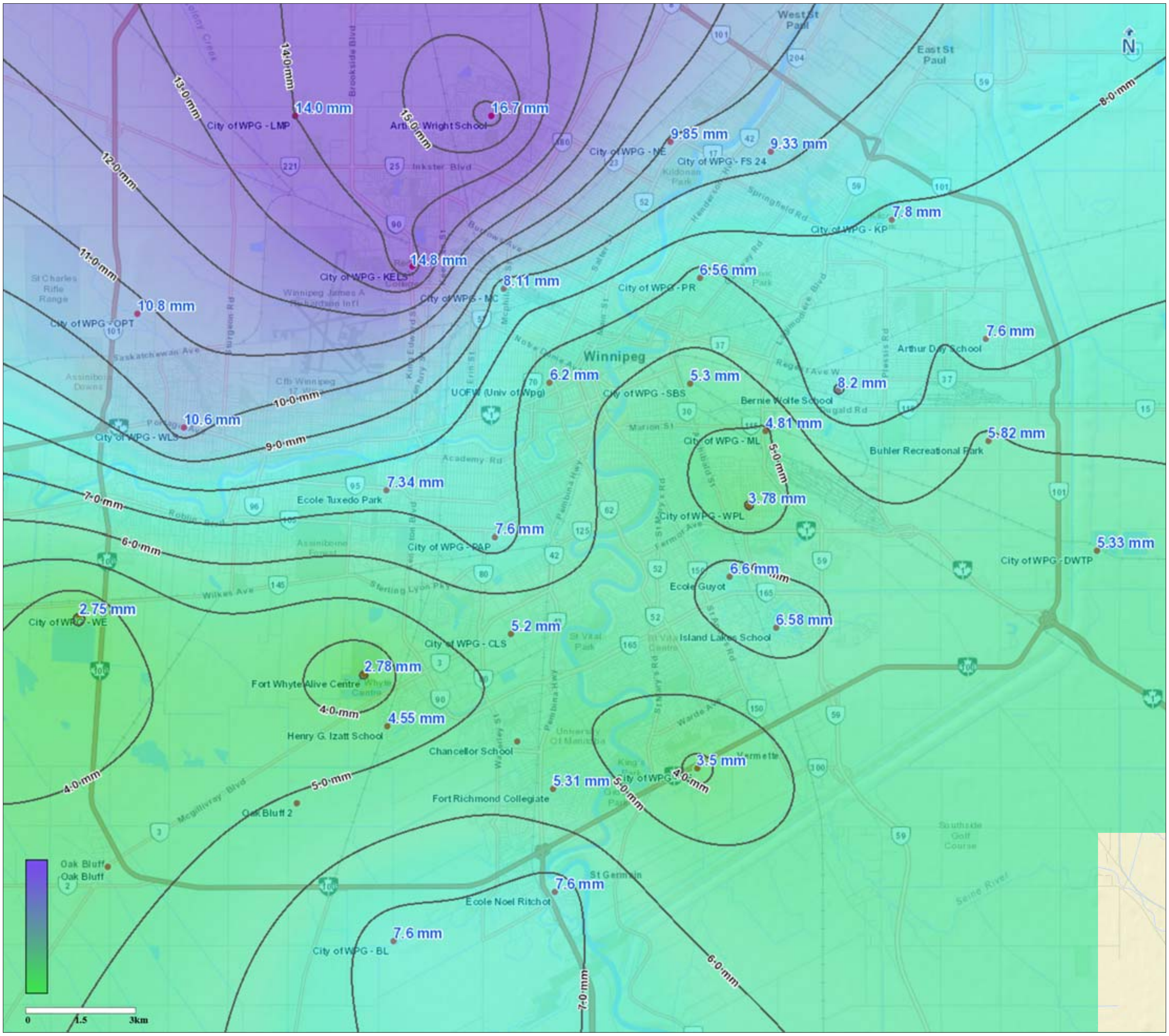
WE - West End Pollution Control Center
OB2 - Oak Bluff 2
UW - University of Winnipeg (Lockhart Hall)

RAINSTORM DATE	APPROXIMATE RAINSTORM START TIME	APPROXIMATE RAINSTORM STOP TIME	RAINFALL MONITORING STATIONS																																			AVERAGE
			WN	AD	AW	BP	BW	CE	MC	NE	CL	EG	ET	FR	FW	HI	IL	KE	KP	LM	OB	OB2	OP	UW	WW	SB	WE	FS	BL	SE	DW	PAP	ML	EN	PR				
April 23-25 2014	4/23/2014 20:00	4/25/2014 12:00	17.3	18.2	17.2	12.4	19.8				19.8	14.8	18.0				10.8	19.8	17.6	16.6		15.8	19.8	19.6	18.2	9.8	8.5		19.0	18.5	19.3	21.8	20.0	19.0	15.8				**17.1**
April 28, 2014	3:00 AM	21:00	9.9	9.0	9.4		9.6				11.2							11.0	8.4	10.2		12.7	10.4	11.2	11.2	4.8	6.8		12.5	5.4	11.0	12.8	8.5	11.3	6.8				**9.7**
May 7, 2014	15:00	21:00	2.3	4.4	5.0	2.5	3.8	2.3			3.0	2.0	3.5	2.3	1.0	3.0	2.3	5.8	4.4	6.4		2.8	5.2	5.0	5.0	2.3	4.3		2.0	0.8	3.3	3.0	2.5	2.0	2.8				**3.3**
May 12, 2014	8:30	21:00	4.8	8.0	3.3	4.8	7.8	4.0			4.8	4.0	3.0	4.5	1.5	3.0	6.0	4.0	3.4	3.6			2.4	6.4	1.6	2.8	0.5		1.5	0.9	14.5	4.5	4.5	4.3	4.3				**4.2**
May 19-20. 2014	5/19/2014 10:30	5/20/2014 4:00	9.8	12.4	8.5	10.4	11.8	11.3	9.8	9.8	13	9	10.3	15.2	8.5	10.1	10.3	10	10.4	9			8.6	11.2	8.8	4.5	3.8	9	41.3	6.1	15.4	12.3	10.1	27.6	8.3				**11.5**
May 24, 2014	0:00	23:59	3.8	7.6	16.7	5.8	8.2	6.1	8.1	9.9	5.2	6.6	7.3	5.3	2.8	4.6	6.6	14.8	7.8	14.0			10.8	6.2	10.6	5.3	2.8	9.3	7.6	3.5	5.3	7.6	4.8	7.6	6.6				**7.4**
		Total	**47.8**	**59.6**	**60.1**	**35.9**	**61.0**	**23.6**	**17.9**	**19.7**	**57.0**	**36.4**	**42.1**	**27.3**	**13.8**	**20.7**	**35.9**	**65.4**	**52.0**	**59.8**	**0.0**	**31.3**	**57.2**	**59.6**	**55.4**	**29.4**	**26.6**	**18.3**	**83.9**	**35.2**	**68.8**	**62.0**	**50.4**	**71.8**	**44.4**	**0.0**	**0.0**	**0.0**	**53.2**



- Rainfall Gauge Station Location
- —8mm— Isohyetal Line
- 3.55mm Accumulation

ALL MEASUREMENTS ARE METRIC

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Winnipeg

THE CITY OF WINNIPEG

Water and Waste Department

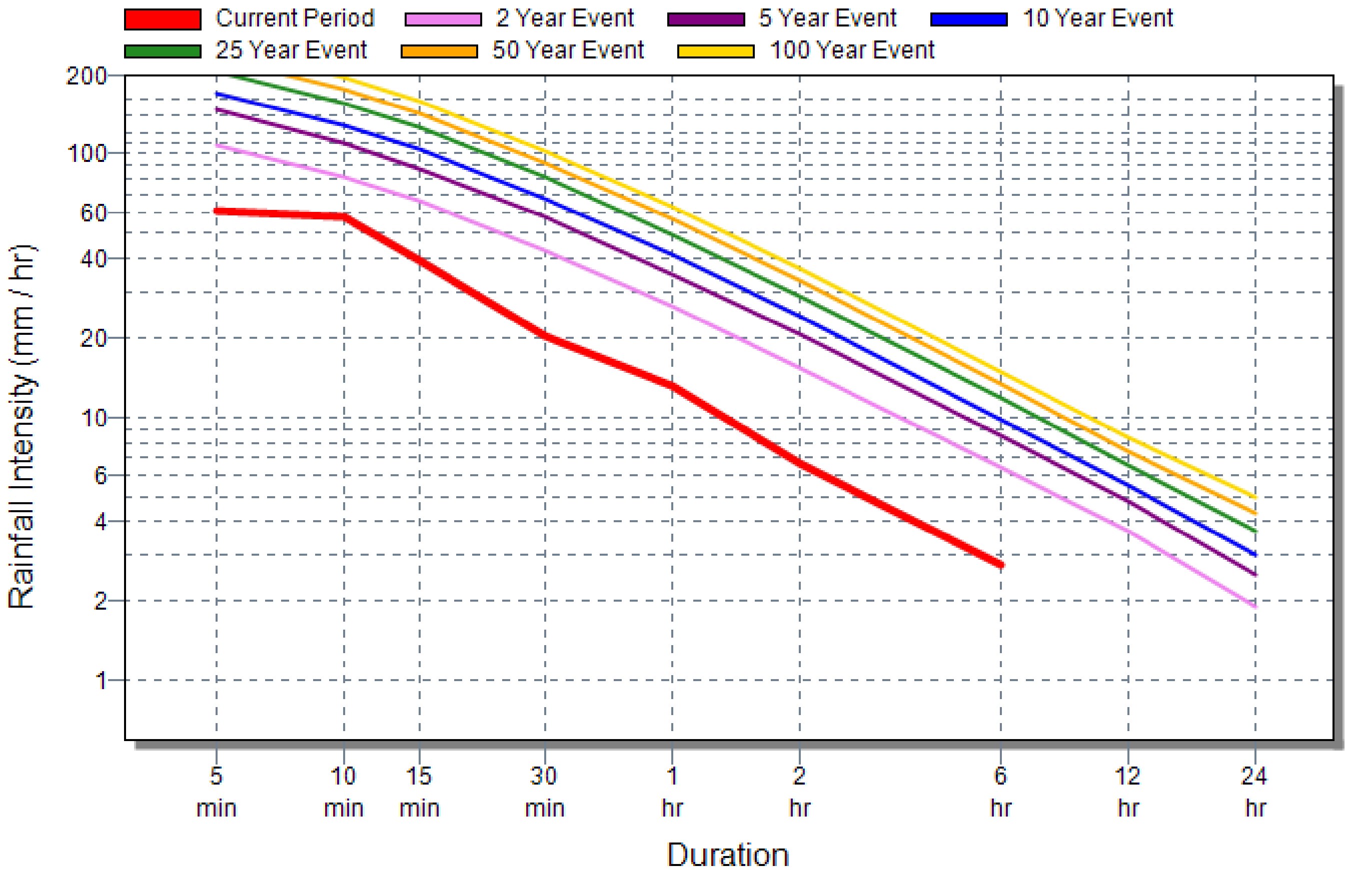
Monday, May 26, 2014

Rainfall Accumulation with Isohyetal for 2014-05-24 00:00 to 2014-05-24 23:59

Intensity Duration Frequency Analysis

Arthur Wright School

Rainfall Period: 2014-05-24 13:00 to 2014-05-24 22:00
Historical Data: 5-min to 12 hour duration based on MacLaren Drainage Criteria Manual
24 hour duration based on AECOM (2012)



Total Rainfall During Period	16.5 mm
Hours in Period	9.0 hrs

	5 min	10 min	15 min	30 min	1 hr	2 hrs	6 hrs	12 hrs	24 hrs
Current Period	61.0	57.9	39.6	20.3	13.2	6.7	2.7	0.0	0.0
2 Year Event	108.8	81.5	65.9	42.8	26.2	15.4	6.4	3.7	1.9
5 Year Event	146.4	109.5	88.3	57.3	34.9	20.5	8.5	4.8	2.5
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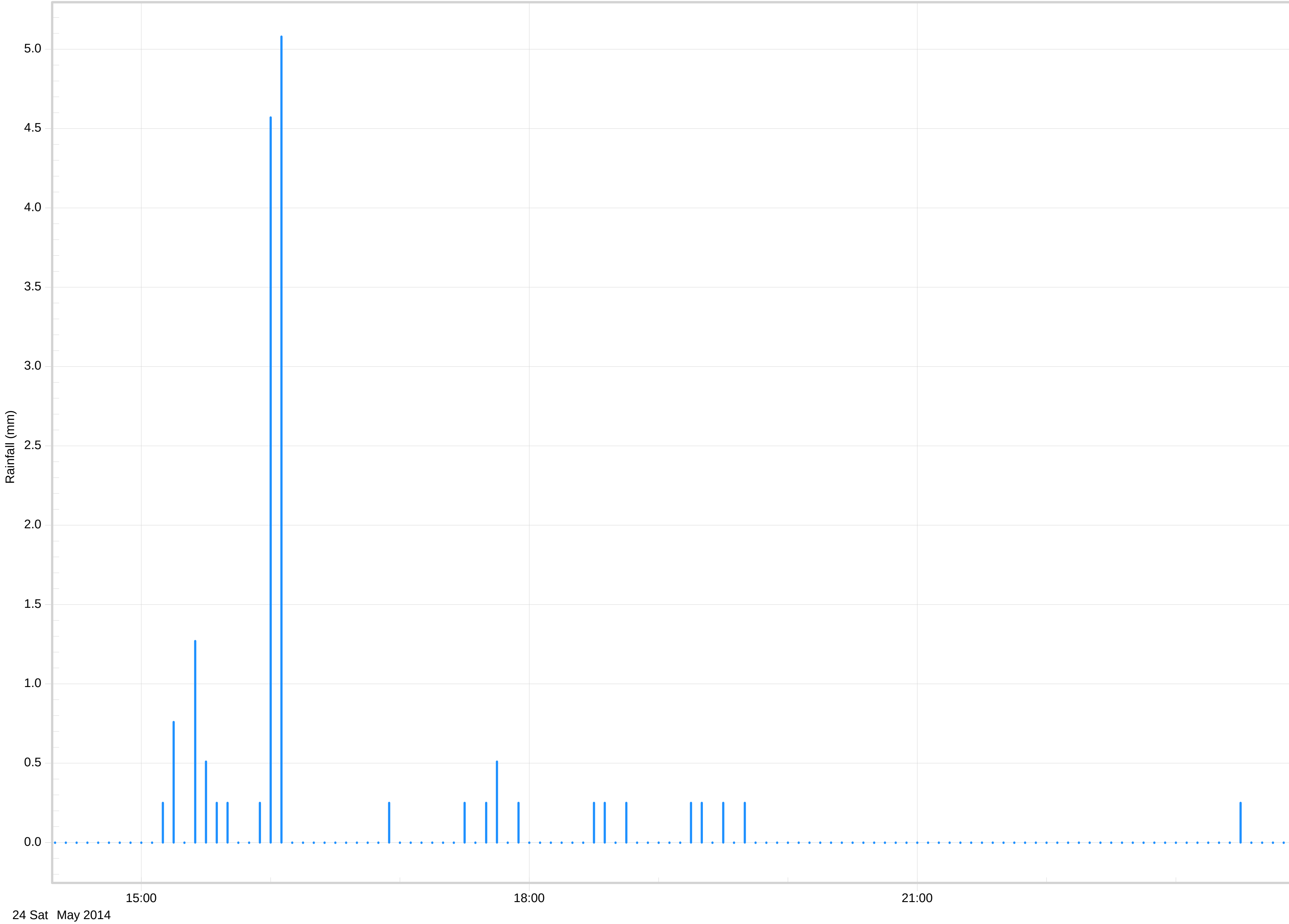
100 Year Event	258.4	195.6	158.6	103.2	62.7	36.5	14.8	8.3	5.0

Arthur Wright School

Start Date: May 24, 2014 14:18:35
End Date: May 24, 2014 23:56:12
Data: Rainfall (mm)



CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
STORM LOG SUMMER 2014

DATE OF STORM	MAX MUM ACCUMULATION (mm)	STATION WHERE MAX. OCCURRED	MINIMUM ACCUMULATION (mm)	STATION WHERE MIN. OCCURRED	MAXIMUM STATION RETURN PERIOD (30 min. interval)	BASEMENT FLOODING
April 23-25, 2014	22.5	Deacon Water Treatment Plant	8.5	West End Pollution Control Centre	Less than 1 year	Yes
April 28	12.8	Pan Am Pool	4.8	St Boniface Shops	Less than 1 year	Yes
May 7, 2014	6.4	Little Mountain Park	0.8	South End Plant	Less than 1 year	No
May 12	14.5	Deacon Water Treatment Plant	0.5	West End Pollution Control Centre	Less than 1 year	No
May 19-20, 2014	41.1	Brady Road Landfill	3.8	West End Pollution Control Centre	Approximately a 5 year	Yes
May 24, 2014	16.7	Arthur E. Wright School	2.8	West End Pollution Control Centre	Less than 1 year	No
Day on which the storm event begins. (6 hour separation between individual	Maximum total rain at any of the telemetry stations.	Station with maximum total rainfall.	Minimum total rainfall at any of the telemetry stations.	Station with minimum total rainfall.	Greatest return period over the 30 minute duration. (Location is not necessarily the same as the	If basement flood--ing has been reported to WWD or District

E9e 14-05-25 Rainfall Report

Water and Waste Department ♦ Service des Eaux et des Déchets

RAINFALL REPORT

May 25, 2014 Rainstorm

Prepared by:

Shenaz Ahmed. – Land Drainage and Flood Protection Technical Assistant

This report is distributed to various recipients at the following:

City of Winnipeg, Water and Waste Department
City of Winnipeg, Planning, Property and Development Department
City of Winnipeg CAO office
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Manitoba Water Stewardship
Environment Canada
Manitoba Organization of Disc Sports
Fort Whyte Alive Centre
Buhler Recreational Park
Lakewood Systems Ltd
Ducks Unlimited Canada
Canadian Wheat Board
AECOM

Winnipeg

Water and Waste Department

RAINFALL ACCUMULATION LOG - SUMMER 2014

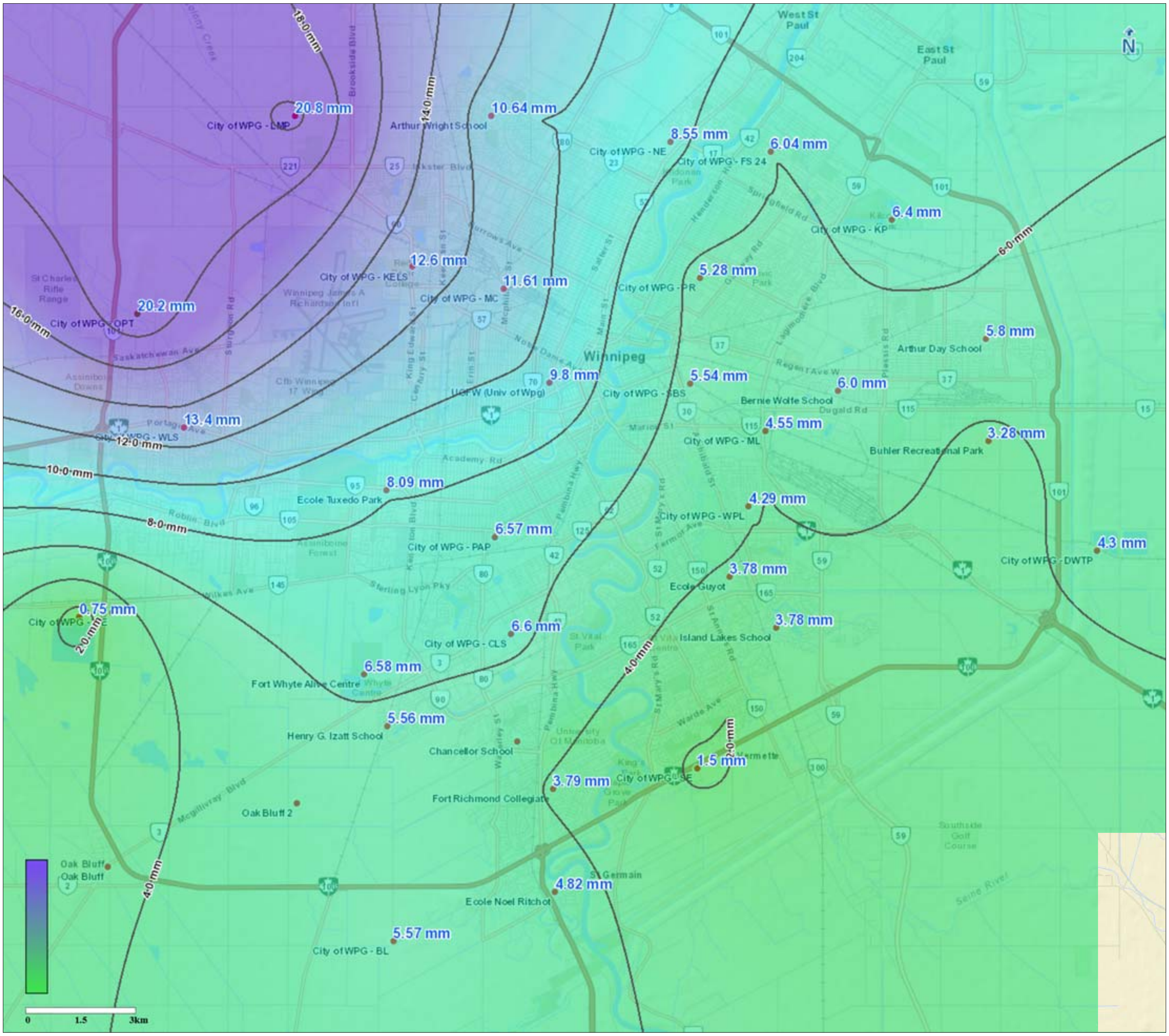
Accumulations in millimeters

NA.......................... Not Available
NO.......................... Not Operational
+............................. Incomplete raingauge data

Rain Gauge Station Locations

PR - Parks and Rec Building
KE - King Edward Lift Station
AW - Arthur E. Wright School
NE - North End Treatment Plant
FS - Fire Station No. 24
WW - Westwood Lift Station
JW - Jameswood School
MC - McPhillips Pumping Static
SB - St. Boniface Shops
BW - Bernie Wolfe School
PM - Perimeter Lift Station
CL - Clarence Lift Station
WN - Windsor Park Library
FR - Fort Richmond Collegiate
IL - Island Lakes School
EN - Ecole Noel Ritchot
AD - Arthur Day School
SE - South End Pollution Control Center
EG - Ecole Guyot
CE - Chancellor Elementary School
HI - Henry G. Izatt Middle School
KP - Kilcona Park
BP - Buhler Recreational Park
BL - Brady Road Landfill
LM - Little Mountain Park
FW - Fort Whyte Alive
OP - Optimist Park
RB - River Bend Lift Station
HD - Headingley (CWB)
OB - Oak Bluff
PAP - Pan Am Pool
ML - MacLean Pumping Station
ET - Ecole Tuxedo Park
DW - Deacon Water Treatment Plant
WE - West End Pollution Control Center
OB2 - Oak Bluff 2
UW - University of Winnipeg (Lockhart Hall)

RAINSTORM DATE	APPROXIMATE RAINSTORM START TIME	APPROXIMATE RAINSTORM STOP TIME	RAINFALL MONITORING STATIONS																																		AVERAGE
			WN	AD	AW	BP	BW	CE	MC	NE	CL	EG	ET	FR	FW	HI	IL	KE	KP	LM	OB	OB2	OP	UW	WW	SB	WE	FS	BL	SE	DW	PAP	ML	EN	PR				
April 23-25 2014	4/23/2014 20:00	4/25/2014 12:00	17.3	18.2	17.2	12.4	19.8				19.8	14.8	18.0				10.8	19.8	17.6	16.6		15.8	19.8	19.6	18.2	9.8	8.5		19.0	18.5	19.3	21.8	20.0	19.0	15.8				**17.1**
April 28, 2014	3:00 AM	21:00	9.9	9.0	9.4		9.6				11.2							11.0	8.4	10.2		12.7	10.4	11.2	11.2	4.8	6.8		12.5	5.4	11.0	12.8	8.5	11.3	6.8				**9.7**
May 7, 2014	15:00	21:00	2.3	4.4	5.0	2.5	3.8	2.3			3.0	2.0	3.5	2.3	1.0	3.0	2.3	5.8	4.4	6.4		2.8	5.2	5.0	5.0	2.3	4.3		2.0	0.8	3.3	3.0	2.5	2.0	2.8				**3.3**
May 12, 2014	8:30	21:00	4.8	8.0	3.3	4.8	7.8	4.0			4.8	4.0	3.0	4.5	1.5	3.0	6.0	4.0	3.4	3.6			2.4	6.4	1.6	2.8	0.5		1.5	0.9	14.5	4.5	4.5	4.3	4.3				**4.2**
May 19-20. 2014	5/19/2014 10:30	5/20/2014 4:00	9.8	12.4	8.5	10.4	11.8	11.3	9.8	9.8	13	9	10.3	15.2	8.5	10.1	10.3	10	10.4	9			8.6	11.2	8.8	4.5	3.8	9	41.3	6.1	15.4	12.3	10.1	27.6	8.3				**11.5**
May 24, 2014	0:00	23:59	3.8	7.6	16.7	5.8	8.2	6.1	8.1	9.9	5.2	6.6	7.3	5.3	2.8	4.6	6.6	14.8	7.8	14.0			10.8	6.2	10.6	5.3	2.8	9.3	7.6	3.5	5.3	7.6	4.8	7.6	6.6				**7.4**
May 25, 2014	7:00	17:00	4.3	5.8	10.6	3.5	6.0	3.8	11.6	8.6	6.6	3.8	8.1	3.8	6.6	5.6	3.8	12.6	6.4	20.8			20.2	9.8	13.4	5.5	14.3	6.0	5.6	1.5	4.3	6.6	4.6	4.8	5.3				**7.5**
		Total	**52.1**	**65.4**	**70.8**	**39.5**	**67.0**	**27.4**	**29.5**	**28.2**	**63.6**	**40.2**	**50.2**	**31.1**	**20.4**	**26.2**	**39.7**	**78.0**	**58.4**	**80.6**	**0.0**	**31.3**	**77.4**	**69.4**	**68.8**	**34.9**	**40.8**	**24.4**	**89.5**	**36.7**	**73.1**	**68.5**	**55.0**	**76.6**	**49.7**	**0.0**	**0.0**	**0.0**	**60.7**



Rainfall Gauge Station Location

8mm Isohyetal Line

3.55mm Accumulation

ALL MEASUREMENTS ARE METRIC

IT IS HEREBY EXPRESSLY UNDERSTOOD that any calculat on, or nformat on provided to private property owners, their agents and contractors with respect to the information provided shall be accepted by such persons at the r own risk, and the CITY shall assume no responsibility for the information conta ned therein. The records of the CITY w ll be supplied on the basis that they are the best knowledge of the CITY and that persons requesting such nformat on must interpret the same for their own needs and/or requirements.

Winnipeg

THE CITY OF WINNIPEG

Water and Waste Department

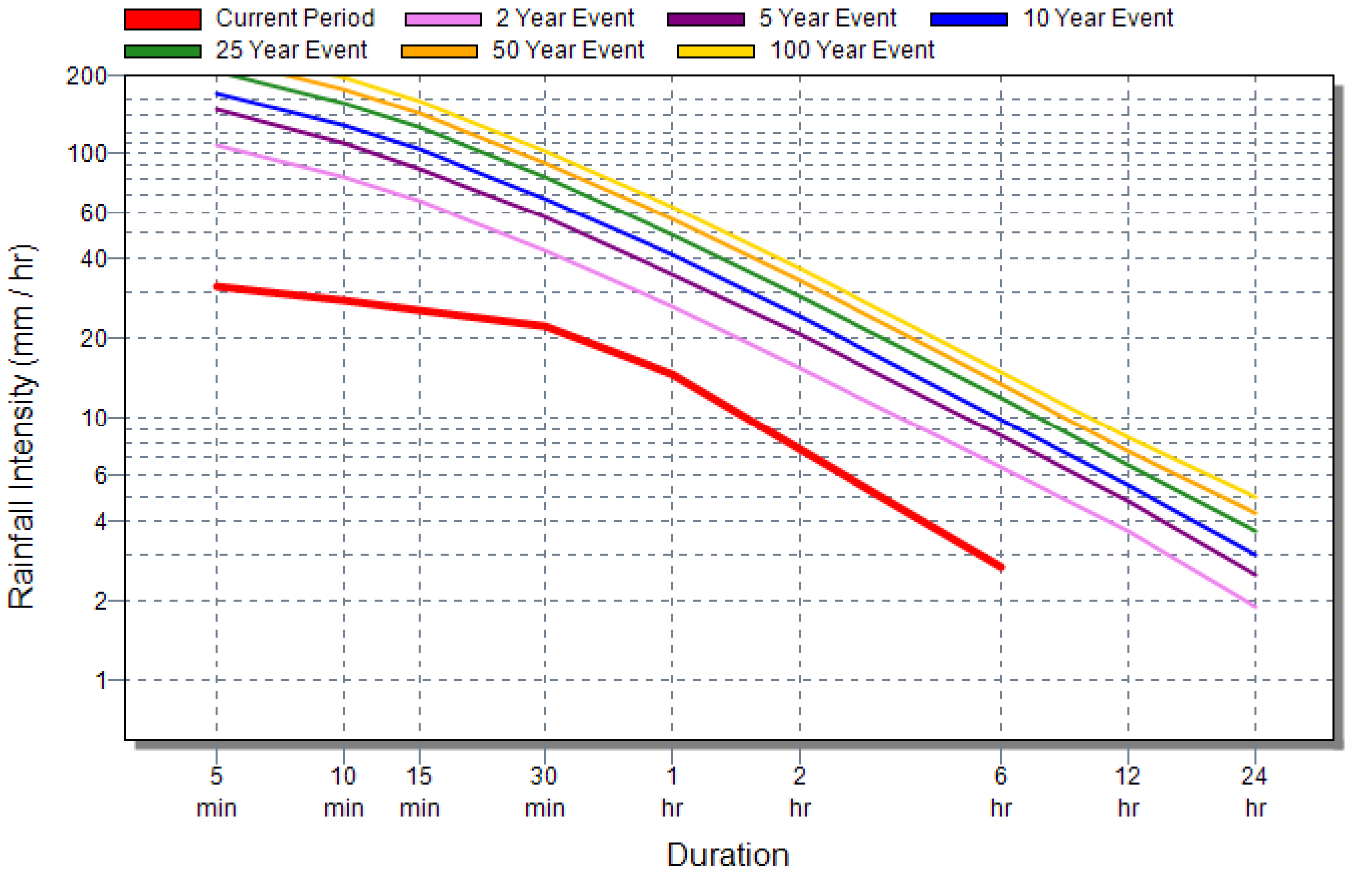
Monday, May 26, 2014

Rainfall Accumulation with Isohyetal for
2014-05-25 07:00
to
2014-05-25 17:00

Intensity Duration Frequency Analysis

LMP (Little Mtn Park)

Rainfall Period: 2014-05-25 07:00 to 2014-05-25 17:00
Historical Data: 5-min to 12 hour duration based on MacLaren Drainage Criteria Manual
24 hour duration based on AECOM (2012)

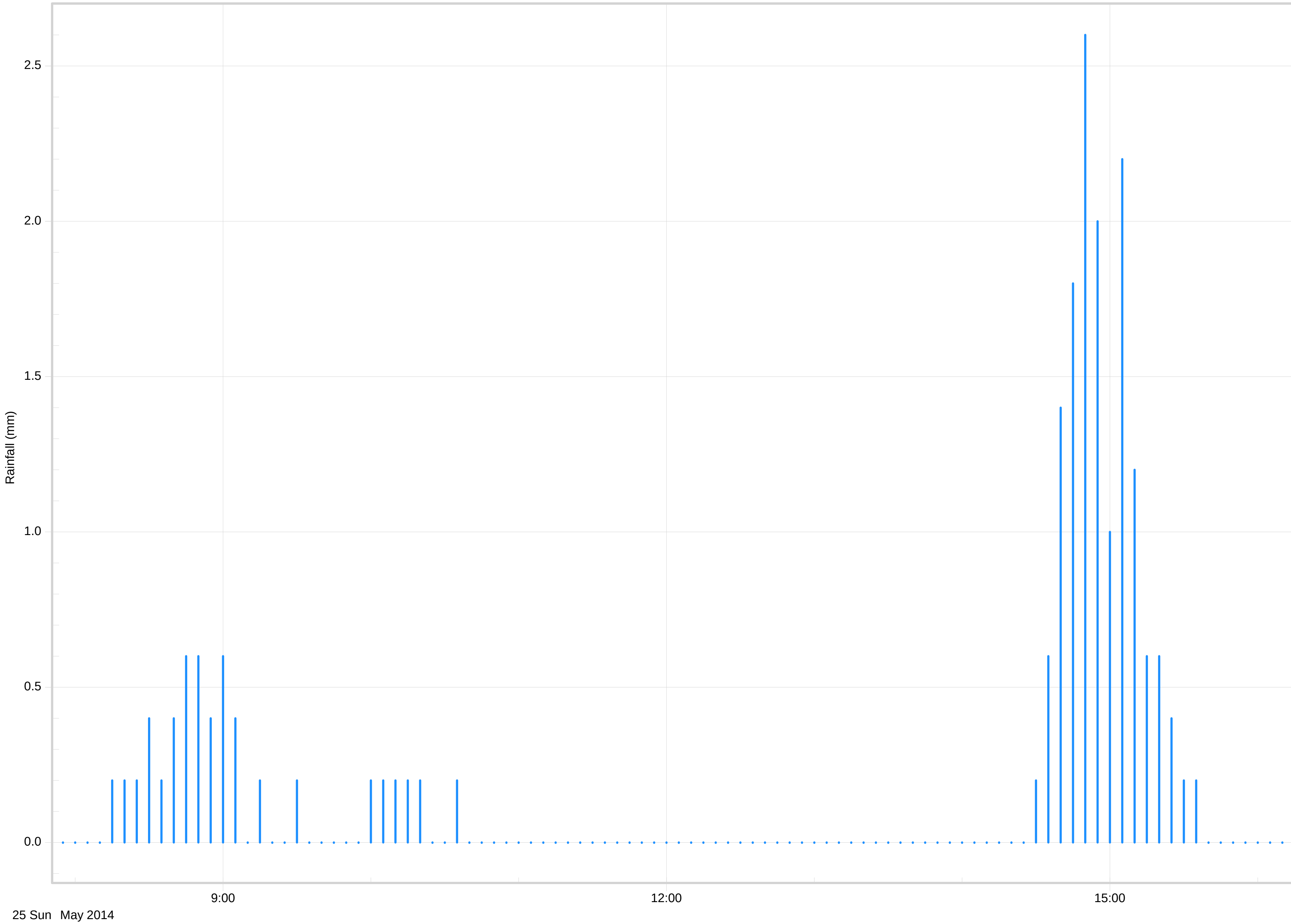


Total Rainfall During Period	20.8 mm
Hours in Period	10.0 hrs

	5 min	10 min	15 min	30 min	1 hr	2 hrs	6 hrs	12 hrs	24 hrs
Current Period	31.2	27.6	25.6	22.0	14.6	7.5	2.7	0.0	0.0
2 Year Event	108.8	81.5	65.9	42.8	26.2	15.4	6.4	3.7	1.9
5 Year Event	146.4	109.5	88.3	57.3	34.9	20.5	8.5	4.8	2.5
10 Year Event	168.8	128.0	103.9	67.8	41.3	24.1	9.8	5.5	3.0
25 Year Event	204.0	154.5	125.4	81.7	49.7	29.0	11.8	6.6	3.7
50 Year Event	231.2	175.1	142.0	92.5	56.3	32.8	13.3	7.4	4.3
100 Year Event	258.4	195.6	158.6	103.2	62.7	36.5	14.8	8.3	5.0

LMP (Little Mtn Park)

Start Date: May 25, 2014 07:50:35
End Date: May 25, 2014 16:15:26
Data: Rainfall (mm)



CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
STORM LOG SUMMER 2014

DATE OF STORM	MAX MUM ACCUMULATION (mm)	STATION WHERE MAX. OCCURRED	MINIMUM ACCUMULATION (mm)	STATION WHERE MIN. OCCURRED	MAXIMUM STATION RETURN PERIOD (30 min. interval)	BASEMENT FLOODING
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May 7, 2014	6.4	Little Mountain Park	0.8	South End Plant	Less than 1 year	No
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May 19-20, 2014	41.1	Brady Road Landfill	3.8	West End Pollution Control Centre	Approximately a 5 year	Yes
May 24,. 2014	16.7	Arthur E. Wright School	2.8	West End Pollution Control Centre	Less than 1 year	No
May 25, 2014	20.8	Little Mountain Park	1.5	South End Plant	Less than 1 year	Yes
Day on which the storm event begins. (6 hour separation between individual	Maximum total rain at any of the telemetry stations.	Station with maximum total rainfall.	Minimum total rainfall at any of the telemetry stations.	Station with minimum total rainfall.	Greatest return period over the 30 minute duration. (Location is not necessarily the same as the	If basement flood--ing has been reported to WWD or District

E9f May 12-26, 2014 Daily Rainfall

DateTime	12/05/2014	13/05/2014	14/05/2014	15/05/2014	16/05/2014	17/05/2014	18/05/2014
City of WPG - WPLRainfall (mm)Sum	4.75	0.25	0.25	0	0	0	0
ADS (Arthur Day School)Rainfall (mm)Sum	8	0.8	0	0	0	0	0.2
Arthur Wright SchoolRainfall (mm)Sum	3.25	0.5	0.25	0	0	0	0
Buhler Recreational ParkRainfall (mm)Sum	4.75	0.5	0.25	0	0	0	0
BWS (Bernie Wolfe School)Rainfall (mm)Sum	7.8	0.8	0.6	0	0	0	0.2
Chancellor SchoolRainfall (mm)Sum	4	0.75	0	0.25	0	0	0
City of WPG - MCRainfall (mm)Sum					0	0	0.5
City of WPG - NERainfall (mm)Sum	3.5	0.25	0.25	0	0	0	0
CLS (Clarence Lift Stn)Rainfall (mm)Sum	4.8	0.4	0.4	0	0	0	0
Ecole GuyotRainfall (mm)Sum	4	0.25	0	0	0	0	0
Ecole Tuxedo ParkRainfall (mm)Sum	3	0.25	0	0	0	0	0
Fort Richmond CollegiateRainfall (mm)Sum	4.5	0.75	0	0	0	0	0
Fort Whyte Alive CentreRainfall (mm)Sum	1.5	0	0.25	0	0	0	0
Henry G. Izatt SchoolRainfall (mm)Sum	3	0.5	0	0	0	0	0
Island Lakes SchoolRainfall (mm)Sum	6	0.5	0.25	0	0	0	0
KELS (King Edward Lift Stn)Rainfall (mm)Sum	4	0.2	0.2	0	0	0	0.2
KP (Kilcona Park)Rainfall (mm)Sum	9.4	0.8	0.4	0	0	0	0
LMP (Little Mtn Park)Rainfall (mm)Sum	3.6	0	0.6	0	0	0	0
Oak BluffRainfall (mm)Sum							
Oak Bluff 2Rain 5 Minute (mm)Sum							
OPT (Optimist Park)Rainfall (mm)Sum	2.4	0.2	0	0	0	0	0.2
UOFW (Univ of Wpg)Rainfall (mm)Sum	6.4	0.6	0.4	0	0	0	0.2
WLS (Westwood Lift Stn)Rainfall (mm)Sum	1.6	0	0	0	0	0	0
City of WPG - SBSRainfall (mm)Sum	2.75	0.25	0	0	0	0	0
City of WPG - WERainfall (mm)Sum	0.5	1	0	0	0	0	0
City of WPG - FS 24Rainfall (mm)Sum	5.25	0.25	0.25	0	0	0	0
City of WPG - BLRainfall (mm)Sum	1.5	0.75	0.25	0	0	0	0
City of WPG - SERainfall (mm)Sum	0.9	0.1	0.1	0	0	0	0
City of WPG - DWTPRainfall (mm)Sum	14.5	1.75	0.25	0	0	0	0
City of WPG - PAPRainfall (mm)Sum	4.5	0.5	0.25	0	0	0	0
City of WPG - MLRainfall (mm)Sum	4.5	0.25	0.25	0	0	0	0
Ecole Noel RitchotRainfall (mm)Sum	4.25	0.25	0	0	0	0	0
City of WPG - PRRainfall (mm)Sum	4.25	0.25	0.25	0	0	0	0

DateTime	19/05/2014	20/05/2014	21/05/2014	22/05/2014	23/05/2014	24/05/2014	25/05/2014
City of WPG - WPLRainfall (mm)Sum	8.54	1.75	0	0	0	3.78	4.29
ADS (Arthur Day School)Rainfall (mm)Sum	11.6	1.4	0	0	0	7.6	5.8
Arthur Wright SchoolRainfall (mm)Sum	8.26	0.75	0.25	0	0	16.7	10.64
Buhler Recreational ParkRainfall (mm)Sum	9.6	1.25	0	0	0	5.82	3.53
BWS (Bernie Wolfe School)Rainfall (mm)Sum	10.8	1.8	0.2	0	0	8.2	6
Chancellor SchoolRainfall (mm)Sum	8.04	4.04	0.25	0	0	6.09	3.78
City of WPG - MCRainfall (mm)Sum	9.03	1.25	0.25	0	0	8.11	11.61
City of WPG - NERainfall (mm)Sum	9.54	0.5	0	0	0	9.85	8.55
CLS (Clarence Lift Stn)Rainfall (mm)Sum	9.4	4.6	0.2	0	0	5.2	6.6
Ecole GuyotRainfall (mm)Sum	7.53	2.01	0	0	0	6.6	3.78
Ecole Tuxedo ParkRainfall (mm)Sum	8.79	2.5	0.25	0	0	7.34	8.09
Fort Richmond CollegiateRainfall (mm)Sum	9.58	6.32	0.25	0	0	5.31	3.79
Fort Whyte Alive CentreRainfall (mm)Sum	6.27	3.02	0.25	0	0	2.78	6.58
Henry G. Izatt SchoolRainfall (mm)Sum	7.29	4.02	0.25	0	0	4.55	5.56
Island Lakes SchoolRainfall (mm)Sum	8.29	2.77	0.25	0	0	6.58	3.78
KELS (King Edward Lift Stn)Rainfall (mm)Sum	9.6	0.8	0.4	0	0	14.8	12.6
KP (Kilcona Park)Rainfall (mm)Sum	9.8	1.4	0	0	0	7.8	6.4
LMP (Little Mtn Park)Rainfall (mm)Sum	8.8	0.8	0.6	0	0	14	20.8
Oak BluffRainfall (mm)Sum							
Oak Bluff 2Rain 5 Minute (mm)Sum							
OPT (Optimist Park)Rainfall (mm)Sum	8.4	0.6	0.4	0	0	10.8	20.2
UOFW (Univ of Wpg)Rainfall (mm)Sum	9.8	2.6	0.2	0	0	6.2	9.8
WLS (Westwood Lift Stn)Rainfall (mm)Sum	8.6	0.2	0	0	0	10.6	13.4
City of WPG - SBSRainfall (mm)Sum	4	0.75	0.25	0	0	5.3	5.54
City of WPG - WERainfall (mm)Sum	2.75	1.5	0.25	0	0	2.75	14.27
City of WPG - FS 24Rainfall (mm)Sum	8.52	0.75	0	0	0	9.33	6.04
City of WPG - BLRainfall (mm)Sum	9.58	32.5	0.25	0	0	7.6	5.57
City of WPG - SERainfall (mm)Sum	2.8	3.4	0	0	0	3.5	1.5
City of WPG - DWTPRainfall (mm)Sum	13.4	2.26	0.25	0	0	5.33	4.3
City of WPG - PAPRainfall (mm)Sum	10.55	2.26	0.25	0	0	7.6	6.57
City of WPG - MLRainfall (mm)Sum	8.8	2	0	0	0	4.81	4.55
Ecole Noel RitchotRainfall (mm)Sum	10.07	18.28	0.25	0	0	7.6	4.82
City of WPG - PRRainfall (mm)Sum	7.51	1	0.25	0	0	6.56	5.28

DateTime	26/05/2014	MEAN	MAX	MIN	2014-05-12 to 2014-05-26
City of WPG - WPLRainfall (mm)Sum	0	1.574	8.54	0	23.61
ADS (Arthur Day School)Rainfall (mm)Sum	0	2.36	11.6	0	35.4
Arthur Wright SchoolRainfall (mm)Sum	0	2.70667	16.7	0	40.6
Buhler Recreational ParkRainfall (mm)Sum	0	1.71333	9.6	0	25.7
BWS (Bernie Wolfe School)Rainfall (mm)Sum	0	2.42667	10.8	0	36.4
Chancellor SchoolRainfall (mm)Sum	0	1.81333	8.04	0	27.2
City of WPG - MCRainfall (mm)Sum	0	2.79545	11.61	0	30.75
City of WPG - NERainfall (mm)Sum	0	2.16267	9.85	0	32.44
CLS (Clarence Lift Stn)Rainfall (mm)Sum	0	2.10667	9.4	0	31.6
Ecole GuyotRainfall (mm)Sum	0	1.61133	7.53	0	24.17
Ecole Tuxedo ParkRainfall (mm)Sum	0	2.01467	8.79	0	30.22
Fort Richmond CollegiateRainfall (mm)Sum	0	2.03333	9.58	0	30.5
Fort Whyte Alive CentreRainfall (mm)Sum	0	1.37667	6.58	0	20.65
Henry G. Izatt SchoolRainfall (mm)Sum	0	1.678	7.29	0	25.17
Island Lakes SchoolRainfall (mm)Sum	0	1.89467	8.29	0	28.42
KELS (King Edward Lift Stn)Rainfall (mm)Sum	0	2.85333	14.8	0	42.8
KP (Kilcona Park)Rainfall (mm)Sum	0	2.4	9.8	0	36
LMP (Little Mtn Park)Rainfall (mm)Sum	0	3.28	20.8	0	49.2
Oak BluffRainfall (mm)Sum					
Oak Bluff 2Rain 5 Minute (mm)Sum					
OPT (Optimist Park)Rainfall (mm)Sum	0	2.88	20.2	0	43.2
UOFW (Univ of Wpg)Rainfall (mm)Sum	0	2.41333	9.8	0	36.2
WLS (Westwood Lift Stn)Rainfall (mm)Sum	0	2.29333	13.4	0	34.4
City of WPG - SBSRainfall (mm)Sum	0	1.256	5.54	0	18.84
City of WPG - WERainfall (mm)Sum	2.25	1.68467	14.27	0	25.27
City of WPG - FS 24Rainfall (mm)Sum	0.25	2.04267	9.33	0	30.64
City of WPG - BLRainfall (mm)Sum	0	3.86667	32.5	0	58
City of WPG - SERainfall (mm)Sum	0	0.82	3.5	0	12.3
City of WPG - DWTPRainfall (mm)Sum	0	2.80267	14.5	0	42.04
City of WPG - PAPRainfall (mm)Sum	0	2.16533	10.55	0	32.48
City of WPG - MLRainfall (mm)Sum	0	1.67733	8.8	0	25.16
Ecole Noel RitchotRainfall (mm)Sum	0	3.03467	18.28	0	45.52
City of WPG - PRRainfall (mm)Sum	0	1.69	7.51	0	25.35

AECOM

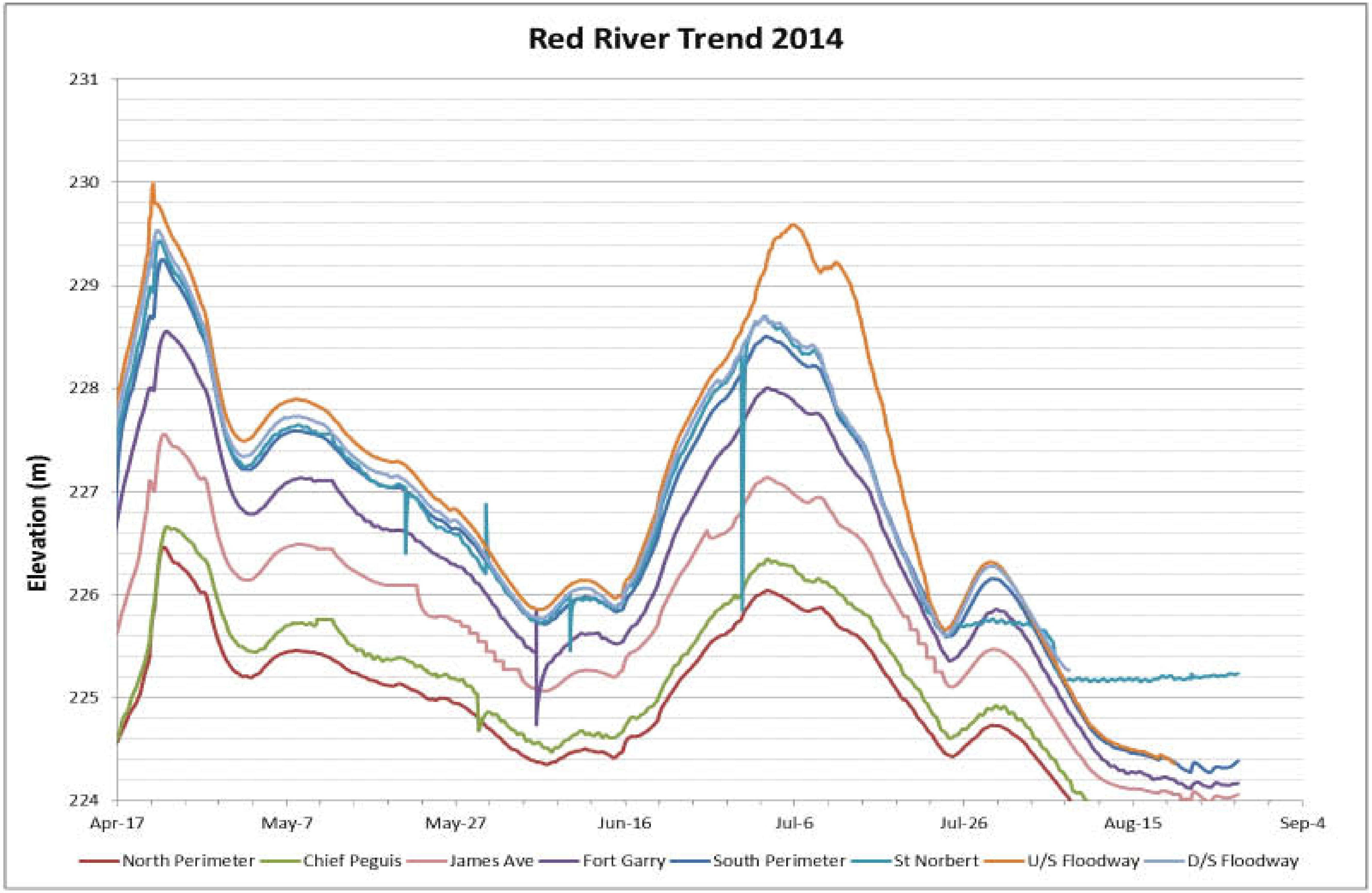
E9g Sept 23-Oct 7, 2013
Daily Rainfall

DateTime	23/09/2013	24/09/2013	25/09/2013	26/09/2013	27/09/2013	28/09/2013	29/09/2013	30/09/2013
Arthur Wright SchoolRain 5 Minute (mm)Sum	0	0	0	4.32	0.51	16.51	0.25	1.02
Buhler Recreational ParkRain 5 Minute (mm)Sum	0	0	0	0	0.51	19.3	0.25	0
Chancellor SchoolRain 5 Minute (mm)Sum	0	0	0	1.78	1.02	18.03	0	0.25
City of WPG - BLRain 5 Minute (mm)Sum	0	0	0	1.78	1.02	20.83	0	1.02
City of WPG - DWTPRain 5 Minute (mm)Sum	0	0	0	0.25	1.52	30.73	0.51	0.25
City of WPG - NERain 5 Minute (mm)Sum	0	0	0	4.06	0	18.54	0.25	0.25
City of WPG - PAPRain 5 Minute (mm)Sum	0	0	0	3.81	0.25	19.81	0	0.51
City of WPG - PRRain 5 Minute (mm)Sum	0	0	0	3.05	0	20.32	0	0.25
City of WPG - SERain 5 Minute (mm)Sum	0	0	0	0.25	0.76	14.48	0.25	0
City of WPG - WERain 5 Minute (mm)Sum	0	0	0	4.83	0.25	17.02	0	0.76
Ecole GuyotRain 5 Minute (mm)Sum	0	0	0	0.76	1.02	18.03	0.25	0
Ecole Noel RitchotRain 5 Minute (mm)Sum	0	0	0	0.76	0.51	1.27	1.02	0.76
Ecole Tuxedo ParkRain 5 Minute (mm)Sum	0	0	0	3.56	0	0	0	0
Fort Richmond CollegiateRain 5 Minute (mm)Sum	0	0	0	1.27	1.77	17.53	0	0.25
Fort Whyte Alive CentreRain 5 Minute (mm)Sum	0	0	0	3.56	0	16.76	0.25	0.51
Henry G. Izatt SchoolRain 5 Minute (mm)Sum	0	0	0	3.3	0.25	17.78	0.25	0.25
Island Lakes SchoolRain 5 Minute (mm)Sum	0	0	0	0.51	1.02	23.11	0	0.25
Oak Bluff 2Rain 5 Minute (mm)Sum	0	0	0	3.3	0.25	19.81	0.25	0.51
Oak BluffRain 5 Minute (mm)Sum	0	0	0	3.81	0	16	0	0.76
BWS (Bernie Wolfe School)Rainfall (mm)Sum	0	0	0	0.6	1.2	25.8	0.2	0
ADS (Arthur Day School)Rainfall (mm)Sum	0	0	0	0.6	1	26.4	0.2	0
CLS (Clarence Lift Stn)Rainfall (mm)Sum	0	0	0	3	0.4	24.8	0	0
KELS (King Edward Lift Stn)Rainfall (mm)Sum	0	0	0	5.4	0.2	26	0	0.2
LMP (Little Mtn Park)Rainfall (mm)Sum	0	0	0	7	0.2	26.4	0.2	0.2
OPT (Optimist Park)Rainfall (mm)Sum	0	0	0	6.6	0	26.6	0	0
UOFW (Univ of Wpg)Rainfall (mm)Sum	0	0	0	3.8	0.2	28.8	0	0
WLS (Westwood Lift Stn)Rainfall (mm)Sum	0	0	0	6	0.2	26	0	0.2

DateTime	01/10/2013	02/10/2013	03/10/2013	04/10/2013	05/10/2013	06/10/2013	07/10/2013	MEAN
Arthur Wright SchoolRain 5 Minute (mm)Sum	3.55	0	0	0	0	0	0	1.744
Buhler Recreational ParkRain 5 Minute (mm)Sum	3.3	0	0	0	0	0	0	1.55733
Chancellor SchoolRain 5 Minute (mm)Sum	3.82	0	0	0	0	0	0	1.66
City of WPG - BLRain 5 Minute (mm)Sum	3.81	0	0	0	0	0	0	1.89733
City of WPG - DWTPRain 5 Minute (mm)Sum	5.59	0	0.25	0	0	0	0	2.60667
City of WPG - NERain 5 Minute (mm)Sum	3.05	0	0	0	0	0	0	1.74333
City of WPG - PAPRain 5 Minute (mm)Sum	2.53	0	0	0	0	0	0	1.794
City of WPG - PRRain 5 Minute (mm)Sum	2.79	0	0	0	0	0	0	1.76067
City of WPG - SERain 5 Minute (mm)Sum	3.3	0	0	0	0	0	0	1.26933
City of WPG - WERain 5 Minute (mm)Sum	1.78	0	0	0	0	0	0	1.64267
Ecole GuyotRain 5 Minute (mm)Sum	3.56	0	0	0	0	0	0	1.57467
Ecole Noel RitchotRain 5 Minute (mm)Sum	0.25	0.51	1.02	0	0	0	0	0.40667
Ecole Tuxedo ParkRain 5 Minute (mm)Sum	2.29	0	0	0	0	0	0	0.39
Fort Richmond CollegiateRain 5 Minute (mm)Sum	4.32	0	0	0	0	0	0	1.676
Fort Whyte Alive CentreRain 5 Minute (mm)Sum	2.03	0	0	0	0	0	0	1.54067
Henry G. Izatt SchoolRain 5 Minute (mm)Sum	2.29	0	0	0	0	0	0	1.608
Island Lakes SchoolRain 5 Minute (mm)Sum	3.81	0	0	0	0	0	0	1.91333
Oak Bluff 2Rain 5 Minute (mm)Sum	2.54	0	0	0	0	0	0	1.77733
Oak BluffRain 5 Minute (mm)Sum	2.03	0	0	0	0	0	0	1.50667
BWS (Bernie Wolfe School)Rainfall (mm)Sum	3.4	0	0	0	0	0	0	2.08
ADS (Arthur Day School)Rainfall (mm)Sum	3.2	0	0	0	0	0	0	2.09333
CLS (Clarence Lift Stn)Rainfall (mm)Sum	3	0	0	0	0	0	0	2.08
KELS (King Edward Lift Stn)Rainfall (mm)Sum	4.4	0	0	0	0	0	0	2.41333
LMP (Little Mtn Park)Rainfall (mm)Sum	4.2	0	0	0	0	0	0	2.54667
OPT (Optimist Park)Rainfall (mm)Sum	3.4	0	0	0	0	0	0	2.44
UOFW (Univ of Wpg)Rainfall (mm)Sum	3.6	0	0	0	0	0	0	2.42667
WLS (Westwood Lift Stn)Rainfall (mm)Sum	3.8	0	0	0	0	0	0	2.41333

DateTime	MAX	MIN	2013-09-23 to 2013-10-07
Arthur Wright SchoolRain 5 Minute (mm)Sum	16.51	0	26.16
Buhler Recreational ParkRain 5 Minute (mm)Sum	19.3	0	23.36
Chancellor SchoolRain 5 Minute (mm)Sum	18.03	0	24.9
City of WPG - BLRain 5 Minute (mm)Sum	20.83	0	28.46
City of WPG - DWTPRain 5 Minute (mm)Sum	30.73	0	39.1
City of WPG - NERain 5 Minute (mm)Sum	18.54	0	26.15
City of WPG - PAPRain 5 Minute (mm)Sum	19.81	0	26.91
City of WPG - PRRain 5 Minute (mm)Sum	20.32	0	26.41
City of WPG - SERain 5 Minute (mm)Sum	14.48	0	19.04
City of WPG - WERain 5 Minute (mm)Sum	17.02	0	24.64
Ecole GuyotRain 5 Minute (mm)Sum	18.03	0	23.62
Ecole Noel RitchotRain 5 Minute (mm)Sum	1.27	0	6.1
Ecole Tuxedo ParkRain 5 Minute (mm)Sum	3.56	0	5.85
Fort Richmond CollegiateRain 5 Minute (mm)Sum	17.53	0	25.14
Fort Whyte Alive CentreRain 5 Minute (mm)Sum	16.76	0	23.11
Henry G. Izatt SchoolRain 5 Minute (mm)Sum	17.78	0	24.12
Island Lakes SchoolRain 5 Minute (mm)Sum	23.11	0	28.7
Oak Bluff 2Rain 5 Minute (mm)Sum	19.81	0	26.66
Oak BluffRain 5 Minute (mm)Sum	16	0	22.6
BWS (Bernie Wolfe School)Rainfall (mm)Sum	25.8	0	31.2
ADS (Arthur Day School)Rainfall (mm)Sum	26.4	0	31.4
CLS (Clarence Lift Stn)Rainfall (mm)Sum	24.8	0	31.2
KELS (King Edward Lift Stn)Rainfall (mm)Sum	26	0	36.2
LMP (Little Mtn Park)Rainfall (mm)Sum	26.4	0	38.2
OPT (Optimist Park)Rainfall (mm)Sum	26.6	0	36.6
UOFW (Univ of Wpg)Rainfall (mm)Sum	28.8	0	36.4
WLS (Westwood Lift Stn)Rainfall (mm)Sum	26	0	36.2

E10 Red River Trend 2014



Red River Trend 2014
Elevation (m)
231
230
229
228
227
226
225
224
Apr-17
May-7
May-27
Jun-16
Jul-6
Jul-26
Aug-15
Sep-4
North Perimeter
Chief Peguis
James Ave
Fort Garry
South Perimeter
St Norbert
U/S Floodway
D/S Floodway

E11 Weather Data

E11a Jan 1-Feb 23, 2015 Environment Canada Weather Data

Station Name	WINNIPEG THE FORKS
Province	MANITOBA
Latitude	49.89
Longitude	-97.13
Elevation	230
Climate Identifier	5023262
WMO Identifier	71579
TC Identifier	XWN

Legend

A	Accumulated
C	Precipitation occurred, amount uncertain
E	Estimated
F	Accumulated and estimated
L	Precipitation may or may not have occurred
M	Missing
N	Temperature missing but known to be > 0
S	More than one occurrence
T	Trace
Y	Temperature missing but known to be < 0
[empty]	No data available
^	The value displayed is based on incomplete data
†	Data for this day has undergone only preliminary quality checking
‡	Partner data that is not subject to review by the National Climate Archives

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
1/1/2015	2015	1	1	†	-4.3	-19	-11.7	29.7	0	3	41
1/2/2015	2015	1	2	†	-13.5	-19.5	-16.5	34.5	5	2	35
1/3/2015	2015	1	3	†	-19.5	-26.9	-23.2	41.2	2.2	35	41
1/4/2015	2015	1	4	†	-26	-29.1	-27.6	45.6	0		<31
1/5/2015	2015	1	5	†	-16.9	-27	-22	40	0		<31
1/6/2015	2015	1	6	†	-16.5	-23.9	-20.2	38.2	0	34	44
1/7/2015	2015	1	7	†	-17.8	-24.4	-21.1	39.1	0		<31
1/8/2015	2015	1	8	†	-14.5	-20	-17.3	35.3	3.6	36	43
1/9/2015	2015	1	9	†	-16.1	-20.1	-18.1	36.1	0.2	31	32
1/10/2015	2015	1	10	†	-18.3	-22.1	-20.2	38.2	0.2		<31
1/11/2015	2015	1	11	†	-17.3	-23.3	-20.3	38.3	0.2		<31
1/12/2015	2015	1	12	†	-20.4	-27.1	-23.8	41.8	0		<31
1/13/2015	2015	1	13	†	-11.4	-21.6	-16.5	34.5		23	57
1/14/2015	2015	1	14	†	0.4	-11.5	-5.6	23.6	3.1	20	48
1/15/2015	2015	1	15	†	1.2	-17.4	-8.1	26.1	0	32	61
1/16/2015	2015	1	16	†	-3.3	-19.5	-11.4	29.4	0	20	54
1/17/2015	2015	1	17	†	1.1	-6	-2.5	20.5	1.1	29	54
1/18/2015	2015	1	18	†	0.4	-12.1	-5.9	23.9	0	32	54
1/19/2015	2015	1	19	†	-3.4	-10.9	-7.2	25.2	0	10	41
1/20/2015	2015	1	20	†	-3.4	-9.6	-6.5	24.5	0	35	46
1/21/2015	2015	1	21	†	-9.6	-16.4	-13	31	0	36	50
1/22/2015	2015	1	22	†	3.8	-9.7	-3	21	0	22	87
1/23/2015	2015	1	23	†	4.9	0.2	2.6	15.4	0	34	54
1/24/2015	2015	1	24	†	0.2	-10.2	-5	23	0	1	56
1/25/2015	2015	1	25	†	-2.4	-10.1	-6.3	24.3	0	22	59
1/26/2015	2015	1	26	†	2.6	-4.7	-1.1	19.1	0	33	65
1/27/2015	2015	1	27	†	-0.1	-5.5	-2.8	20.8	0	23	35
1/28/2015	2015	1	28	†	-0.5	-9.1	-4.8	22.8	0.8	33	70

1/29/2015	2015	1	29	†	-9	-17.3	-13.2	31.2	0	34	72
1/30/2015	2015	1	30	†	-7.2	-16	-11.6	29.6	0.8	36	83
1/31/2015	2015	1	31	†	-13.7	-25	-19.4	37.4	0	35	69
2/1/2015	2015	2	1	†	-19.4	-26.6	-23	41	0	23	48
2/2/2015	2015	2	2	†	-12.6	-19.6	-16.1	34.1	0	22	48
2/3/2015	2015	2	3	†	-10.8	-17.9	-14.4	32.4	0.2	33	52
2/4/2015	2015	2	4	†	-17.3	-23.4	-20.4	38.4		35	50
2/5/2015	2015	2	5	†	-7.2	-17.8	-12.5	30.5	0	19	35
2/6/2015	2015	2	6	†	-13.2	-18	-15.6	33.6	0.7		<31
2/7/2015	2015	2	7	†	-10.1	-15	-12.6	30.6	0		<31
2/8/2015	2015	2	8	†	-14.3	-22.2	-18.3	36.3	0.2		<31
2/9/2015	2015	2	9	†	-12.6	-17.2	-14.9	32.9	0		<31
2/10/2015	2015	2	10	†	-4.6	-15.3	-10	28	5.7	33	37
2/11/2015	2015	2	11	†	-15.3	-24.4	-19.9	37.9	0	34	37
2/12/2015	2015	2	12	†	-14.5	-24.9	-19.7	37.7	0	22	35
2/13/2015	2015	2	13	†	-11.7	-22.6	-17.2	35.2	0	34	41
2/14/2015	2015	2	14	†	-22.1	-28.4	-25.3	43.3	0	1	33
2/15/2015	2015	2	15	†	-13.9	-22.1	-18	36	0.2	22	33
2/16/2015	2015	2	16	†	-12.1	-19.9	-16	34	0	33	32
2/17/2015	2015	2	17	†	-17.9	-24	-21	39	0	31	33
2/18/2015	2015	2	18	†	-21.1	-26.7	-23.9	41.9	0		<31
2/19/2015	2015	2	19	†	-12.8	-28.3	-20.6	38.6	0.4		<31
2/20/2015	2015	2	20	†	-10.3	-18.8	-14.6	32.6	1.4		<31
2/21/2015	2015	2	21	†	-18.7	-27.8	-23.3	41.3	0	2	32
2/22/2015	2015	2	22	†	-21.2	-29.7	-25.5	43.5	0		<31
2/23/2015	2015	2	23	†	-2.5	-24.7	-13.6	31.6	0.4	21	44

E11b 2014 Environment Canada Weather Data

Station Name	WINNIPEG THE FORKS
Province	MANITOBA
Latitude	49.89
Longitude	-97.13
Elevation	230
Climate Identifier	5023262
WMO Identifier	71579
TC Identifier	XWN

Legend

A	Accumulated
C	Precipitation occurred, amount uncertain
E	Estimated
F	Accumulated and estimated
L	Precipitation may or may not have occurred
M	Missing
N	Temperature missing but known to be > 0
S	More than one occurrence
T	Trace
Y	Temperature missing but known to be < 0
[empty]	No data available
^	The value displayed is based on incomplete data
†	Data for this day has undergone only preliminary quality checking
‡	Partner data that is not subject to review by the National Climate Archives

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
1/1/2014	2014	1	1	†	-24.1	-30	-27.1	45.1	M	M	0		<31
1/2/2014	2014	1	2	†	-20.6	-30.4	-25.5	43.5	M	M	0		<31
1/3/2014	2014	1	3	†	-11.1	-20.6	-15.9	33.9	M	M	14.7	32	39
1/4/2014	2014	1	4	†	-13 8	-27.2	-20.5	38.5	M	M	0.2	36	39
1/5/2014	2014	1	5	†	-27.1	-31.7	-29.4	47.4	M	M	0		<31
1/6/2014	2014	1	6	†	-24.4	-31.4	-27.9	45.9	M	M	0		<31
1/7/2014	2014	1	7	†	-20 8	-27.5	-24.2	42.2	M	M	0		<31
1/8/2014	2014	1	8	†	-20.4	-27.7	-24.1	42.1	M	M	0		<31
1/9/2014	2014	1	9	†	-5 8	-20.4	-13.1	31.1	M	M	0	22	32
1/10/2014	2014	1	10	†	-3 9	-9	-6 5	24.5	M	M	0		<31
1/11/2014	2014	1	11	†	-4.7	-9 5	-7.1	25.1	M	M	0.2		<31
1/12/2014	2014	1	12	†	1	-6.1	-2.6	20.6	M	M	0		<31
1/13/2014	2014	1	13	†	-6 2	-14.6	-10.4	28.4	M	M	0		<31
1/14/2014	2014	1	14	†	-12.1	-19.2	-15.7	33.7	M	M	1.5	35	32
1/15/2014	2014	1	15	†	2 9	-22.3	-9.7	27.7	M	M	2.5	33	61
1/16/2014	2014	1	16	†	-5 5	-20.7	-13.1	31.1	M	M	0.7	33	54
1/17/2014	2014	1	17	†	-11.7	-24.2	-18	36	M	M	4.3		<31
1/18/2014	2014	1	18	†	-0.1	-15.2	-7.7	25.7	M	M	0.2		<31
1/19/2014	2014	1	19	†	-2	-19.6	-10.8	28.8	M	M	0.7		<31
1/20/2014	2014	1	20	†	-19.6	-27.2	-23.4	41.4	M	M	0.2	1	37
1/21/2014	2014	1	21	†	-15.7	-26.6	-21.2	39.2	M	M	1.2	1	32
1/22/2014	2014	1	22	†	-18 3	-26.8	-22.6	40.6	M	M	0.2	33	35
1/23/2014	2014	1	23	†	-6 3	-29.5	-17.9	35.9	M	M	2.4	23	41
1/24/2014	2014	1	24	†	-1 2	-16.7	-9	27	M	M	3.4	35	48
1/25/2014	2014	1	25	†	-16.7	-22.3	-19.5	37.5	M	M	0	1	35
1/26/2014	2014	1	26	†	-17 9	-27	-22.5	40.5	M	M	1.4	32	52
1/27/2014	2014	1	27	†	-24.4	-28.7	-26.6	44.6	M	M	0	33	33
1/28/2014	2014	1	28	†	-15 8	-27.4	-21.6	39.6	M	M	0		<31
1/29/2014	2014	1	29	†	-10 3	-21.4	-15.9	33.9	M	M	0	33	41
1/30/2014	2014	1	30	†	-19.1	-23.9	-21.5	39.5	M	M	0	32	32
1/31/2014	2014	1	31	†	-15 2	-24.9	-20.1	38.1	M	M	0		<31
2/1/2014	2014	2	1	†	-16 5	-23.5	-20	38	M	M	0		<31
2/2/2014	2014	2	2	†	-10.7	-24	-17.4	35.4	M	M	0		<31
2/3/2014	2014	2	3	†	-11.4	-19.9	-15.7	33.7	M	M	0		<31
2/4/2014	2014	2	4	†	-17.1	-19.8	-18.5	36.5	M	M	0		<31
2/5/2014	2014	2	5	†	-18.7	-23.7	-21.2	39.2	M	M	0		
2/6/2014	2014	2	6	†	-13 2	-22.1	-17.7	35.7	M	M			<31
2/7/2014	2014	2	7	†	-13 9	-20.3	-17.1	35.1	M	M	0		<31
2/8/2014	2014	2	8	†	-16.4	-22.2	-19.3	37.3	M	M	0		<31
2/9/2014	2014	2	9	†	-21 2	-25.6	-23.4	41.4	M	M	0		<31
2/10/2014	2014	2	10	†	-17 9	-26.1	-22	40	M	M	0		<31
2/11/2014	2014	2	11	†	-12 2	-23.5	-17.9	35.9	M	M	1.8	21	41
2/12/2014	2014	2	12	†	-17.7	-21.8	-19.8	37.8	M	M	0		
2/13/2014	2014	2	13	†	-15 9	-23.3	-19.6	37.6	M	M	4.1	36	37

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
2/14/2014	2014	2	14	†	-15 8	-24.6	-20.2	38.2	M	M	0		<31
2/15/2014	2014	2	15	†	-12 8	-18.4	-15.6	33.6	M	M	0	1	33
2/16/2014	2014	2	16	†	-8 2	-22.8	-15.5	33.5	M	M	1.2		<31
2/17/2014	2014	2	17	†	-1.6	-8.6	-5.1	23.1	M	M	4.5		<31
2/18/2014	2014	2	18	†	1 9	-10.1	-4.1	22.1	M	M	0		<31
2/19/2014	2014	2	19	†	-4 9	-11.3	-8.1	26.1	M	M	0.3		<31
2/20/2014	2014	2	20	†	-6	-18.3	-12.2	30.2	M	M	2.6		<31
2/21/2014	2014	2	21	†	-13 8	-20.1	-17	35	M	M	0.4	35	43
2/22/2014	2014	2	22	†	-13.1	-16.9	-15	33	M	M	0.7	33	41
2/23/2014	2014	2	23	†	-13 8	-19.2	-16.5	34.5	M	M	0	33	39
2/24/2014	2014	2	24	†	-18	-23.9	-21	39	M	M	0		<31
2/25/2014	2014	2	25	†	-20.1	-23.6	-21.9	39.9	M	M	0	32	37
2/26/2014	2014	2	26	†	-14 2	-27.3	-20.8	38.8	M	M	0	32	52
2/27/2014	2014	2	27	†	-20	-29.3	-24.7	42.7	M	M	0		<31
2/28/2014	2014	2	28	†	-17.6	-26.9	-22.3	40.3	M	M	2	32	35
3/1/2014	2014	3	1	†	-24.6	-32.2	-28.4	46.4	M	M	0		<31
3/2/2014	2014	3	2	†	-18.7	-27.2	-23	41	M	M	0		<31
3/3/2014	2014	3	3	†	-15 8	-27.4	-21.6	39.6	M	M	0		<31
3/4/2014	2014	3	4	†	-12.7	-25.7	-19.2	37.2	M	M	0		<31
3/5/2014	2014	3	5	†	-6 2	-18.9	-12.6	30.6	M	M	2	19	32
3/6/2014	2014	3	6	†	-4.6	-8 3	-6 5	24.5	M	M	10.7		<31
3/7/2014	2014	3	7	†	-8 3	-17.7	-13	31	M	M	0	1	33
3/8/2014	2014	3	8	†	-4.1	-20	-12.1	30.1	M	M	0.2		<31
3/9/2014	2014	3	9	†	1	-5 8	-2.4	20.4	M	M	0		<31
3/10/2014	2014	3	10	†	6	-6 3	-0 2	18.2	M	M	0		<31
3/11/2014	2014	3	11	†	-4.1	-16.4	-10.3	28.3	M	M	0	33	32
3/12/2014	2014	3	12	†	-4 2	-19.5	-11.9	29.9	M	M	0	23	32
3/13/2014	2014	3	13	†	4 9	-6.6	-0 9	18.9	M	M	0		<31
3/14/2014	2014	3	14	†	1 9	-17.4	-7 8	25.8	M	M	0	33	43
3/15/2014	2014	3	15	†	-14 8	-23.1	-19	37	M	M	0		<31
3/16/2014	2014	3	16	†	-2 3	-20.6	-11.5	29.5	M	M	7.8	17	35
3/17/2014	2014	3	17	†	-2.1	-5 9	-4	22	M	M	0		<31
3/18/2014	2014	3	18	†	-2 5	-5.7	-4.1	22.1	M	M	0.2		<31
3/19/2014	2014	3	19	†	2.6	-5 3	-1.4	19.4	M	M	0		<31
3/20/2014	2014	3	20	†	2 5	-7 8	-2.7	20.7	M	M	0		<31
3/21/2014	2014	3	21	†	-2.6	-16.6	-9.6	27.6	M	M	0	31	46
3/22/2014	2014	3	22	†	-12.1	-19.1	-15.6	33.6	M	M	0.2		<31
3/23/2014	2014	3	23	†	-9 9	-22	-16	34	M	M	0		<31
3/24/2014	2014	3	24	†	-8 2	-14.7	-11.5	29.5	M	M	0	35	41
3/25/2014	2014	3	25	†	-7 5	-16.9	-12.2	30.2	M	M	0		<31
3/26/2014	2014	3	26	†	-0 8	-14.1	-7 5	25.5	M	M	0		<31
3/27/2014	2014	3	27	†	-5.7	-12.4	-9.1	27.1	M	M	0	32	39
3/28/2014	2014	3	28	†	-3	-16.3	-9.7	27.7	M	M	0		<31
3/29/2014	2014	3	29	†	3.7	-8.4	-2.4	20.4	M	M	0	22	41
3/30/2014	2014	3	30	†	3.4	-11.8	-4 2	22.2	M	M	0	36	43
3/31/2014	2014	3	31	†	-7.7	-12.8	-10.3	28.3	M	M	0	2	46
4/1/2014	2014	4	1	†	-5.6	-13.5	-9.6	27.6	M	M	0	1	32
4/2/2014	2014	4	2	†	0 3	-15	-7.4	25.4	M	M	0		<31
4/3/2014	2014	4	3	†	0 5	-5 9	-2.7	20.7	M	M	4.6		<31
4/4/2014	2014	4	4	†	2	-2 9	-0 5	18.5	M	M	0.2		<31
4/5/2014	2014	4	5	†	7	-2 9	2.1	15.9	M	M	0	23	32
4/6/2014	2014	4	6	†	8.4	-4.6	1.9	16.1	M	M	0.2		<31
4/7/2014	2014	4	7	†	3 5	-3 2	0.2	17.8	M	M	0		<31
4/8/2014	2014	4	8	†	6	-2.1	2	16	M	M	0.2		<31
4/9/2014	2014	4	9	†	11.5	2 3	6.9	11.1	M	M	0	26	44
4/10/2014	2014	4	10	†	8.1	2 5	5.3	12.7	M	M	0	29	33
4/11/2014	2014	4	11	†	3 5	-4.6	-0.6	18.6	M	M	0		<31
4/12/2014	2014	4	12	†	1.4	-4.7	-1.7	19.7	M	M	5.9	31	39
4/13/2014	2014	4	13	†	-1 8	-7.6	-4.7	22.7	M	M	0	33	41
4/14/2014	2014	4	14	†	-6 5	-12.2	-9.4	27.4	M	M	0	32	35
4/15/2014	2014	4	15	†	-1 9	-12.4	-7 2	25.2	M	M	0.2		<31
4/16/2014	2014	4	16	†	0.6	-8 2	-3 8	21.8	M	M	0		<31
4/17/2014	2014	4	17	†	2.7	-10.8	-4.1	22.1	M	M	0		<31
4/18/2014	2014	4	18	†	8.1	-6	1.1	16.9	M	M	1	13	39
4/19/2014	2014	4	19	†	12.6	1.7	7.2	10.8	M	M	1.7	22	43
4/20/2014	2014	4	20	†	11.7	0 8	6.3	11.7	M	M	0.5	33	35
4/21/2014	2014	4	21	†	8.6	1.1	4.9	13.1	M	M	0.2	33	39
4/22/2014	2014	4	22	†	13.8	0 8	7.3	10.7	M	M	0		<31
4/23/2014	2014	4	23	†	14.3	2 2	8.3	9.7	M	M	4.5	11	37

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
4/24/2014	2014	4	24	†	5	0.4	2.7	15.3	M	M	12.5		<31
4/25/2014	2014	4	25	†	8 9	0 5	4.7	13.3	M	M	2.7		<31
4/26/2014	2014	4	26	†	11.8	-0 2	5.8	12.2	M	M	0.2		<31
4/27/2014	2014	4	27	†	10	2.6	6.3	11.7	M	M	0	9	44
4/28/2014	2014	4	28	†	7 5	2 9	5.2	12.8	M	M	9.6	12	39
4/29/2014	2014	4	29	†	12.3	0 8	6.6	11.4	M	M	0	36	41
4/30/2014	2014	4	30	†	7.7	2 8	5.3	12.7	M	M	1.6	35	35
5/1/2014	2014	5	1	†	15.2	2 8	9	9	M	M	0.2	35	32
5/2/2014	2014	5	2	†	10.4	4 2	7.3	10.7	M	M	2.1	36	37
5/3/2014	2014	5	3	†	7	1 8	4.4	13.6	M	M	0.9	33	41
5/4/2014	2014	5	4	†	8.7	-0 5	4.1	13.9	M	M	0.3		<31
5/5/2014	2014	5	5	†	13	1.7	7.4	10.6	M	M	0		<31
5/6/2014	2014	5	6	†	12.9	4.4	8.7	9.3	M	M	0		<31
5/7/2014	2014	5	7	†	14.4	7	10.7	7.3	M	M	3.4		<31
5/8/2014	2014	5	8	†	10.5	4 9	7.7	10.3	M	M	1.3	2	41
5/9/2014	2014	5	9	†	16.4	4 8	10.6	7.4	M	M	0	3	37
5/10/2014	2014	5	10	†	22.8	6 8	14.8	3.2	M	M	0		<31
5/11/2014	2014	5	11	†	21.6	7.7	14.7	3.3	M	M	0	33	35
5/12/2014	2014	5	12	†	9.1	4 8	7	11	M	M	6.1	1	37
5/13/2014	2014	5	13	†	9.4	1 8	5.6	12.4	M	M	0.6	32	41
5/14/2014	2014	5	14	†	5.6	0 2	2.9	15.1	M	M	0.5	35	32
5/15/2014	2014	5	15	†	12.6	1 2	6.9	11.1	M	M	0		<31
5/16/2014	2014	5	16	†	16.8	2 5	9.7	8.3	M	M	0		<31
5/17/2014	2014	5	17	†	19.9	4 5	12.2	5.8	M	M	0		<31
5/18/2014	2014	5	18	†	17.2	5.4	11.3	6.7	M	M	0		<31
5/19/2014	2014	5	19	†	12.7	10.1	11.4	6.6	M	M	10.4	10	32
5/20/2014	2014	5	20	†	12.8	8.4	10.6	7.4	M	M	1.7	29	35
5/21/2014	2014	5	21	†	13	6 8	9.9	8.1	M	M	0		<31
5/22/2014	2014	5	22	†	22.4	4.6	13.5	4.5	M	M	0		<31
5/23/2014	2014	5	23	†	29	13.3	21.2	0	M	M	0		<31
5/24/2014	2014	5	24	†	32.7	16.2	24.5	0	M	M	4.4	32	35
5/25/2014	2014	5	25	†	21.4	12.4	16.9	1.1	M	M	8	7	35
5/26/2014	2014	5	26	†	19.1	9 5	14.3	3.7	M	M	0.2		<31
5/27/2014	2014	5	27	†	28	12.5	20.3	0	M	M	0.2		<31
5/28/2014	2014	5	28	†	26.8	16	21.4	0	M	M	0		<31
5/29/2014	2014	5	29	†	32	15.1	23.6	0	M	M	0	22	32
5/30/2014	2014	5	30	†	26.9	20	23.5	0	M	M	0		<31
5/31/2014	2014	5	31	†	27.5	16.6	22.1	0	M	M	0		<31
6/1/2014	2014	6	1	†	28.4	13.7	21.1	0	M	M	0.2	35	35
6/2/2014	2014	6	2	†	17.7	13.1	15.4	2.6	M	M	4		<31
6/3/2014	2014	6	3	†	25.9	12.3	19.1	0	M	M	0		<31
6/4/2014	2014	6	4	†	27.5	12.8	20.2	0	M	M	4.4	23	33
6/5/2014	2014	6	5	†	26.8	15.9	21.4	0	M	M	0		<31
6/6/2014	2014	6	6	†		12			M	M			<31
6/7/2014	2014	6	7	†	19.1	9.1	14.1	3.9	M	M	0	33	33
6/8/2014	2014	6	8	†	21.2	11.2	16.2	1.8	M	M	0.6		<31
6/9/2014	2014	6	9	†	20.4	10	15.2	2.8	M	M	2.8		<31
6/10/2014	2014	6	10	†	26.8	14.7	20.8	0	M	M	0	23	46
6/11/2014	2014	6	11	†	20.8	10.3	15.6	2.4	M	M	0	34	33
6/12/2014	2014	6	12	†	21.7	8 3	15	3	M	M	0	2	41
6/13/2014	2014	6	13	†	23.8	10	16.9	1.1	M	M	0.7		<31
6/14/2014	2014	6	14	†	16.3	12.3	14.3	3.7	M	M	26	10	33
6/15/2014	2014	6	15	†	13.9	12.3	13.1	4.9	M	M	44.9		<31
6/16/2014	2014	6	16	†	21.3	11.3	16.3	1.7	M	M	0.7		<31
6/17/2014	2014	6	17	†	19.5	11.2	15.4	2.6	M	M	0		<31
6/18/2014	2014	6	18	†	25.8	12.5	19.2	0	M	M	0	5	33
6/19/2014	2014	6	19	†	18.9	14.7	16.8	1.2	M	M	24	10	32
6/20/2014	2014	6	20	†	22.2	12.2	17.2	0.8	M	M	1.2		<31
6/21/2014	2014	6	21	†	28.6	14.8	21.7	0	M	M	5.9	32	33
6/22/2014	2014	6	22	†	24.2	15.6	19.9	0	M	M	0.9	23	33
6/23/2014	2014	6	23	†	24.3	14.5	19.4	0	M	M	1.2	1	35
6/24/2014	2014	6	24	†	17.9	13.2	15.6	2.4	M	M	0		<31
6/25/2014	2014	6	25	†	20.4	13.9	17.2	0.8	M	M	0.3		<31
6/26/2014	2014	6	26	†	23.5	13.2	18.4	0	M	M	0.3		<31
6/27/2014	2014	6	27	†	29.9	17.2	23.6	0	M	M	10.3	10	41
6/28/2014	2014	6	28	†	25.9	19.1	22.5	0	M	M	15.7	21	37
6/29/2014	2014	6	29	†	22	16.8	19.4	0	M	M	22.5	22	61
6/30/2014	2014	6	30	†	21.6	13.4	17.5	0.5	M	M	3.7	26	37
7/1/2014	2014	7	1	†	18.3	10.3	14.3	3.7	M	M	2.3	33	46

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
7/2/2014	2014	7	2	†	22.3	11.2	16.8	1.2	M	M	0.2		<31
7/3/2014	2014	7	3	†	25.6	13.6	19.6	0	M	M	0.2		<31
7/4/2014	2014	7	4	†	25.6	13.9	19.8	0	M	M	0.9		<31
7/5/2014	2014	7	5	†	32.1	20.3	26.2	0	M	M	0.4		<31
7/6/2014	2014	7	6	†	26.9	20.6	23.8	0	M	M	0	32	37
7/7/2014	2014	7	7	†	24.2	16.8	20.5	0	M	M	0.9	34	48
7/8/2014	2014	7	8	†	22.2	13.8	18	0	M	M	0	34	35
7/9/2014	2014	7	9	†	23.6	12.6	18.1	0	M	M	0		<31
7/10/2014	2014	7	10	†	27.4	14.9	21.2	0	M	M	0	23	32
7/11/2014	2014	7	11	†	26.9	19.2	23.1	0	M	M	0	30	35
7/12/2014	2014	7	12	†	25.6	14.5	20.1	0	M	M	2.6	34	46
7/13/2014	2014	7	13	†	15.8	9 9	12.9	5.1	M	M	4.7	1	39
7/14/2014	2014	7	14	†	20	8 9	14.5	3.5	M	M	0.8	34	39
7/15/2014	2014	7	15	†	22.1	11.2	16.7	1.3	M	M	0.2		<31
7/16/2014	2014	7	16	†	25.9	12.5	19.2	0	M	M	0.9		<31
7/17/2014	2014	7	17	†	27.3	16.1	21.7	0	M	M	0	21	33
7/18/2014	2014	7	18	†	28.6	17	22.8	0	M	M	9.4	21	39
7/19/2014	2014	7	19	†	25.3	17.4	21.4	0	M	M	0.5		<31
7/20/2014	2014	7	20	†	31.2	20.2	25.7	0	M	M	0.3	23	32
7/21/2014	2014	7	21	†	28.1	18	23.1	0	M	M	5.1		<31
7/22/2014	2014	7	22	†	25.6	15.7	20.7	0	M	M	0.5		<31
7/23/2014	2014	7	23	†	23.5	13.2	18.4	0	M	M	0.2		<31
7/24/2014	2014	7	24	†	24.5	13.4	19	0	M	M	0.5		<31
7/25/2014	2014	7	25	†	27.6	17.9	22.8	0	M	M	0.2	24	33
7/26/2014	2014	7	26	†	22.2	16	19.1	0	M	M	1.8	2	32
7/27/2014	2014	7	27	†	22.3	14.8	18.6	0	M	M	0.7	3	33
7/28/2014	2014	7	28	†	25.3	13.3	19.3	0	M	M	1.2		<31
7/29/2014	2014	7	29	†	26.4	15.8	21.1	0	M	M	0.9		<31
7/30/2014	2014	7	30	†	28.3	17	22.7	0	M	M			<31
7/31/2014	2014	7	31	†	27.7	17.2	22.5	0	M	M			<31
8/1/2014	2014	8	1	†	29.3	17.2	23.3	0	M	M			<31
8/2/2014	2014	8	2	†	25	17.3	21.2	0	M	M			<31
8/3/2014	2014	8	3	†	25.7	14.1	19.9	0	M	M			<31
8/4/2014	2014	8	4	†	27.7	16.4	22.1	0	M	M			<31
8/5/2014	2014	8	5	†	28.8	19.1	24	0	M	M			<31
8/6/2014	2014	8	6	†	27.9	18.5	23.2	0	M	M			<31
8/7/2014	2014	8	7	†	28.2	19.3	23.8	0	M	M		22	33
8/8/2014	2014	8	8	†	30.1	18.8	24.5	0	M	M			<31
8/9/2014	2014	8	9	†	28.9	18.8	23.9	0	M	M			<31
8/10/2014	2014	8	10	†	23.6	17.3	20.5	0	M	M			<31
8/11/2014	2014	8	11	†	24.9	14.2	19.6	0	M	M			<31
8/12/2014	2014	8	12	†	28.1	15.5	21.8	0	M	M			<31
8/13/2014	2014	8	13	†	25.6	13.4	19.5	0	M	M			<31
8/14/2014	2014	8	14	†	29.3	14.1	21.7	0	M	M			<31
8/15/2014	2014	8	15	†	32.5	19.4	26	0	M	M			<31
8/16/2014	2014	8	16	†	25	15.8	20.4	0	M	M			<31
8/17/2014	2014	8	17	†	24.6	13.2	18.9	0	M	M			<31
8/18/2014	2014	8	18	†	23.9	17.3	20.6	0	M	M			<31
8/19/2014	2014	8	19	†	26.3	16.7	21.5	0	M	M			<31
8/20/2014	2014	8	20	†	28.8	17.4	23.1	0	M	M			<31
8/21/2014	2014	8	21	†	26	18.7	22.4	0	M	M			<31
8/22/2014	2014	8	22	†	19.8	14.6	17.2	0.8	M	M			<31
8/23/2014	2014	8	23	†	19.5	13.4	16.5	1.5	M	M			<31
8/24/2014	2014	8	24	†	26	16.4	21.2	0	M	M		23	39
8/25/2014	2014	8	25	†	16.4	10.4	13.4	4.6	M	M		27	39
8/26/2014	2014	8	26	†	17.9	9	13.5	4.5	M	M			<31
8/27/2014	2014	8	27	†	23.9	9	16.5	1.5	M	M	0		<31
8/28/2014	2014	8	28	†	27.4	15.3	21.4	0	M	M	0		<31
8/29/2014	2014	8	29	†	20.7	11.9	16.3	1.7	M	M	8.4	1	35
8/30/2014	2014	8	30	†	21.3	9 3	15.3	2.7	M	M	0		<31
8/31/2014	2014	8	31	†	18	13.7	15.9	2.1	M	M	17.4		<31
9/1/2014	2014	9	1	†	23.4	12.8	18.1	0	M	M	0		<31
9/2/2014	2014	9	2	†	23.1	11.4	17.3	0.7	M	M	1.4		<31
9/3/2014	2014	9	3	†	22.6	12.2	17.4	0.6	M	M	0		<31
9/4/2014	2014	9	4	†	18.1	11	14.6	3.4	M	M	13.6	33	46
9/5/2014	2014	9	5	†	20.6	9.4	15	3	M	M	2.4	23	44
9/6/2014	2014	9	6	†	24.5	9 2	16.9	1.1	M	M	0	23	33
9/7/2014	2014	9	7	†	24.8	9 5	17.2	0.8	M	M	0		<31
9/8/2014	2014	9	8	†	21.6	9.4	15.5	2.5	M	M	0.3	35	37

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
9/9/2014	2014	9	9	†	11.9	6 5	9.2	8.8	M	M	0	36	37
9/10/2014	2014	9	10	†	11.7	4.7	8.2	9.8	M	M	0	4	35
9/11/2014	2014	9	11	†	12.2	6 3	9.3	8.7	M	M	0.2	33	35
9/12/2014	2014	9	12	†	14	5 3	9.7	8.3	M	M	0	23	32
9/13/2014	2014	9	13	†	16.7	4.4	10.6	7.4	M	M	0		<31
9/14/2014	2014	9	14	†	14.4	6	10.2	7.8	M	M	0.4		<31
9/15/2014	2014	9	15	†	18.6	6.1	12.4	5.6	M	M	0		<31
9/16/2014	2014	9	16	†	18.6	10.5	14.6	3.4	M	M	0		<31
9/17/2014	2014	9	17	†	10.8	4.7	7.8	10.2	M	M	0		<31
9/18/2014	2014	9	18	†	20.6	2 5	11.6	6.4	M	M	0	21	37
9/19/2014	2014	9	19	†	20.3	12.2	16.3	1.7	M	M	4.6	18	33
9/20/2014	2014	9	20	†	15.1	8 5	11.8	6.2	M	M	12.4		<31
9/21/2014	2014	9	21	†	18.7	9 8	14.3	3.7	M	M	0.2		<31
9/22/2014	2014	9	22	†	26.4	9 5	18	0	M	M	0		<31
9/23/2014	2014	9	23	†	25.9	11.3	18.6	0	M	M	0		<31
9/24/2014	2014	9	24	†	20.6	13.1	16.9	1.1	M	M	0		<31
9/25/2014	2014	9	25	†	26.8	14.5	20.7	0	M	M	0		<31
9/26/2014	2014	9	26	†	29.5	17.2	23.4	0	M	M	0	16	35
9/27/2014	2014	9	27	†	24.6	13.8	19.2	0	M	M	0	2	33
9/28/2014	2014	9	28	†	13.8	7 5	10.7	7.3	M	M	7.4	32	32
9/29/2014	2014	9	29	†	11.2	5 5	8.4	9.6	M	M	0.3		<31
9/30/2014	2014	9	30	†	16.2	5.1	10.7	7.3	M	M	1.7		<31
10/1/2014	2014	10	1	†	16.5	11.9	14.2	3.8	M	M	0.2	21	43
10/2/2014	2014	10	2	†	17.8	6.4	12.1	5.9	M	M	0.4	35	41
10/3/2014	2014	10	3	†	7	3 2	5.1	12.9	M	M	2.3	32	44
10/4/2014	2014	10	4	†	7.1	1 8	4.5	13.5	M	M	0.4	33	39
10/5/2014	2014	10	5	†	7 9	1.1	4.5	13.5	M	M	0	32	44
10/6/2014	2014	10	6	†	5 8	3	4.4	13.6	M	M	0	31	37
10/7/2014	2014	10	7	†	6.6	1.1	3.9	14.1	M	M	0.4	31	35
10/8/2014	2014	10	8	†	7 2	1 3	4.3	13.7	M	M	0	32	32
10/9/2014	2014	10	9	†	8 3	0 3	4.3	13.7	M	M	0		<31
10/10/2014	2014	10	10	†	11.1	0.4	5.8	12.2	M	M	0		<31
10/11/2014	2014	10	11	†	16.6	4.4	10.5	7.5	M	M	0	23	41
10/12/2014	2014	10	12	†	15	8 5	11.8	6.2	M	M	0.9		<31
10/13/2014	2014	10	13	†	17.6	6.4	12	6	M	M	0		<31
10/14/2014	2014	10	14	†	18.8	3 2	11	7	M	M	0		<31
10/15/2014	2014	10	15	†	20.6	10.9	15.8	2.2	M	M	0	21	35
10/16/2014	2014	10	16	†	16.8	6 8	11.8	6.2	M	M	0	35	48
10/17/2014	2014	10	17	†	6 8	4 2	5.5	12.5	M	M	0	36	41
10/18/2014	2014	10	18	†	7.1	2.7	4.9	13.1	M	M	0	20	33
10/19/2014	2014	10	19	†	17.3	4 5	10.9	7.1	M	M	0		<31
10/20/2014	2014	10	20	†	11.3	5 5	8.4	9.6	M	M	0		<31
10/21/2014	2014	10	21	†	16.2	4 5	10.4	7.6	M	M	0	12	32
10/22/2014	2014	10	22	†	17.2	10.7	14	4	M	M	2.1	20	39
10/23/2014	2014	10	23	†	17.5	10	13.8	4.2	M	M	0		<31
10/24/2014	2014	10	24	†	20.8	9.1	15	3	M	M	0	27	41
10/25/2014	2014	10	25	†	14.2	3 3	8.8	9.2	M	M	0	33	41
10/26/2014	2014	10	26	†	13.7	0 5	7.1	10.9	M	M	0	11	39
10/27/2014	2014	10	27	†	7 8	3.6	5.7	12.3	M	M	0		<31
10/28/2014	2014	10	28	†	4.7	1.4	3.1	14.9	M	M	0.4	33	41
10/29/2014	2014	10	29	†	3.7	0 8	2.3	15.7	M	M	0		<31
10/30/2014	2014	10	30	†	3.4	-4	-0 3	18.3	M	M	0	35	43
10/31/2014	2014	10	31	†	3 5	-5 5	-1	19	M	M	0		<31
11/1/2014	2014	11	1	†	8	0 8	4.4	13.6	M	M	0.2	22	43
11/2/2014	2014	11	2	†	9 8	0 9	5.4	12.6	M	M	0		<31
11/3/2014	2014	11	3	†	9.6	1	5.3	12.7	M	M	0		<31
11/4/2014	2014	11	4	†	4.1	1 2	2.7	15.3	M	M	0.2	31	35
11/5/2014	2014	11	5	†	4	-1 3	1.4	16.6	M	M	0		<31
11/6/2014	2014	11	6	†	3 3	-1 8	0.8	17.2	M	M	0		<31
11/7/2014	2014	11	7	†	7 3	0 5	3.9	14.1	M	M	2	36	52
11/8/2014	2014	11	8	†	0.7	-6	-2.7	20.7	M	M	0.2	32	44
11/9/2014	2014	11	9	†	-5	-7 9	-6 5	24.5	M	M	0		<31
11/10/2014	2014	11	10	†	-5.6	-9 3	-7 5	25.5	M	M	0.2	33	32
11/11/2014	2014	11	11	†	-4.6	-11.8	-8 2	26.2	M	M	0.2	1	32
11/12/2014	2014	11	12	†	-4 5	-10.1	-7 3	25.3	M	M	0.5	32	37
11/13/2014	2014	11	13	†	-6 2	-12	-9.1	27.1	M	M	0		<31
11/14/2014	2014	11	14	†	-6 8	-15	-10.9	28.9	M	M	0.2		<31
11/15/2014	2014	11	15	†	-9 5	-14.2	-11.9	29.9	M	M	0		<31
11/16/2014	2014	11	16	†	-7.1	-12.7	-9 9	27.9	M	M	2.1	33	48

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
11/17/2014	2014	11	17	†	-9 3	-12.7	-11	29	M	M	0.5	35	35
11/18/2014	2014	11	18	†	-6.7	-13	-9 9	27.9	M	M	0.5		<31
11/19/2014	2014	11	19	†	-6.6	-14.3	-10.5	28.5	M	M	0.2	33	48
11/20/2014	2014	11	20	†	-9.6	-16.6	-13.1	31.1	M	M	0.2		<31
11/21/2014	2014	11	21	†	2.6	-9.6	-3 5	21.5	M	M	0	19	33
11/22/2014	2014	11	22	†	1 2	-3.7	-1 3	19.3	M	M	0.5		<31
11/23/2014	2014	11	23	†	1 9	-11.7	-4 9	22.9	M	M	0	33	37
11/24/2014	2014	11	24	†	-9 9	-16.8	-13.4	31.4	M	M	0	2	35
11/25/2014	2014	11	25	†	-10.7	-20.6	-15.7	33.7	M	M	0.6	1	32
11/26/2014	2014	11	26	†	-18 8	-23.9	-21.4	39.4	M	M	0.2		<31
11/27/2014	2014	11	27	†	-14 5	-24.1	-19.3	37.3	M	M	0		<31
11/28/2014	2014	11	28	†	-10.1	-16.7	-13.4	31.4	M	M	0		<31
11/29/2014	2014	11	29	†	-8.4	-18.3	-13.4	31.4	M	M	10.2	31	35
11/30/2014	2014	11	30	†	-18 3	-23.2	-20.8	38.8	M	M	0	30	41
12/1/2014	2014	12	1	†	-15 8	-26.1	-21	39	M	M	0	22	39
12/2/2014	2014	12	2	†	-10 3	-17.4	-13.9	31.9	M	M	0		<31
12/3/2014	2014	12	3	†	-10 8	-16.5	-13.7	31.7	M	M	0		<31
12/4/2014	2014	12	4	†	-6.4	-13.4	-9 9	27.9	M	M	0		<31
12/5/2014	2014	12	5	†	-7.4	-13.5	-10.5	28.5	M	M	0		<31
12/6/2014	2014	12	6	†	-4.1	-16.6	-10.4	28.4	M	M	0		<31
12/7/2014	2014	12	7	†	1 3	-6.7	-2.7	20.7	M	M	0.4		<31
12/8/2014	2014	12	8	†	-5	-14.7	-9 9	27.9	M	M	0.9	32	35
12/9/2014	2014	12	9	†	-6	-16.5	-11.3	29.3	M	M		22	35
12/10/2014	2014	12	10	†	-1.7	-6	-3 9	21.9	M	M	0.7	22	41
12/11/2014	2014	12	11	†	-0 2	-2 9	-1.6	19.6	M	M	0.2	22	32
12/12/2014	2014	12	12	†	1.4	-0 5	0.5	17.5	M	M	0	21	35
12/13/2014	2014	12	13	†	1 5	-0.4	0.6	17.4	M	M	0		<31
12/14/2014	2014	12	14	†	1	-2.4	-0.7	18.7	M	M	0.7		<31
12/15/2014	2014	12	15	†	-2.4	-13.9	-8 2	26.2	M	M	0.2	32	44
12/16/2014	2014	12	16	†	-12.4	-16.9	-14.7	32.7	M	M	0		<31
12/17/2014	2014	12	17	†	-9.1	-17.3	-13.2	31.2	M	M	0.2		<31
12/18/2014	2014	12	18	†	-6 3	-14.6	-10.5	28.5	M	M	0		<31
12/19/2014	2014	12	19	†	-2.4	-6.7	-4.6	22.6	M	M	0.8		<31
12/20/2014	2014	12	20	†	-1.4	-3 2	-2 3	20.3	M	M	0.4		<31
12/21/2014	2014	12	21	†	-0 2	-1.4	-0 8	18.8	M	M	0.4		<31
12/22/2014	2014	12	22	†	1 5	-0.7	0.4	17.6	M	M	0.5		<31
12/23/2014	2014	12	23	†	0 2	-1.4	-0.6	18.6	M	M	0		<31
12/24/2014	2014	12	24	†	-1	-3.1	-2.1	20.1	M	M	0.7		<31
12/25/2014	2014	12	25	†	-0 9	-4 5	-2.7	20.7	M	M	0.4		<31
12/26/2014	2014	12	26	†	-4 3	-16.8	-10.6	28.6	M	M	0.4		<31
12/27/2014	2014	12	27	†	-12 2	-22.1	-17.2	35.2	M	M	0.4		<31
12/28/2014	2014	12	28	†	-21 5	-25.7	-23.6	41.6	M	M	0		<31
12/29/2014	2014	12	29	†	-19.6	-27.5	-23.6	41.6	M	M	0		<31
12/30/2014	2014	12	30	†	-16.1	-24.5	-20.3	38.3	M	M	0.4	19	37
12/31/2014	2014	12	31	†	-4.4	-16.1	-10.3	28.3	M	M	0	23	35

E11c 2013 Environment Canada Weather Data

Station Name	WINNIPEG THE FORKS
Province	MANITOBA
Latitude	49 89
Longitude	-97.13
Elevation	230
Climate Identifier	5023262
WMO Identifier	71579
TC Identifier	XWN

Legend

A	Accumulated
C	Precipitation occurred, amount uncertain
E	Estimated
F	Accumulated and estimated
L	Precipitation may or may not have occurred
M	Missing
N	Temperature missing but known to be > 0
S	More than one occurrence
T	Trace
Y	Temperature missing but known to be < 0
[empty]	No data available
^	The value displayed is based on incomplete data
†	Data for this day has undergone only preliminary quality checking
‡	Partner data that is not subject to review by the National Climate Archives

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
1/1/2013	2013	1	1	†	-8.3	-22.7	-15 5	33.5	M	M			<31
1/2/2013	2013	1	2	†	-6.8	-15.9	-11.4	29.4	M	M	0.3	34	32
1/3/2013	2013	1	3	†	-2.8	-15.3	-9.1	27.1	M	M	0.4	22	43
1/4/2013	2013	1	4	†	-3.1	-13.9	-8.5	26.5	M	M	0		<31
1/5/2013	2013	1	5	†	-10	-15.2	-12.6	30.6	M	M	0		<31
1/6/2013	2013	1	6	†	-7.3	-13.4	-10.4	28.4	M	M	0	20	41
1/7/2013	2013	1	7	†	1.2	-8.1	-3.5	21.5	M	M	0	32	39
1/8/2013	2013	1	8	†	1	-10.9	-5	23	M	M	1.8	20	39
1/9/2013	2013	1	9	†	-3.2	-6.1	-4.7	22.7	M	M	0	33	44
1/10/2013	2013	1	10	†	3.3	-4.7	-0.7	18.7	M	M	0		<31
1/11/2013	2013	1	11	†	-3.4	-14.3	-8.9	26.9	M	M	4.3	1	52
1/12/2013	2013	1	12	†	-14.3	-22.5	-18.4	36.4	M	M	2.5	1	50
1/13/2013	2013	1	13	†	-15.8	-23.7	-19 8	37.8	M	M	0		<31
1/14/2013	2013	1	14	†	-15.7	-21.8	-18 8	36.8	M	M	0.3		<31
1/15/2013	2013	1	15	†	-4.1	-21.9	-13	31	M	M	2.3	33	37
1/16/2013	2013	1	16	†	-7	-23.6	-15 3	33.3	M	M	0	34	39
1/17/2013	2013	1	17	†	-18.5	-21.5	-20	38	M	M	0		<31
1/18/2013	2013	1	18	†	-12.9	-18.6	-15 8	33.8	M	M	1.3		<31
1/19/2013	2013	1	19	†	-12.6	-23.4	-18	36	M	M	1.1	1	44
1/20/2013	2013	1	20	†	-21.9	-27.2	-24.6	42.6	M	M	0.3		<31
1/21/2013	2013	1	21	†	-24	-27.9	-26	44	M	M	0.3		<31
1/22/2013	2013	1	22	†	-17.9	-29.2	-23.6	41.6	M	M	0		<31
1/23/2013	2013	1	23	†	-17.9	-28.7	-23 3	41.3	M	M	0	36	39
1/24/2013	2013	1	24	†	-17.5	-30.1	-23 8	41.8	M	M	5.3		<31
1/25/2013	2013	1	25	†	-17.1	-25.7	-21.4	39.4	M	M	0.9		<31
1/26/2013	2013	1	26	†	-12.9	-25.2	-19.1	37.1	M	M	0		<31
1/27/2013	2013	1	27	†	-7.8	-19.3	-13.6	31.6	M	M	1.4		<31
1/28/2013	2013	1	28	†	-6.5	-15.5	-11	29	M	M	0		<31
1/29/2013	2013	1	29	†	-6.5	-16.9	-11.7	29.7	M	M	0	36	32
1/30/2013	2013	1	30	†	-14.4	-21.3	-17 9	35.9	M	M	0		<31
1/31/2013	2013	1	31	†	-21.2	-27.9	-24.6	42.6	M	M	0.6	32	32
2/1/2013	2013	2	1	†	-22	-31	-26 5	44.5	M	M	0		<31
2/2/2013	2013	2	2	†	-15.5	-30	-22 8	40.8	M	M	1		<31
2/3/2013	2013	2	3	†	-15.1	-19.7	-17.4	35.4	M	M	0		<31
2/4/2013	2013	2	4	†	-11.6	-26	-18 8	36.8	M	M	2.8		<31
2/5/2013	2013	2	5	†	-14.4	-23.2	-18 8	36.8	M	M	0		<31
2/6/2013	2013	2	6	†	-10.9	-17.5	-14 2	32.2	M	M	0		<31
2/7/2013	2013	2	7	†	-11.3	-19.3	-15 3	33.3	M	M	1.6		<31
2/8/2013	2013	2	8	†	-5.7	-17.4	-11.6	29.6	M	M	0	21	32
2/9/2013	2013	2	9	†	-3.2	-6.2	-4.7	22.7	M	M	0		<31
2/10/2013	2013	2	10	†	-2.2	-5.4	-3.8	21.8	M	M	0	4	37
2/11/2013	2013	2	11	†	-5.1	-11.2	-8.2	26.2	M	M	0.3	36	35
2/12/2013	2013	2	12	†	0.8	-11	-5.1	23.1	M	M	0		<31
2/13/2013	2013	2	13	†	-1.3	-12.6	-7	25	M	M	0		<31

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
2/14/2013	2013	2	14	†	-10.8	-17.2	-14	32	M	M	0.3		<31
2/15/2013	2013	2	15	†	-9.8	-18.1	-14	32	M	M	0.6		<31
2/16/2013	2013	2	16	†	-8.2	-18.9	-13.6	31.6	M	M	0.6		<31
2/17/2013	2013	2	17	†	-2	-8.6	-5.3	23.3	M	M	1	36	41
2/18/2013	2013	2	18	†	-5.6	-22.3	-14	32	M	M	2	36	54
2/19/2013	2013	2	19	†	-20	-26.6	-23 3	41.3	M	M	0.3	36	37
2/20/2013	2013	2	20	†	-13.4	-26	-19.7	37.7	M	M	0		<31
2/21/2013	2013	2	21	†	-7.5	-15.6	-11.6	29.6	M	M	0.5		<31
2/22/2013	2013	2	22	†	-6	-15.2	-10.6	28.6	M	M	2.1		<31
2/23/2013	2013	2	23	†	-4.6	-10.4	-7.5	25.5	M	M	0		<31
2/24/2013	2013	2	24	†	-4.2	-11	-7.6	25.6	M	M	0.3		<31
2/25/2013	2013	2	25	†	0.5	-13.3	-6.4	24.4	M	M	0.3		<31
2/26/2013	2013	2	26	†	-1.5	-9.7	-5.6	23.6	M	M	0.6		<31
2/27/2013	2013	2	27	†	-1.5	-9.5	-5.5	23.5	M	M	0.3	35	35
2/28/2013	2013	2	28	†	-4.8	-12.9	-8.9	26.9	M	M	0		<31
3/1/2013	2013	3	1	†	-3.4	-14	-8.7	26.7	M	M	0.9		<31
3/2/2013	2013	3	2	†	-3.1	-12.9	-8	26	M	M	0.3		<31
3/3/2013	2013	3	3	†	-0.6	-5.5	-3.1	21.1	M	M	0		<31
3/4/2013	2013	3	4	†	-1.1	-6	-3.6	21.6	M	M	6.8	6	32
3/5/2013	2013	3	5	†	-5.1	-8.6	-6.9	24.9	M	M	3.7		<31
3/6/2013	2013	3	6	†	-5.3	-14	-9.7	27.7	M	M	0.3		<31
3/7/2013	2013	3	7	†	-1.5	-14.5	-8	26	M	M	0.6		<31
3/8/2013	2013	3	8	†	-3.5	-7	-5.3	23.3	M	M	0		<31
3/9/2013	2013	3	9	†	-1.4	-7.4	-4.4	22.4	M	M	0.3		<31
3/10/2013	2013	3	10	†	-5.3	-11.4	-8.4	26.4	M	M	0.8		<31
3/11/2013	2013	3	11	†	-3.6	-14.3	-9	27	M	M	1.3		<31
3/12/2013	2013	3	12	†	-4.7	-12.4	-8.6	26.6	M	M	0	33	32
3/13/2013	2013	3	13	†	-5.8	-18.1	-12	30	M	M	1		<31
3/14/2013	2013	3	14	†	-1.9	-12.7	-7.3	25.3	M	M	0	36	37
3/15/2013	2013	3	15	†	-12.7	-17.2	-15	33	M	M	0.4		<31
3/16/2013	2013	3	16	†	-13.2	-21.1	-17 2	35.2	M	M	0	33	37
3/17/2013	2013	3	17	†	-9.4	-23.2	-16 3	34.3	M	M	3.5		<31
3/18/2013	2013	3	18	†	-8.4	-15.4	-11 9	29.9	M	M	4.8	1	41
3/19/2013	2013	3	19	†	-10	-18.7	-14.4	32.4	M	M	0.3	31	35
3/20/2013	2013	3	20										
3/21/2013	2013	3	21	†	-5.2	-18.7	-12	30	M	M	1.4		<31
3/22/2013	2013	3	22	†	-2.3	-16.7	-9.5	27.5	M	M	1.3		<31
3/23/2013	2013	3	23	†	-2	-13.8	-7.9	25.9	M	M	1.1		<31
3/24/2013	2013	3	24	†	-1.4	-7.8	-4.6	22.6	M	M	0.6		<31
3/25/2013	2013	3	25	†	-1.4	-8.5	-5	23	M	M	0		<31
3/26/2013	2013	3	26	†	-0.1	-12.8	-6.5	24.5	M	M			<31
3/27/2013	2013	3	27	†	1	-12.6	-5.8	23.8	M	M	0.9		<31
3/28/2013	2013	3	28										
3/29/2013	2013	3	29	†	1.8	-7.8	-3	21	M	M	0		<31
3/30/2013	2013	3	30	†	4.5	-4.2	0.2	17.8	M	M	0	35	35
3/31/2013	2013	3	31	†	-2.7	-9.9	-6.3	24.3	M	M	1	2	37
4/1/2013	2013	4	1	†	-1.6	-12	-6.8	24.8	M	M	0		<31
4/2/2013	2013	4	2	†	-2.8	-11.2	-7	25	M	M	0		<31
4/3/2013	2013	4	3	†	3.5	-8.9	-2.7	20.7	M	M	0.7	22	46
4/4/2013	2013	4	4	†	0.4	-7.9	-3.8	21.8	M	M	0.6	36	33
4/5/2013	2013	4	5	†	0.2	-10.9	-5.4	23.4	M	M			<31
4/6/2013	2013	4	6	†	1.7	-1.6	0.1	17.9	M	M	1	35	32
4/7/2013	2013	4	7	†	-0.9	-7.3	-4.1	22.1	M	M	1.4		<31
4/8/2013	2013	4	8	†	-4.9	-10.6	-7.8	25.8	M	M	0.3	32	37
4/9/2013	2013	4	9	†	-0.2	-13.2	-6.7	24.7	M	M	0.6		<31
4/10/2013	2013	4	10										
4/11/2013	2013	4	11	†	4.6	-4.9	-0.2	18.2	M	M	0	11	32
4/12/2013	2013	4	12	†	2.5	-1.9	0.3	17.7	M	M	0		<31
4/13/2013	2013	4	13	†	2.6	-5.1	-1.3	19.3	M	M	0.5		<31
4/14/2013	2013	4	14	†	6.4	-4.9	0.8	17.2	M	M	0	7	32
4/15/2013	2013	4	15	†	2.2	-1.4	0.4	17.6	M	M	4.3	3	41
4/16/2013	2013	4	16	†	2.1	-2.8	-0.4	18.4	M	M	0		<31
4/17/2013	2013	4	17	†	3.1	-2.3	0.4	17.6	M	M	0.5		<31
4/18/2013	2013	4	18	†	4.4	-1.9	1.3	16.7	M	M	0.3	2	37
4/19/2013	2013	4	19	†	1.3	-5	-1.9	19.9	M	M	0	36	43
4/20/2013	2013	4	20	†	2.4	-8.4	-3	21	M	M	0.8		<31
4/21/2013	2013	4	21	†	4.3	-1.1	1.6	16.4	M	M	3.8	28	37
4/22/2013	2013	4	22	†	1.7	-3.9	-1.1	19.1	M	M	0		<31
4/23/2013	2013	4	23	†	4	-5.2	-0.6	18.6	M	M	0		<31
4/24/2013	2013	4	24	†	5	-2.6	1.2	16 8	M	M	0	34	35
4/25/2013	2013	4	25	†	5.7	-3.2	1.3	16.7	M	M	0	21	33

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
4/26/2013	2013	4	26	†	15.3	1.8	8.6	9.4	M	M	0		<31
4/27/2013	2013	4	27	†	15.8	7.5	11.7	6 3	M	M	0	22	33
4/28/2013	2013	4	28	†	16.4	4.8	10.6	7.4	M	M	0	34	43
4/29/2013	2013	4	29	†	12.7	-0.4	6.2	11.8	M	M			<31
4/30/2013	2013	4	30	†	8.4	5.5	7	11	M	M			<31
5/1/2013	2013	5	1	†	-0.4	-3.8	-2.1	20.1	M	M			<31
5/2/2013	2013	5	2	†	2.5	-4.1	-0.8	18.8	M	M	0		<31
5/3/2013	2013	5	3	†		-2.9			M	M			<31
5/4/2013	2013	5	4	†	14.5	-0.8	6.9	11.1	M	M	0		<31
5/5/2013	2013	5	5	†	18.9	2.9	10 9	7.1	M	M	0		<31
5/6/2013	2013	5	6	†	25.4	5.8	15.6	2.4	M	M	0	23	32
5/7/2013	2013	5	7	†	24.1	10.7	17.4	0.6	M	M	0	22	32
5/8/2013	2013	5	8	†	12.3	2.2	7.3	10.7	M	M	0	35	41
5/9/2013	2013	5	9	†	14.3	-0.8	6.8	11.2	M	M	0		<31
5/10/2013	2013	5	10	†	11.2	2.7	7	11	M	M	1.3	33	43
5/11/2013	2013	5	11	†	9	0.3	4.7	13.3	M	M	0	32	44
5/12/2013	2013	5	12	†	15.5	-0.9	7.3	10.7	M	M	0		<31
5/13/2013	2013	5	13	†	25.7	8.6	17 2	0 8	M	M	0	22	43
5/14/2013	2013	5	14	†	24.6	13.7	19 2	0	M	M	0	34	59
5/15/2013	2013	5	15	†	21.5	8.2	14 9	3.1	M	M	0		<31
5/16/2013	2013	5	16	†	21.9	8.4	15 2	2 8	M	M	0		<31
5/17/2013	2013	5	17	†	19.3	9.8	14.6	3.4	M	M	2		<31
5/18/2013	2013	5	18	†	18.1	11.8	15	3	M	M	6.2		<31
5/19/2013	2013	5	19	†	16.3	10.9	13.6	4.4	M	M	5.8	8	41
5/20/2013	2013	5	20	†	14.5	8.9	11.7	6 3	M	M	11.4	6	54
5/21/2013	2013	5	21	†	21.6	9.4	15 5	2 5	M	M	0.2	5	46
5/22/2013	2013	5	22	†	20.2	7.1	13.7	4 3	M	M	0	2	41
5/23/2013	2013	5	23	†	18.7	5.1	11 9	6.1	M	M	0		<31
5/24/2013	2013	5	24	†	20.8	5.8	13 3	4.7	M	M	0	20	32
5/25/2013	2013	5	25	†	18.2	11.9	15.1	2 9	M	M	0	12	32
5/26/2013	2013	5	26	†	21.6	13.3	17 5	0 5	M	M	0		<31
5/27/2013	2013	5	27	†	23.8	13.3	18.6	0	M	M	0		<31
5/28/2013	2013	5	28	†	19.8	14.4	17.1	0 9	M	M	4.6		<31
5/29/2013	2013	5	29	†	20.4	11.8	16.1	1 9	M	M	0		<31
5/30/2013	2013	5	30	†	16	12.1	14.1	3 9	M	M	16.4	10	43
5/31/2013	2013	5	31	†	12.7	8.9	10 8	7 2	M	M	23.2	5	43
6/1/2013	2013	6	1	†	14.5	7	10 8	7 2	M	M	0	36	41
6/2/2013	2013	6	2	†	16.6	3.9	10 3	7.7	M	M	0		<31
6/3/2013	2013	6	3	†	19.5	4.8	12 2	5 8	M	M	0		<31
6/4/2013	2013	6	4	†	21.6	10.7	16 2	1 8	M	M	0	9	32
6/5/2013	2013	6	5	†	23.6	9.4	16 5	1 5	M	M	0		<31
6/6/2013	2013	6	6	†	24	11.4	17.7	0 3	M	M	0		<31
6/7/2013	2013	6	7	†	23.9	12.7	18 3	0	M	M	0.6	14	32
6/8/2013	2013	6	8	†	24.7	9.9	17 3	0.7	M	M	0		<31
6/9/2013	2013	6	9	†	20.2	13.1	16.7	1 3	M	M	0.6		<31
6/10/2013	2013	6	10	†	23.9	12.8	18.4	0	M	M	9.6	32	33
6/11/2013	2013	6	11	†	24.1	12.7	18.4	0	M	M	0	30	32
6/12/2013	2013	6	12	†	21.8	14.2	18	0	M	M	0		<31
6/13/2013	2013	6	13	†	25.9	12.3	19.1	0	M	M	0		<31
6/14/2013	2013	6	14	†	24.8	14.9	19 9	0	M	M	3.2		<31
6/15/2013	2013	6	15	†	25.1	13.5	19 3	0	M	M	0.2	27	43
6/16/2013	2013	6	16	†	22	13.8	17 9	0.1	M	M	0		<31
6/17/2013	2013	6	17	†	23.4	12.8	18.1	0	M	M	0		<31
6/18/2013	2013	6	18	†	26.1	12.1	19.1	0	M	M	0		<31
6/19/2013	2013	6	19	†	28.6	14.6	21.6	0	M	M	0		<31
6/20/2013	2013	6	20	†	26.7	16.5	21.6	0	M	M	5.4	9	32
6/21/2013	2013	6	21	†	22.8	17.5	20 2	0	M	M	0.2		<31
6/22/2013	2013	6	22	†	26.9	18.1	22 5	0	M	M	0		<31
6/23/2013	2013	6	23	†	23.5	14.3	18 9	0	M	M	20	29	39
6/24/2013	2013	6	24	†	28.6	14.2	21.4	0	M	M	0.2	21	32
6/25/2013	2013	6	25	†	31.4	17	24 2	0	M	M	14.2	27	54
6/26/2013	2013	6	26	†	27.4	17.6	22 5	0	M	M	8		<31
6/27/2013	2013	6	27	†	24	17.7	20 9	0	M	M	0	33	41
6/28/2013	2013	6	28	†	24.2	17.1	20.7	0	M	M	0.4		<31
6/29/2013	2013	6	29	†	26.9	15.7	21 3	0	M	M	0		<31
6/30/2013	2013	6	30	†	27.7	15.3	21 5	0	M	M	0		<31
7/1/2013	2013	7	1	†	29.4	16.4	22 9	0	M	M	0		<31
7/2/2013	2013	7	2	†	31.2	19.4	25 3	0	M	M	0		<31
7/3/2013	2013	7	3	†	31.8	20.5	26 2	0	M	M			<31
7/4/2013	2013	7	4	†	31.1	20.6	25 9	0	M	M	0		<31
7/5/2013	2013	7	5	†	28.7	19.4	24.1	0	M	M	0		<31

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
7/6/2013	2013	7	6	†	27.6	20.7	24 2	0	M	M	0		<31
7/7/2013	2013	7	7	†	26.8	19.9	23.4	0	M	M	0		<31
7/8/2013	2013	7	8	†	29.7	16.8	23 3	0	M	M	0		<31
7/9/2013	2013	7	9	†	21.6	15.1	18.4	0	M	M	2.6	32	32
7/10/2013	2013	7	10	†	24.7	15.1	19 9	0	M	M	0		<31
7/11/2013	2013	7	11	†	29.3	17	23 2	0	M	M	0	22	37
7/12/2013	2013	7	12	†	26.1	21.2	23.7	0	M	M	1.6		<31
7/13/2013	2013	7	13	†	29.9	18.9	24.4	0	M	M	1.2	22	32
7/14/2013	2013	7	14	†	24.4	16.2	20 3	0	M	M	0.2	32	32
7/15/2013	2013	7	15	†	29.2	15.7	22 5	0	M	M	0		<31
7/16/2013	2013	7	16	†	25.8	19.3	22.6	0	M	M	3	33	32
7/17/2013	2013	7	17	†	25.9	17.1	21 5	0	M	M	0		<31
7/18/2013	2013	7	18	†	25.2	16.7	21	0	M	M	20	36	37
7/19/2013	2013	7	19	†	24.8	12.6	18.7	0	M	M	0	34	41
7/20/2013	2013	7	20	†	19.4	10.4	14 9	3.1	M	M	0		<31
7/21/2013	2013	7	21	†	22.7	12.3	17 5	0 5	M	M	20.6		<31
7/22/2013	2013	7	22	†	20.5	15.2	17 9	0.1	M	M	0.2	30	37
7/23/2013	2013	7	23										
7/24/2013	2013	7	24	†	24.5	15	19 8	0	M	M	0		<31
7/25/2013	2013	7	25	†	19.8	14.1	17	1	M	M	12.4	36	35
7/26/2013	2013	7	26	†	18.2	11.1	14.7	3 3	M	M	0.2	4	37
7/27/2013	2013	7	27	†	21.2	10.8	16	2	M	M	0		<31
7/28/2013	2013	7	28	†	23.7	11.6	17.7	0 3	M	M	0		<31
7/29/2013	2013	7	29	†	23.7	12.3	18	0	M	M	2		<31
7/30/2013	2013	7	30	†	23.6	14.4	19	0	M	M	2.6		<31
7/31/2013	2013	7	31	†	22.5	12.5	17 5	0 5	M	M	0		<31
8/1/2013	2013	8	1	†	23.6	15.6	19.6	0	M	M	0.6		<31
8/2/2013	2013	8	2	†	22.1	12.7	17.4	0.6	M	M	0		<31
8/3/2013	2013	8	3	†	23	11.2	17.1	0 9	M	M	0		<31
8/4/2013	2013	8	4	†	21.8	10.9	16.4	1.6	M	M	5		<31
8/5/2013	2013	8	5	†	25.1	14.1	19.6	0	M	M	0.2		<31
8/6/2013	2013	8	6	†	20.1	13.6	16 9	1.1	M	M	0.2	4	32
8/7/2013	2013	8	7	†	18.5	11.3	14 9	3.1	M	M	0		<31
8/8/2013	2013	8	8	†	20.2	11.3	15 8	2 2	M	M	0	34	37
8/9/2013	2013	8	9	†	17.3	12.6	15	3	M	M	0.6		<31
8/10/2013	2013	8	10	†	23.9	12.3	18.1	0	M	M	3	24	32
8/11/2013	2013	8	11	†	24.8	12.4	18.6	0	M	M	0	35	33
8/12/2013	2013	8	12	†	21.6	13.4	17 5	0 5	M	M	0	36	32
8/13/2013	2013	8	13	†	22.8	11.2	17	1	M	M	0		<31
8/14/2013	2013	8	14	†	25.1	10.6	17 9	0.1	M	M	0		<31
8/15/2013	2013	8	15	†	26.9	13.4	20 2	0	M	M	0		<31
8/16/2013	2013	8	16	†	29.9	16.9	23.4	0	M	M	0	24	43
8/17/2013	2013	8	17	†	28.1	17	22.6	0	M	M	0	23	37
8/18/2013	2013	8	18	†	26.3	16.7	21 5	0	M	M	29.8	31	33
8/19/2013	2013	8	19	†	33.3	17.7	25 5	0	M	M	0		<31
8/20/2013	2013	8	20	†	30.3	18.2	24 3	0	M	M	0	36	35
8/21/2013	2013	8	21	†	24.7	16.3	20 5	0	M	M			<31
8/22/2013	2013	8	22	†	25	13.2	19.1	0	M	M	0		<31
8/23/2013	2013	8	23	†	28.4	13.3	20 9	0	M	M	0		<31
8/24/2013	2013	8	24	†	30.5	21.4	26	0	M	M	0.8	23	39
8/25/2013	2013	8	25	†	33	21.7	27.4	0	M	M	0		<31
8/26/2013	2013	8	26	†	32.5	17.7	25.1	0	M	M	0		<31
8/27/2013	2013	8	27	†	32.9	20.6	26 8	0	M	M	0		<31
8/28/2013	2013	8	28	†	33.5	21	27 3	0	M	M	0		<31
8/29/2013	2013	8	29	†	26.3	21.1	23.7	0	M	M	0.4		<31
8/30/2013	2013	8	30	†	29.8	18.6	24 2	0	M	M	0		<31
8/31/2013	2013	8	31	†	29.4	13.9	21.7	0	M	M	1.2	33	37
9/1/2013	2013	9	1	†	18.3	12.1	15 2	2 8	M	M	0.2	4	33
9/2/2013	2013	9	2	†	23.2	10.3	16 8	1 2	M	M	0		<31
9/3/2013	2013	9	3	†	27.7	10.7	19 2	0	M	M	0	33	32
9/4/2013	2013	9	4	†	21.7	8	14 9	3.1	M	M	0		<31
9/5/2013	2013	9	5	†	28.4	11.8	20.1	0	M	M	0		<31
9/6/2013	2013	9	6	†	33	19.3	26 2	0	M	M	0	36	35
9/7/2013	2013	9	7	†	25.3	15.6	20 5	0	M	M	0	2	35
9/8/2013	2013	9	8	†	22.9	12.9	17 9	0.1	M	M	0		<31
9/9/2013	2013	9	9	†		15.5			M	M			<31
9/10/2013	2013	9	10	†	27.1	15.9	21 5	0	M	M	0.8		<31
9/11/2013	2013	9	11	†	23.3	13.4	18.4	0	M	M			<31
9/12/2013	2013	9	12	†	20.8	12.7	16 8	1 2	M	M	0	33	33
9/13/2013	2013	9	13	†	26	11.4	18.7	0	M	M	0	22	32
9/14/2013	2013	9	14	†	20.6	10.9	15 8	2 2	M	M	1.6	4	37

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
9/15/2013	2013	9	15	†	16.1	5.8	11	7	M	M	0		<31
9/16/2013	2013	9	16	†	21.2	5.1	13 2	4 8	M	M	0	20	33
9/17/2013	2013	9	17	†	18.8	13.1	16	2	M	M	0	20	37
9/18/2013	2013	9	18	†	21.6	15.8	18.7	0	M	M	0.2		<31
9/19/2013	2013	9	19	†	19	9.6	14 3	3.7	M	M	0.2		<31
9/20/2013	2013	9	20	†	13.1	7	10.1	7 9	M	M	0	35	35
9/21/2013	2013	9	21	†	15.7	4.9	10 3	7.7	M	M	0		<31
9/22/2013	2013	9	22	†	21.3	5.8	13.6	4.4	M	M	0	13	33
9/23/2013	2013	9	23	†	26.3	16.3	21 3	0	M	M	0	22	39
9/24/2013	2013	9	24	†	24.6	13	18 8	0	M	M	0		<31
9/25/2013	2013	9	25	†	24.7	10.5	17.6	0.4	M	M	0		<31
9/26/2013	2013	9	26	†	21.8	13	17.4	0.6	M	M	3.4		<31
9/27/2013	2013	9	27	†	15.3	8.8	12.1	5 9	M	M	0.2		<31
9/28/2013	2013	9	28	†	12.5	8.1	10 3	7.7	M	M	23.6		<31
9/29/2013	2013	9	29	†	20.8	5.9	13.4	4.6	M	M	0.2		<31
9/30/2013	2013	9	30	†	22.1	12.9	17 5	0 5	M	M	2.6	23	32
10/1/2013	2013	10	1	†	17	8.3	12.7	5 3	M	M	0.4	27	46
10/2/2013	2013	10	2	†	17.2	5.9	11.6	6.4	M	M	0		<31
10/3/2013	2013	10	3	†	13.6	6.3	10	8	M	M	0	35	32
10/4/2013	2013	10	4	†	7.7	3.7	5.7	12.3	M	M	0	4	39
10/5/2013	2013	10	5	†	11	1.1	6.1	11.9	M	M	0	5	32
10/6/2013	2013	10	6	†	18.4	2.6	10 5	7 5	M	M	0	33	32
10/7/2013	2013	10	7	†	16.1	5.2	10.7	7 3	M	M	0		<31
10/8/2013	2013	10	8	†	19.4	10.7	15.1	2 9	M	M	0		<31
10/9/2013	2013	10	9	†	20.1	7.6	13 9	4.1	M	M	0		<31
10/10/2013	2013	10	10	†	20.9	6.5	13.7	4 3	M	M	0		<31
10/11/2013	2013	10	11	†	21	13.4	17 2	0 8	M	M	7.4	11	33
10/12/2013	2013	10	12	†	14.6	5.1	9.9	8.1	M	M	1.6	31	39
10/13/2013	2013	10	13	†	11.9	2.3	7.1	10.9	M	M	0		<31
10/14/2013	2013	10	14	†	9.1	0.2	4.7	13.3	M	M	0		<31
10/15/2013	2013	10	15	†	7.9	1.2	4.6	13.4	M	M	0		<31
10/16/2013	2013	10	16	†	14.3	1.3	7.8	10.2	M	M	0		<31
10/17/2013	2013	10	17	†	10.4	4.1	7.3	10.7	M	M	0		<31
10/18/2013	2013	10	18	†	7.8	1.7	4.8	13.2	M	M	0		<31
10/19/2013	2013	10	19	†	6.1	2.2	4.2	13.8	M	M	0.4		<31
10/20/2013	2013	10	20	†	2.9	-1.6	0.7	17.3	M	M	0	35	37
10/21/2013	2013	10	21	†	3.7	-1.4	1.2	16.8	M	M	0	32	35
10/22/2013	2013	10	22	†	2.8	-1	0.9	17.1	M	M	0		<31
10/23/2013	2013	10	23	†	2.9	-4	-0.6	18.6	M	M	0		<31
10/24/2013	2013	10	24	†	5.7	-0.4	2.7	15.3	M	M	0		<31
10/25/2013	2013	10	25	†	10.9	-0.7	5.1	12.9	M	M	0	23	46
10/26/2013	2013	10	26	†	5	1.7	3.4	14.6	M	M	0	32	44
10/27/2013	2013	10	27	†	3.2	-4.3	-0.6	18.6	M	M	0	4	43
10/28/2013	2013	10	28	†	-1.3	-5.8	-3.6	21.6	M	M	0		<31
10/29/2013	2013	10	29	†		-7.8			M	M			
10/30/2013	2013	10	30	†					M	M			<31
10/31/2013	2013	10	31	†	7.2	-0.9	3.2	14.8	M	M	0		<31
11/1/2013	2013	11	1	†	7.3	-2.7	2.3	15.7	M	M	0		<31
11/2/2013	2013	11	2	†	9.9	-2.1	3.9	14.1	M	M	0		<31
11/3/2013	2013	11	3	†	9.2	1.8	5.5	12.5	M	M	0	10	35
11/4/2013	2013	11	4	†	8.9	-1.4	3.8	14.2	M	M	0	22	39
11/5/2013	2013	11	5	†	-0.6	-3.3	-2	20	M	M	0	23	32
11/6/2013	2013	11	6	†	1.7	-5.4	-1.9	19.9	M	M	0		<31
11/7/2013	2013	11	7	†	1.9	-6.5	-2.3	20.3	M	M	0		<31
11/8/2013	2013	11	8	†	4.1	-6.3	-1.1	19.1	M	M	1		<31
11/9/2013	2013	11	9	†	1.6	-0.8	0.4	17.6	M	M	0.3		<31
11/10/2013	2013	11	10	†	-0.6	-12	-6.3	24.3	M	M	0	34	41
11/11/2013	2013	11	11	†	-8.6	-13.4	-11	29	M	M	0		<31
11/12/2013	2013	11	12	†	3.4	-12.2	-4.4	22.4	M	M	0	22	33
11/13/2013	2013	11	13	†	10	-1.8	4.1	13.9	M	M	0	22	32
11/14/2013	2013	11	14	†	2.5	-0.1	1.2	16.8	M	M	0		<31
11/15/2013	2013	11	15	†	8.3	-0.8	3.8	14.2	M	M	0	24	35
11/16/2013	2013	11	16	†	2.8	-2.2	0.3	17.7	M	M	0.5		<31
11/17/2013	2013	11	17	†	-0.6	-6.2	-3.4	21.4	M	M	5.2	31	37
11/18/2013	2013	11	18	†	-6.2	-8	-7.1	25.1	M	M	0		<31
11/19/2013	2013	11	19	†	1.7	-7.4	-2.9	20.9	M	M	0		<31
11/20/2013	2013	11	20	†	0.8	-10.4	-4.8	22.8	M	M	2	2	37
11/21/2013	2013	11	21	†	-10.3	-15.6	-13	31	M	M	0	32	35
11/22/2013	2013	11	22	†	-11.2	-19.1	-15 2	33.2	M	M	0.6	33	32
11/23/2013	2013	11	23	†	-13.9	-20.8	-17.4	35.4	M	M	0		<31
11/24/2013	2013	11	24	†	1.5	-13.9	-6.2	24.2	M	M	0	18	43

Date/Time	Year	Month	Day	Data Quality	Max Temp (°C)	Min Temp (°C)	Mean Temp (°C)	Heat Deg Days (°C)	Total Rain Flag	Total Snow Flag	Total Precip (mm)	Dir of Max Gust (10s deg)	Spd of Max Gust (km/h)
11/25/2013	2013	11	25	†	1.6	-10	-4.2	22.2	M	M	0	31	46
11/26/2013	2013	11	26	†	-9.2	-14.1	-11.7	29.7	M	M	0	30	33
11/27/2013	2013	11	27	†	-8.6	-14.1	-11.4	29.4	M	M	4.8		<31
11/28/2013	2013	11	28	†	-10.6	-16.5	-13.6	31.6	M	M	0		<31
11/29/2013	2013	11	29	†	-4.8	-17.6	-11 2	29.2	M	M	0		<31
11/30/2013	2013	11	30	†	-5.2	-6.6	-5.9	23.9	M	M	0		<31
12/1/2013	2013	12	1	†	-4.3	-6.1	-5.2	23.2	M	M	0		<31
12/2/2013	2013	12	2	†	-5.2	-7.6	-6.4	24.4	M	M	0		<31
12/3/2013	2013	12	3	†	-7.4	-11.8	-9.6	27.6	M	M	0	1	33
12/4/2013	2013	12	4	†	-9.3	-12.2	-10 8	28.8	M	M	8.3	1	33
12/5/2013	2013	12	5	†	-11.7	-18.5	-15.1	33.1	M	M	0.6	32	37
12/6/2013	2013	12	6	†	-18.1	-21.4	-19 8	37.8	M	M	0		<31
12/7/2013	2013	12	7	†	-21.2	-26.8	-24	42	M	M	0		<31
12/8/2013	2013	12	8	†	-19.5	-25.9	-22.7	40.7	M	M	0		<31
12/9/2013	2013	12	9	†	-21.6	-25.1	-23.4	41.4	M	M	0		<31
12/10/2013	2013	12	10	†	-19.6	-24.2	-21 9	39.9	M	M	0.2		<31
12/11/2013	2013	12	11	†	-21.1	-26.6	-23 9	41.9	M	M			<31
12/12/2013	2013	12	12	†	-18.5	-23.8	-21 2	39.2	M	M	0		<31
12/13/2013	2013	12	13	†	-23.2	-25	-24.1	42.1	M	M	0		<31
12/14/2013	2013	12	14	†	-20.7	-26.4	-23.6	41.6	M	M	0.9		<31
12/15/2013	2013	12	15	†	-18.5	-29.6	-24.1	42.1	M	M	0		<31
12/16/2013	2013	12	16	†	-0.8	-18.5	-9.7	27.7	M	M	1.4	22	35
12/17/2013	2013	12	17	†	-3	-18.7	-10 9	28.9	M	M	1	34	39
12/18/2013	2013	12	18	†	-12.4	-21.3	-16 9	34.9	M	M	0.2	34	35
12/19/2013	2013	12	19	†	-18.9	-24	-21 5	39.5	M	M	0		<31
12/20/2013	2013	12	20	†	-15.3	-21.7	-18 5	36.5	M	M	0		<31
12/21/2013	2013	12	21	†	-20.3	-27.8	-24.1	42.1	M	M	0		<31
12/22/2013	2013	12	22	†	-23.4	-27.4	-25.4	43.4	M	M	0		<31
12/23/2013	2013	12	23	†	-21.9	-28.9	-25.4	43.4	M	M	0		<31
12/24/2013	2013	12	24	†	-10.8	-23	-16 9	34.9	M	M	1.1	19	41
12/25/2013	2013	12	25	†	-9.6	-18.7	-14 2	32.2	M	M	1.1		<31
12/26/2013	2013	12	26	†	-7.4	-21.5	-14 5	32.5	M	M	0		<31
12/27/2013	2013	12	27	†	-1.2	-13.3	-7.3	25.3	M	M	1.5	21	33
12/28/2013	2013	12	28	†	-13.3	-27.6	-20 5	38.5	M	M	8.4	2	46
12/29/2013	2013	12	29	†	-25.1	-29.5	-27 3	45.3	M	M	0		<31
12/30/2013	2013	12	30	†	-26.4	-30.2	-28 3	46.3	M	M	0		<31
12/31/2013	2013	12	31	†	-27.2	-32	-29.6	47.6	M	M	0		<31

E12 WTP Output Flows and Reservoir Levels

E12a WTP Output Jan 12-26 2015

WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/12/2015 00:00	196.0414174	1/12/2015 00:12	191.8999939	1/12/2015 00:00	200.8000031
1/12/2015 01:00	195.9928018	1/12/2015 01:09	192.1000061	1/12/2015 01:38	201
1/12/2015 02:00	195.9311559	1/12/2015 02:57	192.1000061	1/12/2015 02:10	200.3000031
1/12/2015 03:00	196.0512926	1/12/2015 03:23	191.6000061	1/12/2015 03:45	200.3999939
1/12/2015 04:00	195.9770697	1/12/2015 04:57	192.1000061	1/12/2015 04:18	201.3999939
1/12/2015 05:00	196.0071207	1/12/2015 05:06	191.8999939	1/12/2015 05:17	201
1/12/2015 06:00	192.7840216	1/12/2015 06:48	187.8000031	1/12/2015 06:07	201
1/12/2015 07:00	192.0308911	1/12/2015 07:03	187.8000031	1/12/2015 07:46	197.5
1/12/2015 08:00	191.9943385	1/12/2015 08:43	187.3000031	1/12/2015 08:25	197.3000031
1/12/2015 09:00	191.9815955	1/12/2015 09:11	186.3999939	1/12/2015 09:04	197
1/12/2015 10:00	192.0311711	1/12/2015 10:35	187.8000031	1/12/2015 10:44	196.8999939
1/12/2015 11:00	192.0234488	1/12/2015 11:30	188.1999969	1/12/2015 11:26	197.1999969
1/12/2015 12:00	191.9600866	1/12/2015 12:28	188.1000061	1/12/2015 12:45	197.8999939
1/12/2015 13:00	192.0476567	1/12/2015 13:42	188.6999969	1/12/2015 13:31	196.8000031
1/12/2015 14:00	191.969738	1/12/2015 14:01	187.1999969	1/12/2015 14:37	197.1999969
1/12/2015 15:00	191.3103373	1/12/2015 15:31	184.8000031	1/12/2015 15:10	198.6999969
1/12/2015 16:00	188.5286618	1/12/2015 16:16	182.1999969	1/12/2015 16:13	193.6000061
1/12/2015 17:00	188.3801488	1/12/2015 17:25	183	1/12/2015 17:22	194.1999969
1/12/2015 18:00	187.8234647	1/12/2015 18:18	181.5	1/12/2015 18:37	193.6999969
1/12/2015 19:00	188.7309643	1/12/2015 19:44	183.3000031	1/12/2015 19:20	193.8999939
1/12/2015 20:00	188.4418376	1/12/2015 20:38	182.6000061	1/12/2015 20:08	194.3999939
1/12/2015 21:00	187.6951245	1/12/2015 21:30	180.8000031	1/12/2015 21:00	193.6999969
1/12/2015 22:00	188.0036193	1/12/2015 22:15	182.6000061	1/12/2015 22:08	193.5
1/12/2015 23:00	186.849352	1/12/2015 23:24	180.1999969	1/12/2015 23:49	193.1000061
1/13/2015 00:00	188.2901379	1/13/2015 00:44	182.5	1/13/2015 00:56	193.1999969
1/13/2015 01:00	186.5364663	1/13/2015 01:04	180.3999939	1/13/2015 01:25	193.1999969
1/13/2015 02:00	187.1243945	1/13/2015 02:19	180.1000061	1/13/2015 02:39	192.3999939
1/13/2015 03:00	187.3289082	1/13/2015 03:07	180.6000061	1/13/2015 03:02	192.3999939
1/13/2015 04:00	187.0952668	1/13/2015 04:19	181.1000061	1/13/2015 04:11	192.6999969
1/13/2015 05:00	186.9032603	1/13/2015 05:07	180.5	1/13/2015 05:20	192.8000031
1/13/2015 06:00	187.0090537	1/13/2015 06:39	181	1/13/2015 06:11	192.3999939
1/13/2015 07:00	187.0532128	1/13/2015 07:01	182.3000031	1/13/2015 07:00	192.6000061
1/13/2015 08:00	186.9676207	1/13/2015 08:51	180	1/13/2015 08:48	193.3000031
1/13/2015 09:00	188.1394432	1/13/2015 09:18	183.6000061	1/13/2015 09:14	192.6999969
1/13/2015 10:00	185.8796922	1/13/2015 10:08	180.5	1/13/2015 10:28	192.3000031
1/13/2015 11:00	186.8761084	1/13/2015 11:35	180.3000031	1/13/2015 11:16	193.1000061
1/13/2015 12:00	187.2000923	1/13/2015 12:25	180.8000031	1/13/2015 12:20	193.5
1/13/2015 13:00	187.6996888	1/13/2015 13:54	181.6000061	1/13/2015 13:07	193.3000031
1/13/2015 14:00	187.7697174	1/13/2015 14:42	182.6000061	1/13/2015 14:57	195.1000061
1/13/2015 15:00	188.3809134	1/13/2015 15:18	181.3000031	1/13/2015 15:35	194
1/13/2015 16:00	192.461972	1/13/2015 16:05	184.1000061	1/13/2015 16:22	200.8999939
1/13/2015 17:00	193.9998448	1/13/2015 17:18	188.8999939	1/13/2015 17:47	199.3000031
1/13/2015 18:00	194.039644	1/13/2015 18:37	189.1000061	1/13/2015 18:53	200.5
1/13/2015 19:00	193.9721738	1/13/2015 19:59	187	1/13/2015 19:58	200
1/13/2015 20:00	194.0291582	1/13/2015 20:09	187.8999939	1/13/2015 20:49	201
1/13/2015 21:00	193.9883055	1/13/2015 21:23	186.3999939	1/13/2015 21:50	199.6000061
1/13/2015 22:00	194.0100015	1/13/2015 22:03	189.3999939	1/13/2015 22:34	199.8000031
1/13/2015 23:00	194.0347528	1/13/2015 23:42	187.8000031	1/13/2015 23:50	200.3999939
1/14/2015 00:00	193.9588698	1/14/2015 00:17	188.8000031	1/14/2015 00:14	199.8000031
1/14/2015 01:00	193.9918767	1/14/2015 01:45	187.1000061	1/14/2015 01:58	200

WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/14/2015 02:00	197.7220993	1/14/2015 02:00	189.6999969	1/14/2015 02:40	203.1000061
1/14/2015 03:00	198.0497064	1/14/2015 03:48	192.8000031	1/14/2015 03:18	203.5
1/14/2015 04:00	197.9720965	1/14/2015 04:03	191.6000061	1/14/2015 04:47	203.3000031
1/14/2015 05:00	197.9831948	1/14/2015 05:24	191.6999969	1/14/2015 05:09	203.3000031
1/14/2015 06:00	197.9755985	1/14/2015 06:15	192.8000031	1/14/2015 06:35	204
1/14/2015 07:00	198.040534	1/14/2015 07:31	190.3000031	1/14/2015 07:55	202.3999939
1/14/2015 08:00	197.9883244	1/14/2015 08:05	192.8000031	1/14/2015 08:07	203.1999969
1/14/2015 09:00	197.8102364	1/14/2015 09:44	160.1999969	1/14/2015 09:45	220.8000031
1/14/2015 10:00	197.9734539	1/14/2015 10:55	191.6000061	1/14/2015 10:33	203.1000061
1/14/2015 11:00	198.0112955	1/14/2015 11:22	192.6000061	1/14/2015 11:33	203.8999939
1/14/2015 12:00	197.9480183	1/14/2015 12:42	191.6000061	1/14/2015 12:50	204.3999939
1/14/2015 13:00	197.9899921	1/14/2015 13:55	191.3000031	1/14/2015 13:06	206.1000061
1/14/2015 14:00	198.0310812	1/14/2015 14:10	191.1999969	1/14/2015 14:00	204.1000061
1/14/2015 15:00	197.9944367	1/14/2015 15:21	193	1/14/2015 15:48	203.8999939
1/14/2015 16:00	197.9525281	1/14/2015 16:58	191.6000061	1/14/2015 16:45	204.3999939
1/14/2015 17:00	198.0373381	1/14/2015 17:27	191.8000031	1/14/2015 17:13	203.1000061
1/14/2015 18:00	198.018991	1/14/2015 18:42	192.6999969	1/14/2015 18:58	204.3999939
1/14/2015 19:00	197.9845903	1/14/2015 19:07	191.8000031	1/14/2015 19:37	203.6000061
1/14/2015 20:00	197.9750879	1/14/2015 20:41	191	1/14/2015 20:11	204
1/14/2015 21:00	197.9784932	1/14/2015 21:17	192	1/14/2015 21:43	204.1999969
1/14/2015 22:00	197.9818483	1/14/2015 22:22	193	1/14/2015 22:38	204.8000031
1/14/2015 23:00	198.0011231	1/14/2015 23:49	191.6000061	1/14/2015 23:28	202.6000061
1/15/2015 00:00	198.0079979	1/15/2015 00:05	193	1/15/2015 00:40	203.6000061
1/15/2015 01:00	197.9689538	1/15/2015 01:55	192.8999939	1/15/2015 01:35	203.1999969
1/15/2015 02:00	197.9667348	1/15/2015 02:23	192.6000061	1/15/2015 02:24	206
1/15/2015 03:00	198.0644418	1/15/2015 03:09	190.3000031	1/15/2015 03:11	204.1000061
1/15/2015 04:00	197.9253288	1/15/2015 04:53	191.3999939	1/15/2015 04:30	205.3999939
1/15/2015 05:00	198.0311347	1/15/2015 05:43	193.3999939	1/15/2015 05:10	204.1000061
1/15/2015 06:00	198.0039885	1/15/2015 06:24	191.5	1/15/2015 06:54	203.3999939
1/15/2015 07:00	197.9508727	1/15/2015 07:36	193	1/15/2015 07:09	203.8999939
1/15/2015 08:00	198.0442051	1/15/2015 08:54	190.6999969	1/15/2015 08:13	204.8000031
1/15/2015 09:00	197.7993533	1/15/2015 09:10	165.6000061	1/15/2015 09:10	234.1000061
1/15/2015 10:00	197.9640224	1/15/2015 10:37	191	1/15/2015 10:09	203
1/15/2015 11:00	198.059993	1/15/2015 11:03	192.6999969	1/15/2015 11:02	203
1/15/2015 12:00	197.9429754	1/15/2015 12:06	192.6000061	1/15/2015 12:34	202.6000061
1/15/2015 13:00	197.9629666	1/15/2015 13:13	193.1999969	1/15/2015 13:41	202.3999939
1/15/2015 14:00	198.0577795	1/15/2015 14:15	192.8000031	1/15/2015 14:14	203.3999939
1/15/2015 15:00	198.018759	1/15/2015 15:43	192.3999939	1/15/2015 15:16	202.5
1/15/2015 16:00	197.9941323	1/15/2015 16:38	193.3000031	1/15/2015 16:47	202.8000031
1/15/2015 17:00	198.0165358	1/15/2015 17:06	193.6999969	1/15/2015 17:51	203.6999969
1/15/2015 18:00	197.9923139	1/15/2015 18:31	193.1999969	1/15/2015 18:34	202.3000031
1/15/2015 19:00	198.006458	1/15/2015 19:32	193.1999969	1/15/2015 19:14	202.5
1/15/2015 20:00	198.0190762	1/15/2015 20:11	193.3999939	1/15/2015 20:36	203
1/15/2015 21:00	197.9970571	1/15/2015 21:32	193	1/15/2015 21:30	203.3000031
1/15/2015 22:00	197.9631231	1/15/2015 22:50	192.6000061	1/15/2015 22:13	203.1000061
1/15/2015 23:00	197.9847523	1/15/2015 23:59	193.5	1/15/2015 23:35	202.3000031
1/16/2015 00:00	198.0572617	1/16/2015 00:41	192.1999969	1/16/2015 00:18	202.8999939
1/16/2015 01:00	197.9858181	1/16/2015 01:02	193.6000061	1/16/2015 01:20	203.3999939
1/16/2015 02:00	197.942204	1/16/2015 02:03	191.6999969	1/16/2015 02:40	202.1000061
1/16/2015 03:00	198.0074362	1/16/2015 03:25	192.1999969	1/16/2015 03:11	204.6000061

WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/16/2015 04:00	198.0807092	1/16/2015 04:15	193.8000031	1/16/2015 04:17	203
1/16/2015 05:00	197.9866928	1/16/2015 05:54	192.1000061	1/16/2015 05:37	203
1/16/2015 06:00	197.9561008	1/16/2015 06:39	190.8000031	1/16/2015 06:09	203.6000061
1/16/2015 07:00	198.0004589	1/16/2015 07:25	191.6999969	1/16/2015 07:20	202.8000031
1/16/2015 08:00	198.0080462	1/16/2015 08:54	193.3000031	1/16/2015 08:28	202.8000031
1/16/2015 09:00	198.0637699	1/16/2015 09:04	193.5	1/16/2015 09:13	203.6000061
1/16/2015 10:00	197.9456773	1/16/2015 10:58	192.3999939	1/16/2015 10:59	202.8000031
1/16/2015 11:00	198.0168132	1/16/2015 11:40	192.8999939	1/16/2015 11:00	203.3999939
1/16/2015 12:00	198.0180895	1/16/2015 12:32	192.3999939	1/16/2015 12:46	201.8999939
1/16/2015 13:00	197.9954675	1/16/2015 13:51	192.1999969	1/16/2015 13:48	202.1000061
1/16/2015 14:00	197.9541904	1/16/2015 14:25	192.3999939	1/16/2015 14:06	202.8999939
1/16/2015 15:00	197.9860401	1/16/2015 15:36	190.8000031	1/16/2015 15:36	202.3000031
1/16/2015 16:00	198.0644055	1/16/2015 16:20	192	1/16/2015 16:08	203
1/16/2015 17:00	197.9447347	1/16/2015 17:18	189.1999969	1/16/2015 17:45	204
1/16/2015 18:00	198.0728383	1/16/2015 18:54	192.8000031	1/16/2015 18:34	203.3000031
1/16/2015 19:00	197.9300591	1/16/2015 19:38	192.6000061	1/16/2015 19:22	202.1999969
1/16/2015 20:00	198.0728636	1/16/2015 20:19	193.1999969	1/16/2015 20:02	202.1999969
1/16/2015 21:00	197.9342441	1/16/2015 21:15	193.3999939	1/16/2015 21:33	202.8000031
1/16/2015 22:00	198.0337909	1/16/2015 22:58	193	1/16/2015 22:58	203.3999939
1/16/2015 23:00	197.9634661	1/16/2015 23:42	190.6000061	1/16/2015 23:53	203
1/17/2015 00:00	198.0169065	1/17/2015 00:57	192.6999969	1/17/2015 00:35	202.3000031
1/17/2015 01:00	197.9614817	1/17/2015 01:59	191.5	1/17/2015 01:36	202.3999939
1/17/2015 02:00	198.0057649	1/17/2015 02:56	192.8000031	1/17/2015 02:30	202.5
1/17/2015 03:00	198.0084254	1/17/2015 03:57	190.8000031	1/17/2015 03:49	202.3999939
1/17/2015 04:00	198.059077	1/17/2015 04:16	193	1/17/2015 04:05	203
1/17/2015 05:00	197.9430096	1/17/2015 05:15	192.8000031	1/17/2015 05:27	203.1999969
1/17/2015 06:00	198.0029466	1/17/2015 06:43	192.8999939	1/17/2015 06:36	203.6000061
1/17/2015 07:00	190.5935885	1/17/2015 07:37	183.8000031	1/17/2015 07:14	201.1000061
1/17/2015 08:00	188.066856	1/17/2015 08:17	181.3999939	1/17/2015 08:58	192
1/17/2015 09:00	187.9314174	1/17/2015 09:56	183.3000031	1/17/2015 09:25	194.3999939
1/17/2015 10:00	188.0532709	1/17/2015 10:54	184.3000031	1/17/2015 10:07	192.6999969
1/17/2015 11:00	188.0381542	1/17/2015 11:30	181.1999969	1/17/2015 11:52	193.1999969
1/17/2015 12:00	187.9310984	1/17/2015 12:09	181.6000061	1/17/2015 12:20	192.8000031
1/17/2015 13:00	188.0091696	1/17/2015 13:46	182	1/17/2015 13:55	192.1000061
1/17/2015 14:00	188.0730038	1/17/2015 14:39	181.3999939	1/17/2015 14:26	192.5
1/17/2015 15:00	187.9634809	1/17/2015 15:00	181.8999939	1/17/2015 15:28	193
1/17/2015 16:00	187.9941684	1/17/2015 16:13	183.1000061	1/17/2015 16:43	193.8000031
1/17/2015 17:00	188.0051285	1/17/2015 17:17	183.3999939	1/17/2015 17:20	194.3999939
1/17/2015 18:00	187.9840598	1/17/2015 18:20	182.5	1/17/2015 18:23	193.1999969
1/17/2015 19:00	187.9754673	1/17/2015 19:16	182.8999939	1/17/2015 19:41	193.8999939
1/17/2015 20:00	188.0379226	1/17/2015 20:18	182	1/17/2015 20:01	193.1999969
1/17/2015 21:00	188.0267162	1/17/2015 21:17	182.3999939	1/17/2015 21:52	192.8999939
1/17/2015 22:00	188.0139108	1/17/2015 22:55	180.8000031	1/17/2015 22:43	192.8000031
1/17/2015 23:00	187.9830885	1/17/2015 23:29	181.8999939	1/17/2015 23:44	192.8999939
1/18/2015 00:00	187.9996595	1/18/2015 00:20	182.3999939	1/18/2015 00:20	192.8999939
1/18/2015 01:00	187.9677159	1/18/2015 01:46	182.8000031	1/18/2015 01:44	192.3000031
1/18/2015 02:00	188.0404754	1/18/2015 02:15	181.1999969	1/18/2015 02:41	193.8999939
1/18/2015 03:00	187.9891303	1/18/2015 03:24	181.3000031	1/18/2015 03:07	192.1999969
1/18/2015 04:00	188.0339526	1/18/2015 04:51	182.1999969	1/18/2015 04:50	193.3999939
1/18/2015 05:00	187.9366241	1/18/2015 05:27	183.6000061	1/18/2015 05:02	193

WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/18/2015 06:00	188.0483575	1/18/2015 06:30	182.8999939	1/18/2015 06:05	193.3999939
1/18/2015 07:00	189.6297369	1/18/2015 07:09	183.1999969	1/18/2015 07:40	195.6000061
1/18/2015 08:00	189.962989	1/18/2015 08:00	184.8000031	1/18/2015 08:57	194.1000061
1/18/2015 09:00	189.9669786	1/18/2015 09:45	184.5	1/18/2015 09:09	195.1999969
1/18/2015 10:00	190.0015101	1/18/2015 10:13	183.1000061	1/18/2015 10:29	194.8999939
1/18/2015 11:00	190.0061634	1/18/2015 11:24	184.8999939	1/18/2015 11:13	194.1000061
1/18/2015 12:00	189.9992255	1/18/2015 12:22	185.5	1/18/2015 12:08	193.8999939
1/18/2015 13:00	190.0405887	1/18/2015 13:12	184	1/18/2015 13:28	195.3000031
1/18/2015 14:00	189.9764268	1/18/2015 14:44	185.3000031	1/18/2015 14:46	194.1999969
1/18/2015 15:00	189.963764	1/18/2015 15:14	184.8999939	1/18/2015 15:58	194.8999939
1/18/2015 16:00	190.0767248	1/18/2015 16:09	185	1/18/2015 16:42	195.1999969
1/18/2015 17:00	189.9107602	1/18/2015 17:00	183.8999939	1/18/2015 17:40	194.6999969
1/18/2015 18:00	190.0451564	1/18/2015 18:43	184.8000031	1/18/2015 18:38	195.1999969
1/18/2015 19:00	190.0085267	1/18/2015 19:50	185.6999969	1/18/2015 19:02	193.6999969
1/18/2015 20:00	189.9569232	1/18/2015 20:01	183.6999969	1/18/2015 20:09	195.1000061
1/18/2015 21:00	189.9930355	1/18/2015 21:35	184.6000061	1/18/2015 21:40	194.6999969
1/18/2015 22:00	190.0566888	1/18/2015 22:04	182.8000031	1/18/2015 22:59	194.8000031
1/18/2015 23:00	189.9978576	1/18/2015 23:28	185.5	1/18/2015 23:27	193.6000061
1/19/2015 00:00	189.9942336	1/19/2015 00:01	185.3999939	1/19/2015 00:42	195.3999939
1/19/2015 01:00	189.9973594	1/19/2015 01:22	183.8000031	1/19/2015 01:50	195.3999939
1/19/2015 02:00	189.9480314	1/19/2015 02:06	184.6999969	1/19/2015 02:57	195.5
1/19/2015 03:00	190.0547061	1/19/2015 03:25	185.1000061	1/19/2015 03:17	195
1/19/2015 04:00	189.9742983	1/19/2015 04:04	184.6000061	1/19/2015 04:15	194.6999969
1/19/2015 05:00	189.970137	1/19/2015 05:57	185.3999939	1/19/2015 05:26	194.6000061
1/19/2015 06:00	190.0334131	1/19/2015 06:49	184.8999939	1/19/2015 06:17	195.1999969
1/19/2015 07:00	190.0190227	1/19/2015 07:54	183.6000061	1/19/2015 07:53	197.1000061
1/19/2015 08:00	189.9404767	1/19/2015 08:13	184.8000031	1/19/2015 08:39	195.5
1/19/2015 09:00	190.0273304	1/19/2015 09:12	183.3000031	1/19/2015 09:00	194.3999939
1/19/2015 10:00	189.4966442	1/19/2015 10:58	0	1/19/2015 10:06	194.6999969
1/19/2015 11:00	190.0361543	1/19/2015 11:42	183.6999969	1/19/2015 11:01	195
1/19/2015 12:00	190.0196486	1/19/2015 12:02	185	1/19/2015 12:24	195.5
1/19/2015 13:00	189.9659119	1/19/2015 13:08	182.8999939	1/19/2015 13:25	196.3999939
1/19/2015 14:00	189.9672686	1/19/2015 14:03	183.8999939	1/19/2015 14:31	194
1/19/2015 15:00	190.0619579	1/19/2015 15:20	184.5	1/19/2015 15:21	198.1000061
1/19/2015 16:00	189.9657945	1/19/2015 16:37	185.3000031	1/19/2015 16:55	195.6999969
1/19/2015 17:00	189.9937481	1/19/2015 17:34	185.3000031	1/19/2015 17:07	193.1000061
1/19/2015 18:00	189.9799139	1/19/2015 18:34	185.1999969	1/19/2015 18:30	194.3999939
1/19/2015 19:00	189.9916643	1/19/2015 19:24	185.8000031	1/19/2015 19:10	192.6000061
1/19/2015 20:00	190.0097665	1/19/2015 20:13	185.5	1/19/2015 20:37	193.6000061
1/19/2015 21:00	189.9742491	1/19/2015 21:10	186.3000031	1/19/2015 21:16	193.5
1/19/2015 22:00	190.0721001	1/19/2015 22:25	185	1/19/2015 22:01	195.3000031
1/19/2015 23:00	189.9833721	1/19/2015 23:09	184.8000031	1/19/2015 23:57	194.1000061
1/20/2015 00:00	189.9682633	1/20/2015 00:54	183.1000061	1/20/2015 00:33	194.6000061
1/20/2015 01:00	189.9877296	1/20/2015 01:33	185.5	1/20/2015 01:45	194.1000061
1/20/2015 02:00	189.990117	1/20/2015 02:56	185.8000031	1/20/2015 02:26	193.3000031
1/20/2015 03:00	190.0123139	1/20/2015 03:36	184.6999969	1/20/2015 03:56	194.6000061
1/20/2015 04:00	189.9699182	1/20/2015 04:29	186.3000031	1/20/2015 04:56	193.8000031
1/20/2015 05:00	190.0033824	1/20/2015 05:49	185.8999939	1/20/2015 05:28	193.1999969
1/20/2015 06:00	189.9832914	1/20/2015 06:54	185.6000061	1/20/2015 06:56	193.6000061
1/20/2015 07:00	189.9890681	1/20/2015 07:51	184.3000031	1/20/2015 07:19	194.1000061

WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/20/2015 08:00	190.059901	1/20/2015 08:59	186.1000061	1/20/2015 08:27	196.1000061
1/20/2015 09:00	189.9819688	1/20/2015 09:00	185.6999969	1/20/2015 09:26	194.6999969
1/20/2015 10:00	185.4237714	1/20/2015 10:59	162.8999939	1/20/2015 10:03	193.5
1/20/2015 11:00	165.0068504	1/20/2015 11:22	158.6000061	1/20/2015 11:21	183.1999969
1/20/2015 12:00	165.0192258	1/20/2015 12:17	160.8999939	1/20/2015 12:36	168.6000061
1/20/2015 13:00	165.0016137	1/20/2015 13:21	159.5	1/20/2015 13:05	168.3999939
1/20/2015 14:00	165.0005875	1/20/2015 14:33	161.8999939	1/20/2015 14:18	168.1999969
1/20/2015 15:00	186.645598	1/20/2015 15:01	162.6999969	1/20/2015 15:37	194.8000031
1/20/2015 16:00	190.0416365	1/20/2015 16:10	183.5	1/20/2015 16:36	194.6000061
1/20/2015 17:00	189.9534181	1/20/2015 17:12	184.3999939	1/20/2015 17:23	195.1999969
1/20/2015 18:00	190.00605	1/20/2015 18:39	185.1999969	1/20/2015 18:52	195.8999939
1/20/2015 19:00	190.0058098	1/20/2015 19:07	185	1/20/2015 19:54	195.6000061
1/20/2015 20:00	189.993289	1/20/2015 20:51	185	1/20/2015 20:02	195
1/20/2015 21:00	190.0438396	1/20/2015 21:56	184.1999969	1/20/2015 21:29	193.1999969
1/20/2015 22:00	189.9413663	1/20/2015 22:33	185.1999969	1/20/2015 22:23	194.1000061
1/20/2015 23:00	190.0197171	1/20/2015 23:36	186.6000061	1/20/2015 23:08	194.3999939
1/21/2015 00:00	189.9944022	1/21/2015 00:34	185.5	1/21/2015 00:19	193
1/21/2015 01:00	189.9725964	1/21/2015 01:31	186.1000061	1/21/2015 01:39	195.5
1/21/2015 02:00	190.0199423	1/21/2015 02:54	185.6000061	1/21/2015 02:53	195.8999939
1/21/2015 03:00	190.0299697	1/21/2015 03:24	186.1999969	1/21/2015 03:27	194.8999939
1/21/2015 04:00	189.9567076	1/21/2015 04:58	186	1/21/2015 04:40	195.5
1/21/2015 05:00	189.9840864	1/21/2015 05:06	186	1/21/2015 05:14	195.1000061
1/21/2015 06:00	190.0002448	1/21/2015 06:05	186.6000061	1/21/2015 06:53	195.5
1/21/2015 07:00	190.0311259	1/21/2015 07:52	184.5	1/21/2015 07:48	195.3999939
1/21/2015 08:00	189.9988777	1/21/2015 08:48	185.8000031	1/21/2015 08:26	194.6999969
1/21/2015 09:00	190.0142477	1/21/2015 09:31	184.3999939	1/21/2015 09:42	195.8000031
1/21/2015 10:00	189.9390761	1/21/2015 10:18	185.3000031	1/21/2015 10:50	193
1/21/2015 11:00	190.0682282	1/21/2015 11:43	184.1999969	1/21/2015 11:20	194.6000061
1/21/2015 12:00	189.926491	1/21/2015 12:01	185.8999939	1/21/2015 12:51	194
1/21/2015 13:00	190.0575039	1/21/2015 13:23	186	1/21/2015 13:53	193.8999939
1/21/2015 14:00	189.9629984	1/21/2015 14:07	185.8000031	1/21/2015 14:00	193.3000031
1/21/2015 15:00	189.9804296	1/21/2015 15:51	185.3999939	1/21/2015 15:16	193.8000031
1/21/2015 16:00	190.0405088	1/21/2015 16:39	185.8999939	1/21/2015 16:01	194.1000061
1/21/2015 17:00	190.0016544	1/21/2015 17:40	186.1999969	1/21/2015 17:58	193.3999939
1/21/2015 18:00	190.0108169	1/21/2015 18:13	186.3000031	1/21/2015 18:43	195.8000031
1/21/2015 19:00	190.0180305	1/21/2015 19:56	185.3000031	1/21/2015 19:58	193.3000031
1/21/2015 20:00	189.9651991	1/21/2015 20:24	184	1/21/2015 20:18	193.1999969
1/21/2015 21:00	189.9617773	1/21/2015 21:24	183.3999939	1/21/2015 21:25	194
1/21/2015 22:00	190.0029946	1/21/2015 22:17	185.6000061	1/21/2015 22:37	194.6000061
1/21/2015 23:00	190.0492356	1/21/2015 23:48	185.1000061	1/21/2015 23:32	193
1/22/2015 00:00	189.9557533	1/22/2015 00:00	186	1/22/2015 00:02	194.5
1/22/2015 01:00	189.9758368	1/22/2015 01:34	184	1/22/2015 01:42	193.8999939
1/22/2015 02:00	190.0653971	1/22/2015 02:08	184.6999969	1/22/2015 02:37	194.6999969
1/22/2015 03:00	189.9562521	1/22/2015 03:35	185.1000061	1/22/2015 03:37	194.1999969
1/22/2015 04:00	188.1584239	1/22/2015 04:47	182.1999969	1/22/2015 04:16	193.6000061
1/22/2015 05:00	185.0296611	1/22/2015 05:59	179.8000031	1/22/2015 05:41	190.6000061
1/22/2015 06:00	184.9791428	1/22/2015 06:48	177.8000031	1/22/2015 06:33	190
1/22/2015 07:00	185.0415939	1/22/2015 07:34	180.6999969	1/22/2015 07:16	188.5
1/22/2015 08:00	185.0179581	1/22/2015 08:35	181.6000061	1/22/2015 08:34	189.3000031
1/22/2015 09:00	184.9512791	1/22/2015 09:57	180.3999939	1/22/2015 09:04	188.6999969

WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/22/2015 10:00	185.0578693	1/22/2015 10:37	181.1999969	1/22/2015 10:40	189.3000031
1/22/2015 11:00	184.9594197	1/22/2015 11:19	181.6999969	1/22/2015 11:41	189
1/22/2015 12:00	185.0209072	1/22/2015 12:22	180.6000061	1/22/2015 12:48	189
1/22/2015 13:00	185.0322125	1/22/2015 13:42	180	1/22/2015 13:45	187.5
1/22/2015 14:00	184.9660541	1/22/2015 14:09	181.1999969	1/22/2015 14:53	189
1/22/2015 15:00	185.0299694	1/22/2015 15:22	181.1999969	1/22/2015 15:52	188.5
1/22/2015 16:00	184.9361478	1/22/2015 16:32	181.1999969	1/22/2015 16:46	189.8000031
1/22/2015 17:00	184.9851028	1/22/2015 17:11	180	1/22/2015 17:08	190.1000061
1/22/2015 18:00	185.0120691	1/22/2015 18:35	180.6000061	1/22/2015 18:51	188.6000061
1/22/2015 19:00	184.9964256	1/22/2015 19:53	181	1/22/2015 19:56	188.6000061
1/22/2015 20:00	185.0877988	1/22/2015 20:10	180.6999969	1/22/2015 20:52	189.6000061
1/22/2015 21:00	184.9873716	1/22/2015 21:40	179.3000031	1/22/2015 21:50	188.8999939
1/22/2015 22:00	184.9840054	1/22/2015 22:19	181.1000061	1/22/2015 22:47	188.6999969
1/22/2015 23:00	185.0034424	1/22/2015 23:44	180	1/22/2015 23:03	190.5
1/23/2015 00:00	185.0054653	1/23/2015 00:04	180.8000031	1/23/2015 00:59	190.5
1/23/2015 01:00	184.9560478	1/23/2015 01:14	180.1999969	1/23/2015 01:15	190.3000031
1/23/2015 02:00	185.0629591	1/23/2015 02:07	178.5	1/23/2015 02:13	188.1000061
1/23/2015 03:00	184.9696349	1/23/2015 03:59	181	1/23/2015 03:08	187.8000031
1/23/2015 04:00	185.0342822	1/23/2015 04:11	179.8000031	1/23/2015 04:23	189.3000031
1/23/2015 05:00	184.9952982	1/23/2015 05:25	179.5	1/23/2015 05:02	189.1999969
1/23/2015 06:00	184.9450683	1/23/2015 06:41	179	1/23/2015 06:18	188.1999969
1/23/2015 07:00	185.0084066	1/23/2015 07:33	181.1999969	1/23/2015 07:36	188.6999969
1/23/2015 08:00	185.0663264	1/23/2015 08:12	180.1000061	1/23/2015 08:31	189.3999939
1/23/2015 09:00	184.9377648	1/23/2015 09:07	179.3999939	1/23/2015 09:20	189.8000031
1/23/2015 10:00	185.0265352	1/23/2015 10:11	180	1/23/2015 10:01	189.1999969
1/23/2015 11:00	185.0356581	1/23/2015 11:57	180.8000031	1/23/2015 11:59	189.6000061
1/23/2015 12:00	184.9889435	1/23/2015 12:18	180.3999939	1/23/2015 12:56	189
1/23/2015 13:00	184.9603077	1/23/2015 13:37	180.1999969	1/23/2015 13:55	189.6999969
1/23/2015 14:00	184.9989194	1/23/2015 14:05	180.3000031	1/23/2015 14:11	189.8000031
1/23/2015 15:00	185.0132514	1/23/2015 15:36	180.6999969	1/23/2015 15:05	190.3999939
1/23/2015 16:00	185.0270987	1/23/2015 16:37	179.8000031	1/23/2015 16:30	190.5
1/23/2015 17:00	185.0318548	1/23/2015 17:51	179.3000031	1/23/2015 17:04	190.6000061
1/23/2015 18:00	184.9938674	1/23/2015 18:37	179.6999969	1/23/2015 18:50	190.5
1/23/2015 19:00	184.9643157	1/23/2015 19:46	180.6999969	1/23/2015 19:17	190.1000061
1/23/2015 20:00	185.0240887	1/23/2015 20:24	180.6999969	1/23/2015 20:36	189.1000061
1/23/2015 21:00	184.9465565	1/23/2015 21:41	180.8000031	1/23/2015 21:35	187.5
1/23/2015 22:00	185.0064603	1/23/2015 22:30	180	1/23/2015 22:28	189
1/23/2015 23:00	185.0454892	1/23/2015 23:48	180.6999969	1/23/2015 23:26	190.8000031
1/24/2015 00:00	184.9844105	1/24/2015 00:02	180.8000031	1/24/2015 00:03	189.3999939
1/24/2015 01:00	184.9738496	1/24/2015 01:21	178.6999969	1/24/2015 01:29	190.8999939
1/24/2015 02:00	184.9907746	1/24/2015 02:06	178.1999969	1/24/2015 02:20	188.3999939
1/24/2015 03:00	185.0007365	1/24/2015 03:05	180.6000061	1/24/2015 03:44	189.1999969
1/24/2015 04:00	184.9967973	1/24/2015 04:28	179.1000061	1/24/2015 04:23	189.6999969
1/24/2015 05:00	185.039647	1/24/2015 05:14	181.1999969	1/24/2015 05:33	192.1000061
1/24/2015 06:00	184.9988987	1/24/2015 06:25	178.8999939	1/24/2015 06:12	190.8000031
1/24/2015 07:00	185.0330868	1/24/2015 07:05	180.5	1/24/2015 07:09	190.6999969
1/24/2015 08:00	184.9891121	1/24/2015 08:00	180	1/24/2015 08:02	190.1000061
1/24/2015 09:00	184.9412007	1/24/2015 09:45	179.1999969	1/24/2015 09:14	189.6999969
1/24/2015 10:00	185.0686416	1/24/2015 10:23	179.6000061	1/24/2015 10:25	189.3999939
1/24/2015 11:00	185.0027675	1/24/2015 11:01	181.1999969	1/24/2015 11:22	187.8999939

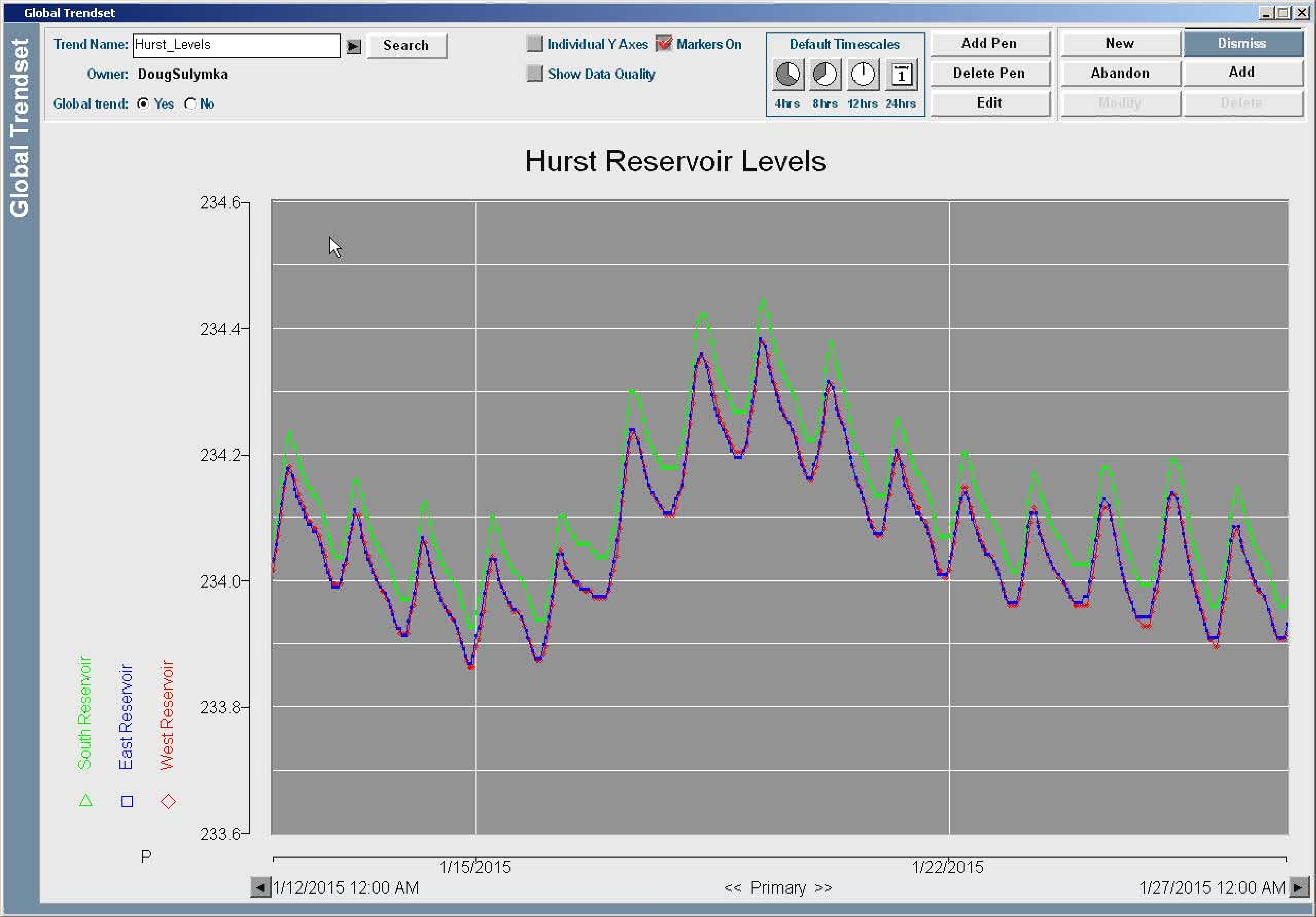
WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/24/2015 12:00	184.967411	1/24/2015 12:31	180.1000061	1/24/2015 12:05	187.8999939
1/24/2015 13:00	184.9842046	1/24/2015 13:28	179.1999969	1/24/2015 13:59	189
1/24/2015 14:00	185.0003523	1/24/2015 14:21	179.1000061	1/24/2015 14:06	191.3999939
1/24/2015 15:00	185.0329053	1/24/2015 15:19	180.8999939	1/24/2015 15:21	190.1000061
1/24/2015 16:00	184.9759757	1/24/2015 16:05	179.8000031	1/24/2015 16:51	190.1999969
1/24/2015 17:00	185.0111006	1/24/2015 17:42	180.6000061	1/24/2015 17:44	188.5
1/24/2015 18:00	184.9769799	1/24/2015 18:38	180.6999969	1/24/2015 18:52	189.5
1/24/2015 19:00	185.0301858	1/24/2015 19:52	179.8999939	1/24/2015 19:53	189.1000061
1/24/2015 20:00	185.0123653	1/24/2015 20:51	180.6999969	1/24/2015 20:25	189.6000061
1/24/2015 21:00	185.0008155	1/24/2015 21:29	179.1999969	1/24/2015 21:59	188.8000031
1/24/2015 22:00	185.0122579	1/24/2015 22:38	179.6000061	1/24/2015 22:18	188.6000061
1/24/2015 23:00	184.9684336	1/24/2015 23:01	179.8000031	1/24/2015 23:50	189.8999939
1/25/2015 00:00	185.0255482	1/25/2015 00:08	178.8999939	1/25/2015 00:02	187.6999969
1/25/2015 01:00	185.0252011	1/25/2015 01:39	179.8000031	1/25/2015 01:23	188.8000031
1/25/2015 02:00	184.9482498	1/25/2015 02:19	179.8000031	1/25/2015 02:05	188.1999969
1/25/2015 03:00	184.9988661	1/25/2015 03:08	179.8000031	1/25/2015 03:55	189.6999969
1/25/2015 04:00	185.0419976	1/25/2015 04:31	181	1/25/2015 04:42	189.8000031
1/25/2015 05:00	184.9375062	1/25/2015 05:09	180	1/25/2015 05:12	189.8999939
1/25/2015 06:00	184.9653923	1/25/2015 06:14	180.8000031	1/25/2015 06:20	190.8000031
1/25/2015 07:00	185.0254446	1/25/2015 07:52	180.1999969	1/25/2015 07:24	190.8000031
1/25/2015 08:00	184.9926993	1/25/2015 08:59	179.6000061	1/25/2015 08:07	191.3000031
1/25/2015 09:00	185.0326088	1/25/2015 09:04	181.1999969	1/25/2015 09:39	187.8999939
1/25/2015 10:00	185.0260826	1/25/2015 10:49	179.1999969	1/25/2015 10:47	188.1999969
1/25/2015 11:00	184.9304627	1/25/2015 11:02	179.8999939	1/25/2015 11:16	189.8999939
1/25/2015 12:00	185.0316711	1/25/2015 12:50	180.8000031	1/25/2015 12:52	189.6000061
1/25/2015 13:00	185.0287681	1/25/2015 13:24	179.6000061	1/25/2015 13:59	190.1999969
1/25/2015 14:00	185.0133336	1/25/2015 14:14	180.5	1/25/2015 14:23	190.1000061
1/25/2015 15:00	184.9468938	1/25/2015 15:08	180.3000031	1/25/2015 15:33	188.8999939
1/25/2015 16:00	185.0475895	1/25/2015 16:23	180.5	1/25/2015 16:25	189.6999969
1/25/2015 17:00	185.0150853	1/25/2015 17:09	180.3000031	1/25/2015 17:54	189.3000031
1/25/2015 18:00	184.9772891	1/25/2015 18:17	180.3000031	1/25/2015 18:05	188.8000031
1/25/2015 19:00	185.0100928	1/25/2015 19:50	178.3999939	1/25/2015 19:52	189.6999969
1/25/2015 20:00	185.0035487	1/25/2015 20:38	180.6000061	1/25/2015 20:44	191.1000061
1/25/2015 21:00	184.9426057	1/25/2015 21:25	178.8999939	1/25/2015 21:54	189.1999969
1/25/2015 22:00	185.0666337	1/25/2015 22:25	179.3999939	1/25/2015 22:02	188.6000061
1/25/2015 23:00	184.9869148	1/25/2015 23:39	180.6999969	1/25/2015 23:48	189.8999939
1/26/2015 00:00	184.975313	1/26/2015 00:30	180.8999939	1/26/2015 00:52	188.5
1/26/2015 01:00	184.9921814	1/26/2015 01:48	178.8000031	1/26/2015 01:14	190.8000031
1/26/2015 02:00	185.0037037	1/26/2015 02:53	178.8999939	1/26/2015 02:01	189.6999969
1/26/2015 03:00	184.9852111	1/26/2015 03:04	180.8000031	1/26/2015 03:36	189.6000061
1/26/2015 04:00	184.9884815	1/26/2015 04:13	178.8999939	1/26/2015 04:23	188.1999969
1/26/2015 05:00	185.0289873	1/26/2015 05:35	179.6000061	1/26/2015 05:25	189.6000061
1/26/2015 06:00	184.9953172	1/26/2015 06:07	180.8999939	1/26/2015 06:51	188.8000031
1/26/2015 07:00	184.9797378	1/26/2015 07:30	180.8999939	1/26/2015 07:04	189.6000061
1/26/2015 08:00	184.990119	1/26/2015 08:38	178.1000061	1/26/2015 08:37	190.3000031
1/26/2015 09:00	185.0230303	1/26/2015 09:31	181.8000031	1/26/2015 09:02	189.1000061
1/26/2015 10:00	184.999125	1/26/2015 10:16	179.6000061	1/26/2015 10:52	189
1/26/2015 11:00	184.9615048	1/26/2015 11:47	180.1999969	1/26/2015 11:08	190
1/26/2015 12:00	184.9733321	1/26/2015 12:00	180.6999969	1/26/2015 12:00	190.1999969
1/26/2015 13:00	185.0335784	1/26/2015 13:31	180.1999969	1/26/2015 13:30	190.1999969

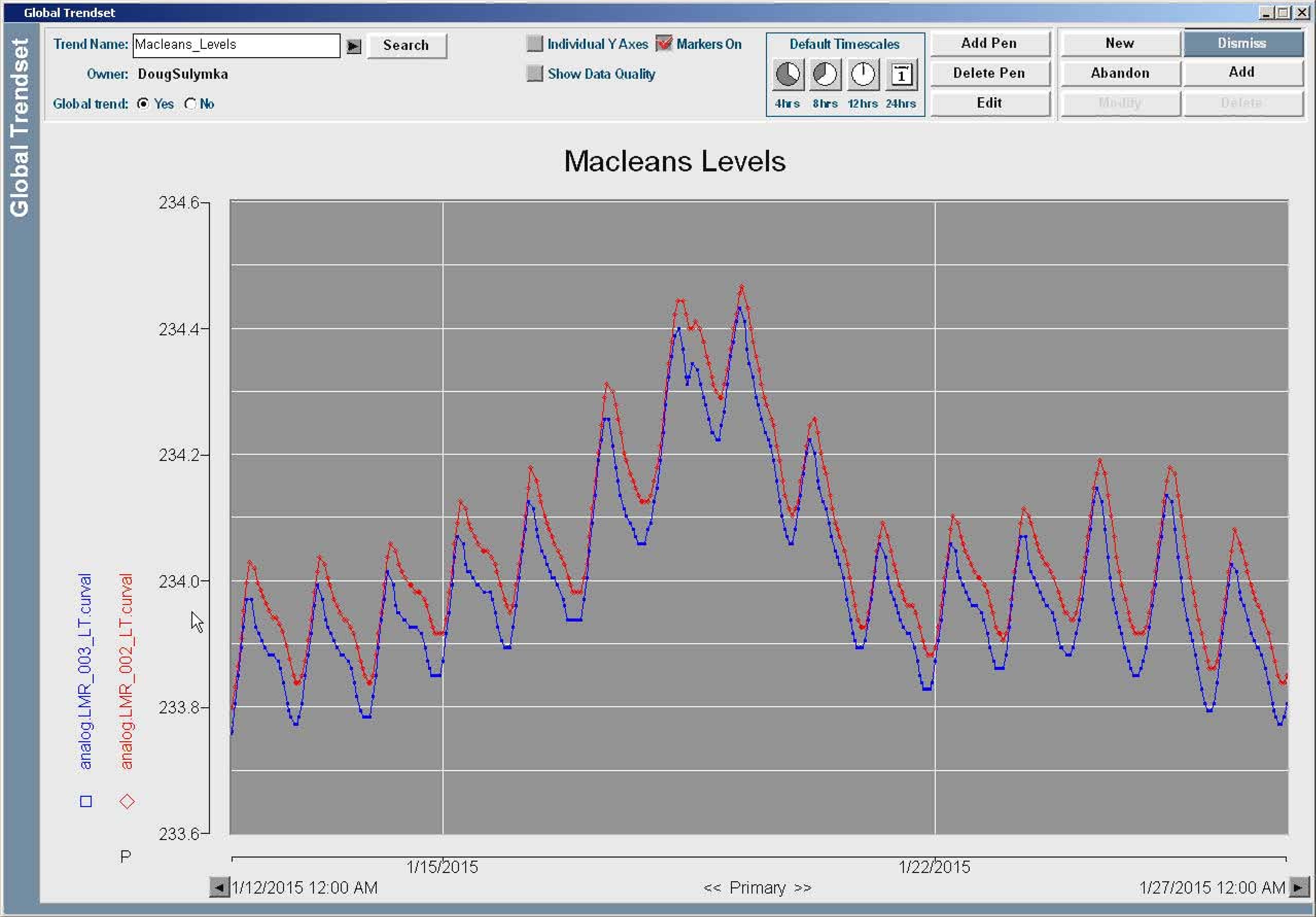
WTP Output Flow (MLD)

StartDateTime	Average	MinDateTime	Minimum	MaxDateTime	Maximum
1/26/2015 14:00	184.9949726	1/26/2015 14:06	179.8000031	1/26/2015 14:24	189.1999969
1/26/2015 15:00	185.0215064	1/26/2015 15:28	181.1000061	1/26/2015 15:36	189.6999969
1/26/2015 16:00	185.0192391	1/26/2015 16:48	181.5	1/26/2015 16:14	189.6999969
1/26/2015 17:00	184.9772293	1/26/2015 17:32	180.1999969	1/26/2015 17:04	188.6999969
1/26/2015 18:00	184.9971952	1/26/2015 18:13	178.3999939	1/26/2015 18:38	190.1000061
1/26/2015 19:00	184.9914423	1/26/2015 19:39	180.6000061	1/26/2015 19:41	189.6999969
1/26/2015 20:00	185.0135205	1/26/2015 20:12	178.8999939	1/26/2015 20:20	189
1/26/2015 21:00	184.9852845	1/26/2015 21:19	180.6999969	1/26/2015 21:20	189.3000031
1/26/2015 22:00	185.0283847	1/26/2015 22:34	180.3000031	1/26/2015 22:52	187.1999969
1/26/2015 23:00	184.9538069	1/26/2015 23:21	180.8999939	1/26/2015 23:18	189.6000061

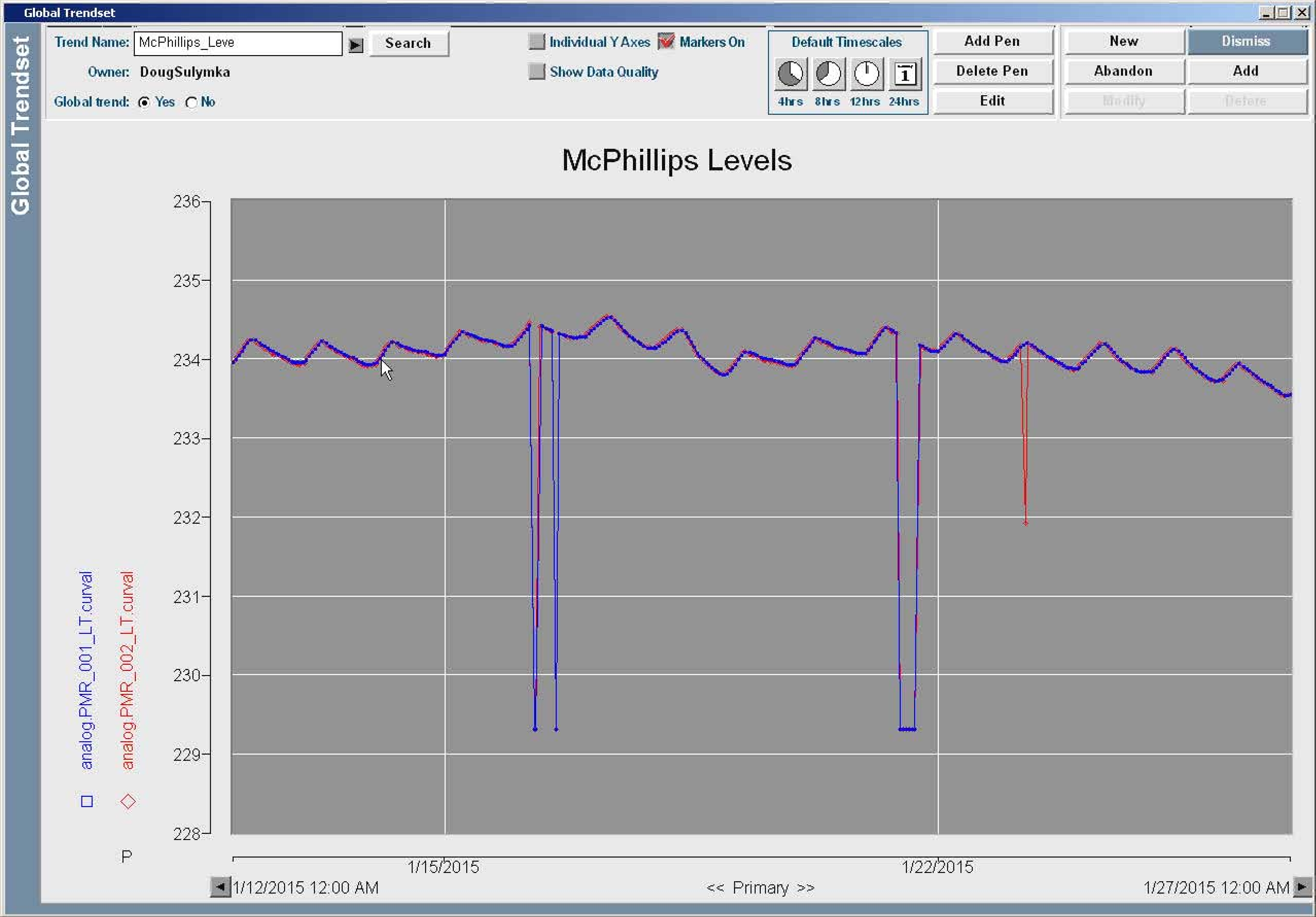
E12b Hurst Hourly Min Res Levels Jan 12-27, 2015


Global Trendset
Global Trendset
Trend Name: Hurst_Levels
Search
Owner: DougSulymka
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
Hurst Reservoir Levels
234.6
234.4
234.2
234.0
233.8
233.6
South Reservoir
East Reservoir
West Reservoir
P
1/15/2015
1/22/2015
1/12/2015 12:00 AM
<< Primary >>
1/27/2015 12:00 AM

E12c MacLean Hourly Min Res Levels Jan 12 – 27, 2015


Global Trendset
Trend Name: Macleans_Levels
Search
Owner: DougSulymka
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Abandon
Modify
Dismiss
Add
Delete
Macleans Levels
234.6
234.4
234.2
234.0
233.8
233.6
analog.LMR_003_LT.curval
analog.LMR_002_LT.curval
P
1/15/2015
1/22/2015
1/12/2015 12:00 AM
<< Primary >>
1/27/2015 12:00 AM

E12d McPhillips Hourly Min Res Levels Jan 12 – 27, 2015


Global Trendset
Global Trendset
Trend Name: McPhillips_Leve
Search
Owner: DougSulymka
Global trend: Yes No
Individual Y Axes
Markers On
Show Data Quality
Default Timescales
4hrs 8hrs 12hrs 24hrs
Add Pen
Delete Pen
Edit
New
Dismiss
Abandon
Add
Modify
Delete
McPhillips Levels
236
235
234
233
232
231
230
229
228
analog.PMR_001_LT.curval
analog.PMR_002_LT.curval
P
1/15/2015
1/22/2015
1/12/2015 12:00 AM
<< Primary >>
1/27/2015 12:00 AM

E12e Hurst Minimum Reservoir Levels Jan 12-26, 2015

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/12/2015 0:00	234.0161832	1/12/2015 0:00	234.0345038	1/12/2015 0:00	234.0696153
1/12/2015 1:00	234.0491603	1/12/2015 1:00	234.0564885	1/12/2015 1:00	234.0916
1/12/2015 2:00	234.071145	1/12/2015 2:00	234.0894656	1/12/2015 2:00	234.1245771
1/12/2015 3:00	234.1041221	1/12/2015 3:00	234.1224427	1/12/2015 3:00	234.1575542
1/12/2015 4:00	234.1480916	1/12/2015 4:00	234.1554198	1/12/2015 4:00	234.1905313
1/12/2015 5:00	234.1700763	1/12/2015 5:00	234.1774046	1/12/2015 5:00	234.2235084
1/12/2015 6:00	234.1810687	1/12/2015 6:56	234.1664122	1/12/2015 6:00	234.2345008
1/12/2015 7:41	234.159084	1/12/2015 7:38	234.1444275	1/12/2015 7:44	234.212516
1/12/2015 8:59	234.1370992	1/12/2015 8:23	234.1334351	1/12/2015 8:58	234.1905313
1/12/2015 9:55	234.1261069	1/12/2015 9:29	234.1224427	1/12/2015 9:51	234.1795389
1/12/2015 10:49	234.1151145	1/12/2015 10:26	234.1114504	1/12/2015 10:45	234.1685466
1/12/2015 11:44	234.1041221	1/12/2015 11:23	234.100458	1/12/2015 11:45	234.1575542
1/12/2015 12:55	234.0931298	1/12/2015 12:33	234.0894656	1/12/2015 12:50	234.1465618
1/12/2015 13:00	234.0931298	1/12/2015 13:00	234.0894656	1/12/2015 13:00	234.1465618
1/12/2015 14:40	234.0821374	1/12/2015 14:13	234.0784733	1/12/2015 14:21	234.1355695
1/12/2015 15:00	234.0821374	1/12/2015 15:00	234.0784733	1/12/2015 15:00	234.1355695
1/12/2015 16:23	234.071145	1/12/2015 16:58	234.0564885	1/12/2015 16:07	234.1245771
1/12/2015 17:59	234.0491603	1/12/2015 17:40	234.0454962	1/12/2015 17:47	234.1025924
1/12/2015 18:37	234.0381679	1/12/2015 18:48	234.0235115	1/12/2015 18:30	234.0916
1/12/2015 19:51	234.0161832	1/12/2015 19:32	234.0125191	1/12/2015 19:42	234.0696153
1/12/2015 20:35	234.0051908	1/12/2015 20:22	234.0015267	1/12/2015 20:26	234.0586229
1/12/2015 21:28	233.9941985	1/12/2015 21:16	233.9905344	1/12/2015 21:17	234.0476305
1/12/2015 22:00	233.9941985	1/12/2015 22:00	233.9905344	1/12/2015 22:21	234.0366382
1/12/2015 23:00	233.9941985	1/12/2015 23:00	233.9905344	1/12/2015 23:00	234.0366382
1/13/2015 0:00	233.9941985	1/13/2015 0:00	234.0015267	1/13/2015 0:00	234.0366382
1/13/2015 1:00	234.0161832	1/13/2015 1:00	234.0235115	1/13/2015 1:00	234.0586229
1/13/2015 2:00	234.0271756	1/13/2015 2:00	234.0345038	1/13/2015 2:00	234.0806076
1/13/2015 3:00	234.0601527	1/13/2015 3:00	234.0674809	1/13/2015 3:00	234.1025924
1/13/2015 4:00	234.0821374	1/13/2015 4:00	234.0894656	1/13/2015 4:00	234.1355695
1/13/2015 5:00	234.1041221	1/13/2015 5:00	234.1114504	1/13/2015 5:00	234.1575542
1/13/2015 6:45	234.1041221	1/13/2015 6:53	234.0894656	1/13/2015 6:00	234.1575542
1/13/2015 7:56	234.071145	1/13/2015 7:34	234.0674809	1/13/2015 7:40	234.1355695
1/13/2015 8:24	234.0601527	1/13/2015 8:58	234.0454962	1/13/2015 8:34	234.1135847
1/13/2015 9:52	234.0381679	1/13/2015 9:45	234.0345038	1/13/2015 9:15	234.1025924
1/13/2015 10:37	234.0271756	1/13/2015 10:37	234.0235115	1/13/2015 10:48	234.0806076
1/13/2015 11:27	234.0161832	1/13/2015 11:30	234.0125191	1/13/2015 11:38	234.0696153
1/13/2015 12:25	234.0051908	1/13/2015 12:30	234.0015267	1/13/2015 12:32	234.0586229
1/13/2015 13:21	233.9941985	1/13/2015 13:52	233.9905344	1/13/2015 13:39	234.0476305
1/13/2015 14:50	233.9832061	1/13/2015 14:00	233.9905344	1/13/2015 14:00	234.0476305
1/13/2015 15:00	233.9832061	1/13/2015 15:39	233.979542	1/13/2015 15:09	234.0366382
1/13/2015 16:22	233.9722137	1/13/2015 16:46	233.9685496	1/13/2015 16:43	234.0256458
1/13/2015 17:31	233.9612214	1/13/2015 17:37	233.9575573	1/13/2015 17:50	234.0146534
1/13/2015 18:20	233.950229	1/13/2015 18:19	233.9465649	1/13/2015 18:36	234.0036611
1/13/2015 19:53	233.9282443	1/13/2015 19:04	233.9355725	1/13/2015 19:19	233.9926687
1/13/2015 20:57	233.9172519	1/13/2015 20:09	233.9245802	1/13/2015 20:17	233.9816763
1/13/2015 21:00	233.9172519	1/13/2015 21:00	233.9245802	1/13/2015 21:36	233.970684
1/13/2015 22:00	233.9172519	1/13/2015 22:04	233.9135878	1/13/2015 22:00	233.970684
1/13/2015 23:00	233.9172519	1/13/2015 23:00	233.9135878	1/13/2015 23:00	233.970684
1/14/2015 0:00	233.9172519	1/14/2015 0:00	233.9355725	1/14/2015 0:00	233.970684
1/14/2015 1:00	233.950229	1/14/2015 1:00	233.9575573	1/14/2015 1:00	234.0036611
1/14/2015 2:00	233.9612214	1/14/2015 2:00	233.979542	1/14/2015 2:00	234.0256458
1/14/2015 3:00	233.9941985	1/14/2015 3:00	234.0125191	1/14/2015 3:00	234.0476305

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/14/2015 4:00	234.0271756	1/14/2015 4:00	234.0454962	1/14/2015 4:00	234.0806076
1/14/2015 5:00	234.0601527	1/14/2015 5:00	234.0674809	1/14/2015 5:00	234.1135847
1/14/2015 6:00	234.0601527	1/14/2015 6:57	234.0454962	1/14/2015 6:00	234.1245771
1/14/2015 7:52	234.0271756	1/14/2015 7:36	234.0235115	1/14/2015 7:50	234.0916
1/14/2015 8:59	234.0051908	1/14/2015 8:08	234.0125191	1/14/2015 8:47	234.0696153
1/14/2015 9:42	233.9941985	1/14/2015 9:51	233.9905344	1/14/2015 9:31	234.0586229
1/14/2015 10:36	233.9832061	1/14/2015 10:40	233.979542	1/14/2015 10:25	234.0476305
1/14/2015 11:28	233.9722137	1/14/2015 11:39	233.9685496	1/14/2015 11:21	234.0366382
1/14/2015 12:30	233.9612214	1/14/2015 12:52	233.9575573	1/14/2015 12:22	234.0256458
1/14/2015 13:39	233.950229	1/14/2015 13:00	233.9575573	1/14/2015 13:32	234.0146534
1/14/2015 14:00	233.950229	1/14/2015 14:26	233.9465649	1/14/2015 14:00	234.0146534
1/14/2015 15:28	233.9392366	1/14/2015 15:00	233.9465649	1/14/2015 15:22	234.0036611
1/14/2015 16:00	233.9392366	1/14/2015 16:29	233.9355725	1/14/2015 16:59	233.9926687
1/14/2015 17:53	233.9172519	1/14/2015 17:28	233.9245802	1/14/2015 17:59	233.9816763
1/14/2015 18:34	233.9062595	1/14/2015 18:45	233.9025954	1/14/2015 18:40	233.970684
1/14/2015 19:16	233.8952672	1/14/2015 19:35	233.8916031	1/14/2015 19:20	233.9596916
1/14/2015 20:50	233.8732824	1/14/2015 20:17	233.8806107	1/14/2015 20:54	233.9377069
1/14/2015 21:56	233.8622901	1/14/2015 21:33	233.8696183	1/14/2015 21:57	233.9267145
1/14/2015 22:00	233.8622901	1/14/2015 22:00	233.8696183	1/14/2015 22:00	233.9267145
1/14/2015 23:00	233.8622901	1/14/2015 23:00	233.8806107	1/14/2015 23:00	233.9267145
1/15/2015 0:00	233.8952672	1/15/2015 0:00	233.9135878	1/15/2015 0:00	233.9486992
1/15/2015 1:00	233.9062595	1/15/2015 1:00	233.9245802	1/15/2015 1:00	233.970684
1/15/2015 2:00	233.9282443	1/15/2015 2:00	233.9465649	1/15/2015 2:00	233.9926687
1/15/2015 3:00	233.950229	1/15/2015 3:00	233.979542	1/15/2015 3:00	234.0146534
1/15/2015 4:00	233.9941985	1/15/2015 4:00	234.0125191	1/15/2015 4:00	234.0476305
1/15/2015 5:00	234.0161832	1/15/2015 5:00	234.0345038	1/15/2015 5:00	234.0806076
1/15/2015 6:00	234.0381679	1/15/2015 6:46	234.0345038	1/15/2015 6:00	234.1025924
1/15/2015 7:36	234.0161832	1/15/2015 7:56	234.0015267	1/15/2015 7:45	234.0806076
1/15/2015 8:48	233.9941985	1/15/2015 8:00	234.0015267	1/15/2015 8:57	234.0586229
1/15/2015 9:49	233.9832061	1/15/2015 9:08	233.9905344	1/15/2015 9:51	234.0476305
1/15/2015 10:48	233.9722137	1/15/2015 10:07	233.979542	1/15/2015 10:50	234.0366382
1/15/2015 11:00	233.9722137	1/15/2015 11:48	233.9648855	1/15/2015 11:58	234.0256458
1/15/2015 12:01	233.9612214	1/15/2015 12:00	233.9648855	1/15/2015 12:00	234.0256458
1/15/2015 13:18	233.950229	1/15/2015 13:06	233.9538931	1/15/2015 13:17	234.0146534
1/15/2015 14:00	233.950229	1/15/2015 14:00	233.9538931	1/15/2015 14:00	234.0146534
1/15/2015 15:00	233.950229	1/15/2015 15:58	233.9429008	1/15/2015 15:48	234.0036611
1/15/2015 16:02	233.9392366	1/15/2015 16:00	233.9429008	1/15/2015 16:00	234.0036611
1/15/2015 17:20	233.9282443	1/15/2015 17:47	233.920916	1/15/2015 17:16	233.9926687
1/15/2015 18:59	233.9062595	1/15/2015 18:25	233.9099237	1/15/2015 18:50	233.970684
1/15/2015 19:41	233.8952672	1/15/2015 19:57	233.8879389	1/15/2015 19:33	233.9596916
1/15/2015 20:26	233.8842748	1/15/2015 20:00	233.8879389	1/15/2015 20:21	233.9486992
1/15/2015 21:35	233.8732824	1/15/2015 21:15	233.8769466	1/15/2015 21:23	233.9377069
1/15/2015 22:00	233.8732824	1/15/2015 22:00	233.8769466	1/15/2015 22:00	233.9377069
1/15/2015 23:00	233.8732824	1/15/2015 23:00	233.8769466	1/15/2015 23:00	233.9377069
1/16/2015 0:00	233.8842748	1/16/2015 0:00	233.8989313	1/16/2015 0:00	233.9377069
1/16/2015 1:00	233.8952672	1/16/2015 1:00	233.9099237	1/16/2015 1:00	233.9596916
1/16/2015 2:00	233.9282443	1/16/2015 2:00	233.9429008	1/16/2015 2:00	233.9816763
1/16/2015 3:00	233.9612214	1/16/2015 3:00	233.9758779	1/16/2015 3:00	234.0146534
1/16/2015 4:00	233.9941985	1/16/2015 4:00	234.008855	1/16/2015 4:00	234.0476305
1/16/2015 5:00	234.0271756	1/16/2015 5:00	234.0418321	1/16/2015 5:00	234.0806076
1/16/2015 6:00	234.0491603	1/16/2015 6:50	234.0418321	1/16/2015 6:00	234.1025924
1/16/2015 7:58	234.0271756	1/16/2015 7:42	234.0198473	1/16/2015 7:32	234.1025924

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/16/2015 8:52	234.0161832	1/16/2015 8:00	234.0198473	1/16/2015 8:06	234.0916
1/16/2015 9:00	234.0161832	1/16/2015 9:12	234.008855	1/16/2015 9:01	234.0806076
1/16/2015 10:24	234.0051908	1/16/2015 10:49	233.9978626	1/16/2015 10:33	234.0696153
1/16/2015 11:59	233.9941985	1/16/2015 11:00	233.9978626	1/16/2015 11:00	234.0696153
1/16/2015 12:00	233.9941985	1/16/2015 12:00	233.9978626	1/16/2015 12:19	234.0586229
1/16/2015 13:00	233.9941985	1/16/2015 13:09	233.9868702	1/16/2015 13:00	234.0586229
1/16/2015 14:47	233.9832061	1/16/2015 14:00	233.9868702	1/16/2015 14:00	234.0586229
1/16/2015 15:00	233.9832061	1/16/2015 15:00	233.9868702	1/16/2015 15:00	234.0586229
1/16/2015 16:00	233.9832061	1/16/2015 16:00	233.9868702	1/16/2015 16:00	234.0586229
1/16/2015 17:00	233.9832061	1/16/2015 17:46	233.9758779	1/16/2015 17:25	234.0476305
1/16/2015 18:09	233.9722137	1/16/2015 18:00	233.9758779	1/16/2015 18:00	234.0476305
1/16/2015 19:00	233.9722137	1/16/2015 19:00	233.9758779	1/16/2015 19:10	234.0366382
1/16/2015 20:00	233.9722137	1/16/2015 20:00	233.9758779	1/16/2015 20:00	234.0366382
1/16/2015 21:00	233.9722137	1/16/2015 21:00	233.9758779	1/16/2015 21:00	234.0366382
1/16/2015 22:00	233.9722137	1/16/2015 22:00	233.9758779	1/16/2015 22:00	234.0366382
1/16/2015 23:00	233.9832061	1/16/2015 23:00	233.9868702	1/16/2015 23:00	234.0476305
1/17/2015 0:00	233.9941985	1/17/2015 0:00	234.008855	1/17/2015 0:00	234.0696153
1/17/2015 1:00	234.0161832	1/17/2015 1:00	234.0308397	1/17/2015 1:00	234.0806076
1/17/2015 2:00	234.0381679	1/17/2015 2:00	234.0638168	1/17/2015 2:00	234.1135847
1/17/2015 3:00	234.0821374	1/17/2015 3:00	234.0967939	1/17/2015 3:00	234.1465618
1/17/2015 4:00	234.1261069	1/17/2015 4:00	234.1407634	1/17/2015 4:00	234.1905313
1/17/2015 5:00	234.159084	1/17/2015 5:00	234.1847328	1/17/2015 5:00	234.2345008
1/17/2015 6:00	234.2030534	1/17/2015 6:00	234.2177099	1/17/2015 6:00	234.2674779
1/17/2015 7:00	234.2250382	1/17/2015 7:00	234.2396947	1/17/2015 7:00	234.300455
1/17/2015 8:00	234.2360305	1/17/2015 8:00	234.2396947	1/17/2015 8:00	234.300455
1/17/2015 9:32	234.2250382	1/17/2015 9:44	234.2177099	1/17/2015 9:55	234.2894626
1/17/2015 10:45	234.2030534	1/17/2015 10:48	234.1957252	1/17/2015 10:31	234.2784702
1/17/2015 11:54	234.1810687	1/17/2015 11:58	234.1737405	1/17/2015 11:40	234.2564855
1/17/2015 12:29	234.1700763	1/17/2015 12:45	234.1627481	1/17/2015 12:50	234.2345008
1/17/2015 13:51	234.1480916	1/17/2015 13:27	234.1517557	1/17/2015 13:31	234.2235084
1/17/2015 14:52	234.1370992	1/17/2015 14:37	234.1407634	1/17/2015 14:19	234.212516
1/17/2015 15:00	234.1370992	1/17/2015 15:00	234.1407634	1/17/2015 15:26	234.2015237
1/17/2015 16:10	234.1261069	1/17/2015 16:05	234.129771	1/17/2015 16:48	234.1905313
1/17/2015 17:32	234.1151145	1/17/2015 17:15	234.1187786	1/17/2015 17:00	234.1905313
1/17/2015 18:00	234.1151145	1/17/2015 18:44	234.1077863	1/17/2015 18:01	234.1795389
1/17/2015 19:09	234.1041221	1/17/2015 19:00	234.1077863	1/17/2015 19:00	234.1795389
1/17/2015 20:00	234.1041221	1/17/2015 20:00	234.1077863	1/17/2015 20:00	234.1795389
1/17/2015 21:00	234.1041221	1/17/2015 21:00	234.1077863	1/17/2015 21:00	234.1795389
1/17/2015 22:00	234.1041221	1/17/2015 22:00	234.1187786	1/17/2015 22:00	234.1795389
1/17/2015 23:00	234.1151145	1/17/2015 23:00	234.129771	1/17/2015 23:00	234.1795389
1/18/2015 0:00	234.1370992	1/18/2015 0:00	234.1407634	1/18/2015 0:00	234.2015237
1/18/2015 1:00	234.1480916	1/18/2015 1:00	234.1517557	1/18/2015 1:00	234.212516
1/18/2015 2:00	234.1700763	1/18/2015 2:00	234.1847328	1/18/2015 2:00	234.2345008
1/18/2015 3:00	234.2030534	1/18/2015 3:00	234.2177099	1/18/2015 3:00	234.2674779
1/18/2015 4:00	234.2470229	1/18/2015 4:00	234.2616794	1/18/2015 4:00	234.300455
1/18/2015 5:00	234.28	1/18/2015 5:00	234.3056489	1/18/2015 5:00	234.3444244
1/18/2015 6:00	234.3239695	1/18/2015 6:00	234.338626	1/18/2015 6:00	234.3883939
1/18/2015 7:00	234.3459542	1/18/2015 7:00	234.3496183	1/18/2015 7:00	234.4103786
1/18/2015 8:00	234.3569466	1/18/2015 8:00	234.3606107	1/18/2015 8:00	234.421371
1/18/2015 9:50	234.3459542	1/18/2015 9:44	234.338626	1/18/2015 9:00	234.421371
1/18/2015 10:31	234.3349618	1/18/2015 10:53	234.3166412	1/18/2015 10:43	234.3993863
1/18/2015 11:38	234.3129771	1/18/2015 11:51	234.2946565	1/18/2015 11:48	234.3774015

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/18/2015 12:40	234.2909924	1/18/2015 12:54	234.2726718	1/18/2015 12:48	234.3554168
1/18/2015 13:46	234.2690076	1/18/2015 13:30	234.2616794	1/18/2015 13:54	234.3334321
1/18/2015 14:35	234.2580153	1/18/2015 14:23	234.250687	1/18/2015 14:36	234.3224397
1/18/2015 15:37	234.2470229	1/18/2015 15:37	234.2396947	1/18/2015 15:36	234.3114473
1/18/2015 16:48	234.2360305	1/18/2015 16:47	234.2287023	1/18/2015 16:43	234.300455
1/18/2015 17:58	234.2250382	1/18/2015 17:47	234.2177099	1/18/2015 17:52	234.2894626
1/18/2015 18:55	234.2140458	1/18/2015 18:46	234.2067176	1/18/2015 18:51	234.2784702
1/18/2015 19:00	234.2140458	1/18/2015 19:57	234.1957252	1/18/2015 19:54	234.2674779
1/18/2015 20:03	234.2030534	1/18/2015 20:00	234.1957252	1/18/2015 20:00	234.2674779
1/18/2015 21:00	234.2030534	1/18/2015 21:00	234.1957252	1/18/2015 21:00	234.2674779
1/18/2015 22:00	234.2030534	1/18/2015 22:00	234.1957252	1/18/2015 22:00	234.2674779
1/18/2015 23:00	234.2030534	1/18/2015 23:00	234.2067176	1/18/2015 23:00	234.2674779
1/19/2015 0:00	234.2140458	1/19/2015 0:00	234.2177099	1/19/2015 0:00	234.2784702
1/19/2015 1:00	234.2360305	1/19/2015 1:00	234.250687	1/19/2015 1:00	234.2894626
1/19/2015 2:00	234.2690076	1/19/2015 2:00	234.2836641	1/19/2015 2:00	234.3224397
1/19/2015 3:00	234.3019847	1/19/2015 3:00	234.3166412	1/19/2015 3:00	234.3554168
1/19/2015 4:00	234.3459542	1/19/2015 4:00	234.3606107	1/19/2015 4:00	234.3993863
1/19/2015 5:00	234.3789313	1/19/2015 5:00	234.3825954	1/19/2015 5:00	234.4323634
1/19/2015 6:00	234.3789313	1/19/2015 6:49	234.3716031	1/19/2015 6:00	234.4433557
1/19/2015 7:41	234.3569466	1/19/2015 7:52	234.338626	1/19/2015 7:38	234.421371
1/19/2015 8:36	234.3349618	1/19/2015 8:33	234.3276336	1/19/2015 8:29	234.3993863
1/19/2015 9:56	234.3129771	1/19/2015 9:18	234.3166412	1/19/2015 9:45	234.3774015
1/19/2015 10:35	234.3019847	1/19/2015 10:43	234.2946565	1/19/2015 10:28	234.3664092
1/19/2015 11:21	234.2909924	1/19/2015 11:24	234.2836641	1/19/2015 11:52	234.3444244
1/19/2015 12:55	234.2690076	1/19/2015 12:15	234.2726718	1/19/2015 12:40	234.3334321
1/19/2015 13:59	234.2580153	1/19/2015 13:09	234.2616794	1/19/2015 13:31	234.3224397
1/19/2015 14:00	234.2580153	1/19/2015 14:41	234.250687	1/19/2015 14:45	234.3114473
1/19/2015 15:25	234.2470229	1/19/2015 15:00	234.250687	1/19/2015 15:00	234.3114473
1/19/2015 16:42	234.2360305	1/19/2015 16:05	234.2396947	1/19/2015 16:15	234.300455
1/19/2015 17:36	234.2250382	1/19/2015 17:40	234.2177099	1/19/2015 17:17	234.2894626
1/19/2015 18:48	234.2030534	1/19/2015 18:48	234.1957252	1/19/2015 18:40	234.2674779
1/19/2015 19:20	234.1920611	1/19/2015 19:33	234.1847328	1/19/2015 19:55	234.2454931
1/19/2015 20:08	234.1810687	1/19/2015 20:25	234.1737405	1/19/2015 20:44	234.2345008
1/19/2015 21:04	234.1700763	1/19/2015 21:35	234.1627481	1/19/2015 21:46	234.2235084
1/19/2015 22:16	234.159084	1/19/2015 22:00	234.1627481	1/19/2015 22:00	234.2235084
1/19/2015 23:00	234.159084	1/19/2015 23:00	234.1627481	1/19/2015 23:00	234.2235084
1/20/2015 0:00	234.1700763	1/20/2015 0:00	234.1847328	1/20/2015 0:00	234.2235084
1/20/2015 1:00	234.1810687	1/20/2015 1:00	234.1957252	1/20/2015 1:00	234.2345008
1/20/2015 2:00	234.2140458	1/20/2015 2:00	234.2177099	1/20/2015 2:00	234.2674779
1/20/2015 3:00	234.2360305	1/20/2015 3:00	234.250687	1/20/2015 3:00	234.2894626
1/20/2015 4:00	234.2690076	1/20/2015 4:00	234.2946565	1/20/2015 4:00	234.3334321
1/20/2015 5:00	234.3019847	1/20/2015 5:00	234.3166412	1/20/2015 5:00	234.3554168
1/20/2015 6:00	234.3129771	1/20/2015 6:45	234.3056489	1/20/2015 6:00	234.3774015
1/20/2015 7:36	234.2909924	1/20/2015 7:47	234.2726718	1/20/2015 7:57	234.3444244
1/20/2015 8:39	234.2690076	1/20/2015 8:42	234.2616794	1/20/2015 8:25	234.3334321
1/20/2015 9:31	234.2580153	1/20/2015 9:42	234.250687	1/20/2015 9:09	234.3224397
1/20/2015 10:23	234.2470229	1/20/2015 10:45	234.2396947	1/20/2015 10:57	234.300455
1/20/2015 11:43	234.2250382	1/20/2015 11:54	234.2177099	1/20/2015 11:48	234.2784702
1/20/2015 12:41	234.2030534	1/20/2015 12:52	234.1957252	1/20/2015 12:43	234.2564855
1/20/2015 13:42	234.1810687	1/20/2015 13:25	234.1847328	1/20/2015 13:45	234.2345008
1/20/2015 14:54	234.159084	1/20/2015 14:41	234.1627481	1/20/2015 14:57	234.212516
1/20/2015 15:00	234.159084	1/20/2015 15:30	234.1517557	1/20/2015 15:00	234.212516

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/20/2015 16:10	234.1480916	1/20/2015 16:32	234.1407634	1/20/2015 16:42	234.2015237
1/20/2015 17:56	234.1261069	1/20/2015 17:24	234.129771	1/20/2015 17:40	234.1905313
1/20/2015 18:38	234.1151145	1/20/2015 18:45	234.1077863	1/20/2015 18:24	234.1795389
1/20/2015 19:23	234.1041221	1/20/2015 19:24	234.0967939	1/20/2015 19:47	234.1575542
1/20/2015 20:10	234.0931298	1/20/2015 20:19	234.0858015	1/20/2015 20:35	234.1465618
1/20/2015 21:06	234.0821374	1/20/2015 21:27	234.0748092	1/20/2015 21:37	234.1355695
1/20/2015 22:23	234.071145	1/20/2015 22:00	234.0748092	1/20/2015 22:00	234.1355695
1/20/2015 23:00	234.071145	1/20/2015 23:00	234.0748092	1/20/2015 23:00	234.1355695
1/21/2015 0:00	234.071145	1/21/2015 0:00	234.0748092	1/21/2015 0:00	234.1355695
1/21/2015 1:00	234.0821374	1/21/2015 1:00	234.0967939	1/21/2015 1:00	234.1355695
1/21/2015 2:00	234.1151145	1/21/2015 2:00	234.1187786	1/21/2015 2:00	234.1575542
1/21/2015 3:00	234.1370992	1/21/2015 3:00	234.1517557	1/21/2015 3:00	234.1905313
1/21/2015 4:00	234.1700763	1/21/2015 4:00	234.1847328	1/21/2015 4:00	234.2235084
1/21/2015 5:00	234.1920611	1/21/2015 5:00	234.2067176	1/21/2015 5:00	234.2454931
1/21/2015 6:00	234.2030534	1/21/2015 6:58	234.1847328	1/21/2015 6:00	234.2564855
1/21/2015 7:39	234.1810687	1/21/2015 7:47	234.1627481	1/21/2015 7:59	234.2345008
1/21/2015 8:39	234.159084	1/21/2015 8:12	234.1517557	1/21/2015 8:25	234.2235084
1/21/2015 9:34	234.1480916	1/21/2015 9:25	234.1407634	1/21/2015 9:55	234.2015237
1/21/2015 10:26	234.1370992	1/21/2015 10:15	234.129771	1/21/2015 10:49	234.1905313
1/21/2015 11:26	234.1261069	1/21/2015 11:17	234.1187786	1/21/2015 11:49	234.1795389
1/21/2015 12:37	234.1151145	1/21/2015 12:32	234.1077863	1/21/2015 12:58	234.1685466
1/21/2015 13:00	234.1151145	1/21/2015 13:00	234.1077863	1/21/2015 13:00	234.1685466
1/21/2015 14:02	234.1041221	1/21/2015 14:11	234.0967939	1/21/2015 14:31	234.1575542
1/21/2015 15:32	234.0931298	1/21/2015 15:46	234.0858015	1/21/2015 15:48	234.1465618
1/21/2015 16:35	234.0821374	1/21/2015 16:36	234.0748092	1/21/2015 16:47	234.1355695
1/21/2015 17:55	234.0601527	1/21/2015 17:45	234.0528244	1/21/2015 17:32	234.1245771
1/21/2015 18:30	234.0491603	1/21/2015 18:55	234.0308397	1/21/2015 18:41	234.1025924
1/21/2015 19:45	234.0271756	1/21/2015 19:36	234.0198473	1/21/2015 19:54	234.0806076
1/21/2015 20:33	234.0161832	1/21/2015 20:14	234.008855	1/21/2015 20:55	234.0696153
1/21/2015 21:00	234.0161832	1/21/2015 21:00	234.008855	1/21/2015 21:00	234.0696153
1/21/2015 22:16	234.0051908	1/21/2015 22:00	234.008855	1/21/2015 22:00	234.0696153
1/21/2015 23:00	234.0051908	1/21/2015 23:00	234.008855	1/21/2015 23:00	234.0696153
1/22/2015 0:00	234.0161832	1/22/2015 0:00	234.0308397	1/22/2015 0:00	234.0696153
1/22/2015 1:00	234.0381679	1/22/2015 1:00	234.0418321	1/22/2015 1:00	234.0916
1/22/2015 2:00	234.0601527	1/22/2015 2:00	234.0748092	1/22/2015 2:00	234.1135847
1/22/2015 3:00	234.0931298	1/22/2015 3:00	234.1077863	1/22/2015 3:00	234.1465618
1/22/2015 4:00	234.1261069	1/22/2015 4:00	234.129771	1/22/2015 4:00	234.1795389
1/22/2015 5:00	234.1480916	1/22/2015 5:42	234.1407634	1/22/2015 5:00	234.2015237
1/22/2015 6:00	234.1480916	1/22/2015 6:49	234.129771	1/22/2015 6:00	234.2015237
1/22/2015 7:53	234.1151145	1/22/2015 7:29	234.1077863	1/22/2015 7:46	234.1795389
1/22/2015 8:24	234.1041221	1/22/2015 8:04	234.0967939	1/22/2015 8:51	234.1575542
1/22/2015 9:58	234.0821374	1/22/2015 9:53	234.0748092	1/22/2015 9:39	234.1465618
1/22/2015 10:43	234.071145	1/22/2015 10:50	234.0638168	1/22/2015 10:30	234.1355695
1/22/2015 11:46	234.0601527	1/22/2015 11:48	234.0528244	1/22/2015 11:27	234.1245771
1/22/2015 12:39	234.0491603	1/22/2015 12:00	234.0528244	1/22/2015 12:29	234.1135847
1/22/2015 13:00	234.0491603	1/22/2015 13:04	234.0418321	1/22/2015 13:47	234.1025924
1/22/2015 14:24	234.0381679	1/22/2015 14:00	234.0418321	1/22/2015 14:00	234.1025924
1/22/2015 15:00	234.0381679	1/22/2015 15:48	234.0308397	1/22/2015 15:52	234.0916
1/22/2015 16:20	234.0271756	1/22/2015 16:53	234.0198473	1/22/2015 16:00	234.0916
1/22/2015 17:23	234.0161832	1/22/2015 17:38	234.008855	1/22/2015 17:11	234.0806076
1/22/2015 18:47	233.9941985	1/22/2015 18:57	233.9868702	1/22/2015 18:42	234.0586229
1/22/2015 19:29	233.9832061	1/22/2015 19:55	233.9758779	1/22/2015 19:23	234.0476305

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/22/2015 20:16	233.9722137	1/22/2015 20:55	233.9648855	1/22/2015 20:11	234.0366382
1/22/2015 21:12	233.9612214	1/22/2015 21:00	233.9648855	1/22/2015 21:08	234.0256458
1/22/2015 22:00	233.9612214	1/22/2015 22:00	233.9648855	1/22/2015 22:35	234.0146534
1/22/2015 23:00	233.9612214	1/22/2015 23:00	233.9648855	1/22/2015 23:00	234.0146534
1/23/2015 0:00	233.9612214	1/23/2015 0:00	233.9648855	1/23/2015 0:00	234.0146534
1/23/2015 1:00	233.9722137	1/23/2015 1:00	233.9868702	1/23/2015 1:00	234.0256458
1/23/2015 2:00	233.9941985	1/23/2015 2:00	234.008855	1/23/2015 2:00	234.0476305
1/23/2015 3:00	234.0271756	1/23/2015 3:00	234.0418321	1/23/2015 3:00	234.0806076
1/23/2015 4:00	234.0601527	1/23/2015 4:00	234.0858015	1/23/2015 4:00	234.1245771
1/23/2015 5:00	234.0931298	1/23/2015 5:00	234.1077863	1/23/2015 5:00	234.1465618
1/23/2015 6:00	234.1151145	1/23/2015 6:49	234.1077863	1/23/2015 6:00	234.1685466
1/23/2015 7:33	234.0931298	1/23/2015 7:33	234.0858015	1/23/2015 7:39	234.1575542
1/23/2015 8:32	234.071145	1/23/2015 8:05	234.0748092	1/23/2015 8:40	234.1355695
1/23/2015 9:26	234.0601527	1/23/2015 9:07	234.0638168	1/23/2015 9:30	234.1245771
1/23/2015 10:17	234.0491603	1/23/2015 10:51	234.0418321	1/23/2015 10:18	234.1135847
1/23/2015 11:05	234.0381679	1/23/2015 11:48	234.0308397	1/23/2015 11:09	234.1025924
1/23/2015 12:06	234.0271756	1/23/2015 12:55	234.0198473	1/23/2015 12:06	234.0916
1/23/2015 13:14	234.0161832	1/23/2015 13:00	234.0198473	1/23/2015 13:07	234.0806076
1/23/2015 14:54	234.0051908	1/23/2015 14:42	234.008855	1/23/2015 14:31	234.0696153
1/23/2015 15:00	234.0051908	1/23/2015 15:00	234.008855	1/23/2015 15:00	234.0696153
1/23/2015 16:40	233.9941985	1/23/2015 16:38	233.9978626	1/23/2015 16:45	234.0586229
1/23/2015 17:00	233.9941985	1/23/2015 17:44	233.9868702	1/23/2015 17:55	234.0476305
1/23/2015 18:00	233.9832061	1/23/2015 18:44	233.9758779	1/23/2015 18:54	234.0366382
1/23/2015 19:04	233.9722137	1/23/2015 19:00	233.9758779	1/23/2015 19:00	234.0366382
1/23/2015 20:34	233.9612214	1/23/2015 20:51	233.9648855	1/23/2015 20:16	234.0256458
1/23/2015 21:00	233.9612214	1/23/2015 21:00	233.9648855	1/23/2015 21:00	234.0256458
1/23/2015 22:00	233.9612214	1/23/2015 22:00	233.9648855	1/23/2015 22:00	234.0256458
1/23/2015 23:00	233.9612214	1/23/2015 23:00	233.9648855	1/23/2015 23:00	234.0256458
1/24/2015 0:00	233.9612214	1/24/2015 0:00	233.9758779	1/24/2015 0:00	234.0256458
1/24/2015 1:00	233.9612214	1/24/2015 1:00	233.9758779	1/24/2015 1:00	234.0256458
1/24/2015 2:00	233.9832061	1/24/2015 2:00	233.9978626	1/24/2015 2:00	234.0476305
1/24/2015 3:00	234.0051908	1/24/2015 3:00	234.0308397	1/24/2015 3:00	234.0696153
1/24/2015 4:00	234.0381679	1/24/2015 4:00	234.0638168	1/24/2015 4:00	234.1025924
1/24/2015 5:00	234.071145	1/24/2015 5:00	234.0967939	1/24/2015 5:00	234.1355695
1/24/2015 6:00	234.1041221	1/24/2015 6:00	234.1187786	1/24/2015 6:00	234.1685466
1/24/2015 7:00	234.1151145	1/24/2015 7:00	234.129771	1/24/2015 7:00	234.1795389
1/24/2015 8:00	234.1151145	1/24/2015 8:40	234.1187786	1/24/2015 8:00	234.1795389
1/24/2015 9:27	234.1041221	1/24/2015 9:37	234.0967939	1/24/2015 9:34	234.1685466
1/24/2015 10:58	234.071145	1/24/2015 10:38	234.0748092	1/24/2015 10:39	234.1465618
1/24/2015 11:51	234.0491603	1/24/2015 11:59	234.0418321	1/24/2015 11:34	234.1245771
1/24/2015 12:47	234.0271756	1/24/2015 12:59	234.0198473	1/24/2015 12:57	234.0916
1/24/2015 13:50	234.0051908	1/24/2015 13:31	234.008855	1/24/2015 13:59	234.0696153
1/24/2015 14:34	233.9941985	1/24/2015 14:13	233.9978626	1/24/2015 14:38	234.0586229
1/24/2015 15:22	233.9832061	1/24/2015 15:06	233.9868702	1/24/2015 15:26	234.0476305
1/24/2015 16:11	233.9722137	1/24/2015 16:52	233.9648855	1/24/2015 16:18	234.0366382
1/24/2015 17:55	233.950229	1/24/2015 17:39	233.9538931	1/24/2015 17:57	234.0146534
1/24/2015 18:59	233.9392366	1/24/2015 18:39	233.9429008	1/24/2015 18:51	234.0036611
1/24/2015 19:00	233.9392366	1/24/2015 19:00	233.9429008	1/24/2015 19:00	234.0036611
1/24/2015 20:53	233.9282443	1/24/2015 20:00	233.9429008	1/24/2015 20:18	233.9926687
1/24/2015 21:00	233.9282443	1/24/2015 21:00	233.9429008	1/24/2015 21:00	233.9926687
1/24/2015 22:00	233.9282443	1/24/2015 22:00	233.9429008	1/24/2015 22:00	233.9926687
1/24/2015 23:00	233.9282443	1/24/2015 23:00	233.9429008	1/24/2015 23:00	233.9926687

Hurst Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir	Timestamp	South Reservoir
1/25/2015 0:00	233.950229	1/25/2015 0:00	233.9648855	1/25/2015 0:00	234.0036611
1/25/2015 1:00	233.9722137	1/25/2015 1:00	233.9868702	1/25/2015 1:00	234.0256458
1/25/2015 2:00	233.9832061	1/25/2015 2:00	233.9978626	1/25/2015 2:00	234.0476305
1/25/2015 3:00	234.0161832	1/25/2015 3:00	234.0308397	1/25/2015 3:00	234.0696153
1/25/2015 4:00	234.0491603	1/25/2015 4:00	234.0638168	1/25/2015 4:00	234.1025924
1/25/2015 5:00	234.0821374	1/25/2015 5:00	234.0967939	1/25/2015 5:00	234.1355695
1/25/2015 6:00	234.1151145	1/25/2015 6:00	234.129771	1/25/2015 6:00	234.1685466
1/25/2015 7:00	234.1370992	1/25/2015 7:00	234.1407634	1/25/2015 7:00	234.1905313
1/25/2015 8:00	234.1370992	1/25/2015 8:51	234.129771	1/25/2015 8:00	234.1905313
1/25/2015 9:46	234.1151145	1/25/2015 9:42	234.1077863	1/25/2015 9:41	234.1795389
1/25/2015 10:44	234.0931298	1/25/2015 10:59	234.0748092	1/25/2015 10:40	234.1575542
1/25/2015 11:59	234.0601527	1/25/2015 11:48	234.0528244	1/25/2015 11:55	234.1245771
1/25/2015 12:52	234.0381679	1/25/2015 12:44	234.0308397	1/25/2015 12:48	234.1025924
1/25/2015 13:50	234.0161832	1/25/2015 13:48	234.008855	1/25/2015 13:44	234.0806076
1/25/2015 14:56	233.9941985	1/25/2015 14:15	233.9978626	1/25/2015 14:48	234.0586229
1/25/2015 15:39	233.9832061	1/25/2015 15:54	233.9758779	1/25/2015 15:32	234.0476305
1/25/2015 16:28	233.9722137	1/25/2015 16:43	233.9648855	1/25/2015 16:15	234.0366382
1/25/2015 17:58	233.950229	1/25/2015 17:27	233.9538931	1/25/2015 17:46	234.0146534
1/25/2015 18:36	233.9392366	1/25/2015 18:41	233.9319084	1/25/2015 18:25	234.0036611
1/25/2015 19:47	233.9172519	1/25/2015 19:20	233.920916	1/25/2015 19:41	233.9816763
1/25/2015 20:44	233.9062595	1/25/2015 20:05	233.9099237	1/25/2015 20:23	233.970684
1/25/2015 21:00	233.9062595	1/25/2015 21:00	233.9099237	1/25/2015 21:26	233.9596916
1/25/2015 22:26	233.8952672	1/25/2015 22:00	233.9099237	1/25/2015 22:00	233.9596916
1/25/2015 23:00	233.8952672	1/25/2015 23:00	233.9099237	1/25/2015 23:00	233.9596916
1/26/2015 0:00	233.9172519	1/26/2015 0:00	233.9319084	1/26/2015 0:00	233.970684
1/26/2015 1:00	233.950229	1/26/2015 1:00	233.9648855	1/26/2015 1:00	234.0036611
1/26/2015 2:00	233.9722137	1/26/2015 2:00	233.9978626	1/26/2015 2:00	234.0256458
1/26/2015 3:00	234.0051908	1/26/2015 3:00	234.0308397	1/26/2015 3:00	234.0586229
1/26/2015 4:00	234.0381679	1/26/2015 4:00	234.0638168	1/26/2015 4:00	234.1025924
1/26/2015 5:00	234.071145	1/26/2015 5:00	234.0858015	1/26/2015 5:00	234.1245771
1/26/2015 6:00	234.0821374	1/26/2015 6:51	234.0858015	1/26/2015 6:00	234.1465618
1/26/2015 7:48	234.0601527	1/26/2015 7:30	234.0638168	1/26/2015 7:55	234.1245771
1/26/2015 8:20	234.0491603	1/26/2015 8:05	234.0528244	1/26/2015 8:25	234.1135847
1/26/2015 9:58	234.0271756	1/26/2015 9:52	234.0308397	1/26/2015 9:56	234.0916
1/26/2015 10:47	234.0161832	1/26/2015 10:44	234.0198473	1/26/2015 10:45	234.0806076
1/26/2015 11:39	234.0051908	1/26/2015 11:30	234.008855	1/26/2015 11:34	234.0696153
1/26/2015 12:29	233.9941985	1/26/2015 12:33	233.9978626	1/26/2015 12:23	234.0586229
1/26/2015 13:52	233.9832061	1/26/2015 13:54	233.9868702	1/26/2015 13:24	234.0476305
1/26/2015 14:00	233.9832061	1/26/2015 14:00	233.9868702	1/26/2015 14:58	234.0366382
1/26/2015 15:58	233.9722137	1/26/2015 15:57	233.9758779	1/26/2015 15:00	234.0366382
1/26/2015 16:00	233.9722137	1/26/2015 16:00	233.9758779	1/26/2015 16:38	234.0256458
1/26/2015 17:57	233.950229	1/26/2015 17:31	233.9538931	1/26/2015 17:35	234.0146534
1/26/2015 18:37	233.9392366	1/26/2015 18:49	233.9319084	1/26/2015 18:54	233.9926687
1/26/2015 19:13	233.9282443	1/26/2015 19:37	233.920916	1/26/2015 19:34	233.9816763
1/26/2015 20:03	233.9172519	1/26/2015 20:49	233.9099237	1/26/2015 20:24	233.970684
1/26/2015 21:01	233.9062595	1/26/2015 21:00	233.9099237	1/26/2015 21:30	233.9596916
1/26/2015 22:00	233.9062595	1/26/2015 22:00	233.9099237	1/26/2015 22:00	233.9596916
1/26/2015 23:00	233.9062595	1/26/2015 23:00	233.9099237	1/26/2015 23:00	233.9596916

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Timestamp	North Reservoir	Timestamp	South Reservoir
1/12/2015 0:00	233.7985965	1/12/2015 0:00	233.7619552
1/12/2015 1:00	233.8315736	1/12/2015 1:00	233.8059247
1/12/2015 2:00	233.8645507	1/12/2015 2:00	233.8498942
1/12/2015 3:00	233.9085201	1/12/2015 3:00	233.8938636
1/12/2015 4:00	233.9524896	1/12/2015 4:00	233.9268407
1/12/2015 5:00	233.9964591	1/12/2015 5:00	233.9708102
1/12/2015 6:00	234.0294362	1/12/2015 6:40	233.9708102
1/12/2015 7:43	234.0184438	1/12/2015 7:56	233.9268407
1/12/2015 8:54	233.9964591	1/12/2015 8:00	233.9268407
1/12/2015 9:41	233.9854667	1/12/2015 9:07	233.9158484
1/12/2015 10:41	233.9744743	1/12/2015 10:06	233.904856
1/12/2015 11:40	233.963482	1/12/2015 11:12	233.8938636
1/12/2015 12:29	233.9524896	1/12/2015 12:29	233.8828713
1/12/2015 13:59	233.9414972	1/12/2015 13:00	233.8828713
1/12/2015 14:00	233.9414972	1/12/2015 14:00	233.8828713
1/12/2015 15:00	233.9414972	1/12/2015 15:42	233.8718789
1/12/2015 16:10	233.9305049	1/12/2015 16:36	233.8608865
1/12/2015 17:17	233.9195125	1/12/2015 17:35	233.8389018
1/12/2015 18:31	233.8975278	1/12/2015 18:57	233.8059247
1/12/2015 19:33	233.875543	1/12/2015 19:27	233.7949323
1/12/2015 20:57	233.8498942	1/12/2015 20:07	233.78394
1/12/2015 21:55	233.8389018	1/12/2015 21:24	233.7729476
1/12/2015 22:00	233.8389018	1/12/2015 22:00	233.7729476
1/12/2015 23:00	233.8389018	1/12/2015 23:00	233.78394
1/13/2015 0:00	233.8498942	1/13/2015 0:00	233.8059247
1/13/2015 1:00	233.8718789	1/13/2015 1:00	233.8498942
1/13/2015 2:00	233.904856	1/13/2015 2:00	233.8828713
1/13/2015 3:00	233.9378331	1/13/2015 3:00	233.9158484
1/13/2015 4:00	233.9818026	1/13/2015 4:00	233.9598178
1/13/2015 5:00	234.0147797	1/13/2015 5:00	233.9927949
1/13/2015 6:00	234.0367644	1/13/2015 6:59	233.9708102
1/13/2015 7:41	234.025772	1/13/2015 7:49	233.9378331
1/13/2015 8:38	234.0037873	1/13/2015 8:32	233.9268407
1/13/2015 9:22	233.9927949	1/13/2015 9:38	233.9158484
1/13/2015 10:52	233.9708102	1/13/2015 10:36	233.904856
1/13/2015 11:43	233.9598178	1/13/2015 11:42	233.8938636
1/13/2015 12:51	233.9488255	1/13/2015 12:00	233.8938636
1/13/2015 13:00	233.9488255	1/13/2015 13:17	233.8828713
1/13/2015 14:25	233.9378331	1/13/2015 14:00	233.8828713
1/13/2015 15:00	233.9378331	1/13/2015 15:49	233.8718789
1/13/2015 16:26	233.9268407	1/13/2015 16:34	233.8608865
1/13/2015 17:27	233.9158484	1/13/2015 17:42	233.8389018
1/13/2015 18:50	233.8938636	1/13/2015 18:32	233.8169171
1/13/2015 19:51	233.8718789	1/13/2015 19:45	233.7949323
1/13/2015 20:30	233.8608865	1/13/2015 20:53	233.78394
1/13/2015 21:21	233.8498942	1/13/2015 21:00	233.78394
1/13/2015 22:44	233.8389018	1/13/2015 22:00	233.78394
1/13/2015 23:00	233.8389018	1/13/2015 23:00	233.78394

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Timestamp	North Reservoir	Timestamp	South Reservoir
1/14/2015 0:00	233.8498942	1/14/2015 0:00	233.8169171
1/14/2015 1:00	233.8828713	1/14/2015 1:00	233.8498942
1/14/2015 2:00	233.9158484	1/14/2015 2:00	233.8938636
1/14/2015 3:00	233.9488255	1/14/2015 3:00	233.9378331
1/14/2015 4:00	233.9927949	1/14/2015 4:00	233.9708102
1/14/2015 5:00	234.0367644	1/14/2015 5:00	234.0147797
1/14/2015 6:00	234.0587491	1/14/2015 6:58	233.9927949
1/14/2015 7:47	234.0477568	1/14/2015 7:46	233.9598178
1/14/2015 8:55	234.025772	1/14/2015 8:29	233.9488255
1/14/2015 9:47	234.0147797	1/14/2015 9:00	233.9488255
1/14/2015 10:53	234.0037873	1/14/2015 10:46	233.9378331
1/14/2015 11:00	234.0037873	1/14/2015 11:00	233.9378331
1/14/2015 12:35	233.9927949	1/14/2015 12:37	233.9268407
1/14/2015 13:00	233.9927949	1/14/2015 13:00	233.9268407
1/14/2015 14:33	233.9818026	1/14/2015 14:00	233.9268407
1/14/2015 15:43	233.9818026	1/14/2015 15:00	233.9268407
1/14/2015 16:00	233.9818026	1/14/2015 16:28	233.9158484
1/14/2015 17:43	233.9708102	1/14/2015 17:58	233.8938636
1/14/2015 18:28	233.9598178	1/14/2015 18:51	233.8718789
1/14/2015 19:45	233.9378331	1/14/2015 19:30	233.8608865
1/14/2015 20:29	233.9268407	1/14/2015 20:15	233.8498942
1/14/2015 21:21	233.9158484	1/14/2015 21:00	233.8498942
1/14/2015 22:00	233.9158484	1/14/2015 22:00	233.8498942
1/14/2015 23:00	233.9158484	1/14/2015 23:00	233.8498942
1/15/2015 0:00	233.9158484	1/15/2015 0:00	233.8718789
1/15/2015 1:00	233.9378331	1/15/2015 1:00	233.9158484
1/15/2015 2:00	233.9818026	1/15/2015 2:00	233.9488255
1/15/2015 3:00	234.0147797	1/15/2015 3:00	233.9927949
1/15/2015 4:00	234.0587491	1/15/2015 4:00	234.0367644
1/15/2015 5:00	234.0917262	1/15/2015 5:00	234.0697415
1/15/2015 6:00	234.1247033	1/15/2015 6:54	234.0587491
1/15/2015 7:43	234.113711	1/15/2015 7:44	234.025772
1/15/2015 8:52	234.0917262	1/15/2015 8:23	234.0147797
1/15/2015 9:38	234.0807339	1/15/2015 9:00	234.0147797
1/15/2015 10:52	234.0697415	1/15/2015 10:11	234.0037873
1/15/2015 11:57	234.0587491	1/15/2015 11:28	233.9927949
1/15/2015 12:00	234.0587491	1/15/2015 12:00	233.9927949
1/15/2015 13:49	234.0477568	1/15/2015 13:58	233.9818026
1/15/2015 14:00	234.0477568	1/15/2015 14:00	233.9818026
1/15/2015 15:00	234.0477568	1/15/2015 15:58	233.9818026
1/15/2015 16:40	234.0367644	1/15/2015 16:53	233.9708102
1/15/2015 17:44	234.025772	1/15/2015 17:58	233.9488255
1/15/2015 18:26	234.0147797	1/15/2015 18:45	233.9268407
1/15/2015 19:34	233.9927949	1/15/2015 19:52	233.904856
1/15/2015 20:55	233.9708102	1/15/2015 20:55	233.8938636
1/15/2015 21:43	233.9598178	1/15/2015 21:00	233.8938636
1/15/2015 22:57	233.9488255	1/15/2015 22:00	233.8938636
1/15/2015 23:00	233.9488255	1/15/2015 23:00	233.8938636

Maclean Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	North Reservoir	Timestamp	South Reservoir
1/16/2015 0:00	233.9598178	1/16/2015 0:00	233.9268407
1/16/2015 1:00	233.9927949	1/16/2015 1:00	233.9598178
1/16/2015 2:00	234.025772	1/16/2015 2:00	234.0037873
1/16/2015 3:00	234.0587491	1/16/2015 3:00	234.0477568
1/16/2015 4:00	234.1027186	1/16/2015 4:00	234.0807339
1/16/2015 5:00	234.1466881	1/16/2015 5:00	234.1247033
1/16/2015 6:00	234.1796652	1/16/2015 6:59	234.113711
1/16/2015 7:53	234.1576804	1/16/2015 7:52	234.0807339
1/16/2015 8:51	234.1356957	1/16/2015 8:21	234.0697415
1/16/2015 9:28	234.1247033	1/16/2015 9:51	234.0477568
1/16/2015 10:45	234.1027186	1/16/2015 10:44	234.0367644
1/16/2015 11:28	234.0917262	1/16/2015 11:30	234.025772
1/16/2015 12:08	234.0807339	1/16/2015 12:28	234.0147797
1/16/2015 13:04	234.0697415	1/16/2015 13:23	234.0037873
1/16/2015 14:01	234.0587491	1/16/2015 14:00	234.0037873
1/16/2015 15:16	234.0477568	1/16/2015 15:04	233.9927949
1/16/2015 16:22	234.0367644	1/16/2015 16:57	233.9708102
1/16/2015 17:29	234.025772	1/16/2015 17:31	233.9598178
1/16/2015 18:45	234.0037873	1/16/2015 18:33	233.9378331
1/16/2015 19:31	233.9927949	1/16/2015 19:00	233.9378331
1/16/2015 20:20	233.9818026	1/16/2015 20:00	233.9378331
1/16/2015 21:00	233.9818026	1/16/2015 21:00	233.9378331
1/16/2015 22:00	233.9818026	1/16/2015 22:00	233.9378331
1/16/2015 23:00	233.9818026	1/16/2015 23:00	233.9378331
1/17/2015 0:00	234.0037873	1/17/2015 0:00	233.9708102
1/17/2015 1:00	234.025772	1/17/2015 1:00	234.0037873
1/17/2015 2:00	234.0697415	1/17/2015 2:00	234.0477568
1/17/2015 3:00	234.113711	1/17/2015 3:00	234.0917262
1/17/2015 4:00	234.1576804	1/17/2015 4:00	234.1356957
1/17/2015 5:00	234.2016499	1/17/2015 5:00	234.1906575
1/17/2015 6:00	234.2456194	1/17/2015 6:00	234.2236346
1/17/2015 7:00	234.2895888	1/17/2015 7:00	234.2566117
1/17/2015 8:00	234.3115736	1/17/2015 8:35	234.2566117
1/17/2015 9:59	234.3005812	1/17/2015 9:59	234.2126423
1/17/2015 10:57	234.2785965	1/17/2015 10:59	234.1796652
1/17/2015 11:47	234.2566117	1/17/2015 11:43	234.1576804
1/17/2015 12:36	234.234627	1/17/2015 12:33	234.1356957
1/17/2015 13:58	234.2016499	1/17/2015 13:40	234.113711
1/17/2015 14:33	234.1906575	1/17/2015 14:39	234.1027186
1/17/2015 15:55	234.1686728	1/17/2015 15:55	234.0917262
1/17/2015 16:58	234.1576804	1/17/2015 16:57	234.0807339
1/17/2015 17:37	234.1466881	1/17/2015 17:37	234.0697415
1/17/2015 18:45	234.1356957	1/17/2015 18:44	234.0587491
1/17/2015 19:48	234.1247033	1/17/2015 19:00	234.0587491
1/17/2015 20:00	234.1247033	1/17/2015 20:00	234.0587491
1/17/2015 21:00	234.1247033	1/17/2015 21:00	234.0587491
1/17/2015 22:00	234.1247033	1/17/2015 22:00	234.0807339
1/17/2015 23:00	234.1356957	1/17/2015 23:00	234.0917262

Maclean Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	North Reservoir	Timestamp	South Reservoir
1/18/2015 0:00	234.1576804	1/18/2015 0:00	234.1247033
1/18/2015 1:00	234.1796652	1/18/2015 1:00	234.1466881
1/18/2015 2:00	234.2126423	1/18/2015 2:00	234.1906575
1/18/2015 3:00	234.2566117	1/18/2015 3:00	234.234627
1/18/2015 4:00	234.3005812	1/18/2015 4:00	234.2785965
1/18/2015 5:00	234.3445507	1/18/2015 5:00	234.3225659
1/18/2015 6:00	234.3775278	1/18/2015 6:00	234.355543
1/18/2015 7:00	234.4214972	1/18/2015 7:00	234.3885201
1/18/2015 8:00	234.443482	1/18/2015 8:28	234.3995125
1/18/2015 9:57	234.443482	1/18/2015 9:42	234.3665354
1/18/2015 10:57	234.4214972	1/18/2015 10:54	234.3225659
1/18/2015 11:53	234.3995125	1/18/2015 11:13	234.3115736
1/18/2015 12:00	234.3995125	1/18/2015 12:00	234.3225659
1/18/2015 13:00	234.3995125	1/18/2015 13:00	234.3445507
1/18/2015 14:00	234.4105049	1/18/2015 14:55	234.3335583
1/18/2015 15:22	234.3995125	1/18/2015 15:50	234.3115736
1/18/2015 16:43	234.3775278	1/18/2015 16:55	234.2895888
1/18/2015 17:59	234.355543	1/18/2015 17:36	234.2785965
1/18/2015 18:33	234.3445507	1/18/2015 18:34	234.2566117
1/18/2015 19:35	234.3225659	1/18/2015 19:35	234.234627
1/18/2015 20:07	234.3115736	1/18/2015 20:00	234.234627
1/18/2015 21:01	234.3005812	1/18/2015 21:23	234.2236346
1/18/2015 22:26	234.2895888	1/18/2015 22:00	234.2236346
1/18/2015 23:00	234.2895888	1/18/2015 23:00	234.2456194
1/19/2015 0:00	234.3115736	1/19/2015 0:00	234.2676041
1/19/2015 1:00	234.3335583	1/19/2015 1:00	234.3115736
1/19/2015 2:00	234.3665354	1/19/2015 2:00	234.355543
1/19/2015 3:00	234.3995125	1/19/2015 3:00	234.3775278
1/19/2015 4:00	234.4214972	1/19/2015 4:00	234.4105049
1/19/2015 5:00	234.4544743	1/19/2015 5:00	234.4324896
1/19/2015 6:00	234.4654667	1/19/2015 6:51	234.4105049
1/19/2015 7:56	234.4324896	1/19/2015 7:44	234.3665354
1/19/2015 8:58	234.3995125	1/19/2015 8:24	234.3445507
1/19/2015 9:50	234.3775278	1/19/2015 9:33	234.3225659
1/19/2015 10:45	234.355543	1/19/2015 10:54	234.2895888
1/19/2015 11:41	234.3335583	1/19/2015 11:23	234.2785965
1/19/2015 12:36	234.3115736	1/19/2015 12:29	234.2566117
1/19/2015 13:45	234.2895888	1/19/2015 13:58	234.234627
1/19/2015 14:21	234.2785965	1/19/2015 14:51	234.2236346
1/19/2015 15:54	234.2566117	1/19/2015 15:38	234.2126423
1/19/2015 16:42	234.2456194	1/19/2015 16:46	234.1906575
1/19/2015 17:53	234.2126423	1/19/2015 17:45	234.1576804
1/19/2015 18:44	234.1906575	1/19/2015 18:43	234.1247033
1/19/2015 19:51	234.1576804	1/19/2015 19:26	234.1027186
1/19/2015 20:46	234.1356957	1/19/2015 20:33	234.0807339
1/19/2015 21:58	234.113711	1/19/2015 21:10	234.0697415
1/19/2015 22:00	234.113711	1/19/2015 22:19	234.0587491
1/19/2015 23:00	234.1027186	1/19/2015 23:00	234.0587491

Maclean Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	North Reservoir	Timestamp	South Reservoir
1/20/2015 0:00	234.113711	1/20/2015 0:00	234.0807339
1/20/2015 1:00	234.1247033	1/20/2015 1:00	234.113711
1/20/2015 2:00	234.1576804	1/20/2015 2:00	234.1356957
1/20/2015 3:00	234.1796652	1/20/2015 3:00	234.1686728
1/20/2015 4:00	234.2126423	1/20/2015 4:00	234.2016499
1/20/2015 5:00	234.2456194	1/20/2015 5:00	234.2236346
1/20/2015 6:48	234.2566117	1/20/2015 6:56	234.2016499
1/20/2015 7:43	234.234627	1/20/2015 7:55	234.1576804
1/20/2015 8:53	234.2016499	1/20/2015 8:19	234.1466881
1/20/2015 9:56	234.1796652	1/20/2015 9:41	234.1247033
1/20/2015 10:29	234.1686728	1/20/2015 10:32	234.113711
1/20/2015 11:56	234.1356957	1/20/2015 11:32	234.0917262
1/20/2015 12:52	234.113711	1/20/2015 12:34	234.0697415
1/20/2015 13:52	234.0917262	1/20/2015 13:44	234.0477568
1/20/2015 14:26	234.0807339	1/20/2015 14:30	234.0367644
1/20/2015 15:05	234.0697415	1/20/2015 15:06	234.025772
1/20/2015 16:49	234.0477568	1/20/2015 16:37	234.0037873
1/20/2015 17:59	234.025772	1/20/2015 17:48	233.9708102
1/20/2015 18:48	234.0037873	1/20/2015 18:58	233.9378331
1/20/2015 19:37	233.9818026	1/20/2015 19:48	233.9158484
1/20/2015 20:34	233.9598178	1/20/2015 20:29	233.904856
1/20/2015 21:40	233.9378331	1/20/2015 21:08	233.8938636
1/20/2015 22:31	233.9268407	1/20/2015 22:00	233.8938636
1/20/2015 23:00	233.9268407	1/20/2015 23:00	233.8938636
1/21/2015 0:00	233.9268407	1/21/2015 0:00	233.904856
1/21/2015 1:00	233.9488255	1/21/2015 1:00	233.9378331
1/21/2015 2:00	233.9818026	1/21/2015 2:00	233.9708102
1/21/2015 3:00	234.0147797	1/21/2015 3:00	234.0037873
1/21/2015 4:00	234.0477568	1/21/2015 4:00	234.0367644
1/21/2015 5:00	234.0697415	1/21/2015 5:00	234.0587491
1/21/2015 6:00	234.0917262	1/21/2015 6:58	234.0367644
1/21/2015 7:51	234.0697415	1/21/2015 7:48	234.0037873
1/21/2015 8:42	234.0477568	1/21/2015 8:50	233.9818026
1/21/2015 9:44	234.025772	1/21/2015 9:50	233.9708102
1/21/2015 10:23	234.0147797	1/21/2015 10:32	233.9598178
1/21/2015 11:45	233.9927949	1/21/2015 11:16	233.9488255
1/21/2015 12:29	233.9818026	1/21/2015 12:06	233.9378331
1/21/2015 13:18	233.9708102	1/21/2015 13:00	233.9268407
1/21/2015 14:28	233.9598178	1/21/2015 14:30	233.9158484
1/21/2015 15:00	233.9598178	1/21/2015 15:00	233.9158484
1/21/2015 16:00	233.9598178	1/21/2015 16:44	233.8938636
1/21/2015 17:15	233.9488255	1/21/2015 17:46	233.8718789
1/21/2015 18:35	233.9268407	1/21/2015 18:37	233.8498942
1/21/2015 19:44	233.904856	1/21/2015 19:10	233.8389018
1/21/2015 20:30	233.8938636	1/21/2015 20:04	233.8279094
1/21/2015 21:30	233.8828713	1/21/2015 21:00	233.8279094
1/21/2015 22:00	233.8828713	1/21/2015 22:00	233.8279094
1/21/2015 23:00	233.8828713	1/21/2015 23:00	233.8389018

Maclean Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	North Reservoir	Timestamp	South Reservoir
1/22/2015 0:00	233.8938636	1/22/2015 0:00	233.8718789
1/22/2015 1:00	233.9268407	1/22/2015 1:00	233.904856
1/22/2015 2:00	233.9598178	1/22/2015 2:00	233.9378331
1/22/2015 3:00	234.0037873	1/22/2015 3:00	233.9818026
1/22/2015 4:00	234.0367644	1/22/2015 4:00	234.025772
1/22/2015 5:00	234.0807339	1/22/2015 5:00	234.0587491
1/22/2015 6:00	234.1027186	1/22/2015 6:52	234.0477568
1/22/2015 7:42	234.0917262	1/22/2015 7:42	234.0147797
1/22/2015 8:40	234.0697415	1/22/2015 8:08	234.0037873
1/22/2015 9:18	234.0587491	1/22/2015 9:16	233.9927949
1/22/2015 10:08	234.0477568	1/22/2015 10:19	233.9818026
1/22/2015 11:03	234.0367644	1/22/2015 11:18	233.9708102
1/22/2015 12:02	234.025772	1/22/2015 12:33	233.9598178
1/22/2015 13:15	234.0147797	1/22/2015 13:00	233.9598178
1/22/2015 14:44	234.0037873	1/22/2015 14:00	233.9598178
1/22/2015 15:00	234.0037873	1/22/2015 15:36	233.9488255
1/22/2015 16:45	233.9927949	1/22/2015 16:27	233.9378331
1/22/2015 17:43	233.9818026	1/22/2015 17:40	233.9158484
1/22/2015 18:56	233.9598178	1/22/2015 18:34	233.8938636
1/22/2015 19:23	233.9488255	1/22/2015 19:44	233.8718789
1/22/2015 20:40	233.9268407	1/22/2015 20:34	233.8608865
1/22/2015 21:31	233.9158484	1/22/2015 21:00	233.8608865
1/22/2015 22:00	233.9158484	1/22/2015 22:00	233.8608865
1/22/2015 23:04	233.904856	1/22/2015 23:00	233.8608865
1/23/2015 0:00	233.9158484	1/23/2015 0:00	233.8828713
1/23/2015 1:00	233.9378331	1/23/2015 1:00	233.9268407
1/23/2015 2:00	233.9708102	1/23/2015 2:00	233.9598178
1/23/2015 3:00	234.0147797	1/23/2015 3:00	234.0037873
1/23/2015 4:00	234.0477568	1/23/2015 4:00	234.0367644
1/23/2015 5:00	234.0917262	1/23/2015 5:00	234.0697415
1/23/2015 6:00	234.113711	1/23/2015 6:47	234.0697415
1/23/2015 7:56	234.1027186	1/23/2015 7:56	234.025772
1/23/2015 8:36	234.0917262	1/23/2015 8:34	234.0147797
1/23/2015 9:55	234.0697415	1/23/2015 9:43	234.0037873
1/23/2015 10:47	234.0587491	1/23/2015 10:33	233.9927949
1/23/2015 11:29	234.0477568	1/23/2015 11:34	233.9818026
1/23/2015 12:30	234.0367644	1/23/2015 12:35	233.9708102
1/23/2015 13:19	234.025772	1/23/2015 13:52	233.9598178
1/23/2015 14:00	234.025772	1/23/2015 14:00	233.9598178
1/23/2015 15:03	234.0147797	1/23/2015 15:55	233.9488255
1/23/2015 16:08	234.0037873	1/23/2015 16:31	233.9378331
1/23/2015 17:59	233.9818026	1/23/2015 17:37	233.9158484
1/23/2015 18:40	233.9708102	1/23/2015 18:45	233.8938636
1/23/2015 19:29	233.9598178	1/23/2015 19:00	233.8938636
1/23/2015 20:11	233.9488255	1/23/2015 20:49	233.8828713
1/23/2015 21:00	233.9488255	1/23/2015 21:00	233.8828713
1/23/2015 22:06	233.9378331	1/23/2015 22:00	233.8828713
1/23/2015 23:00	233.9378331	1/23/2015 23:00	233.8938636

Maclean Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	North Reservoir	Timestamp	South Reservoir
1/24/2015 0:00	233.9488255	1/24/2015 0:00	233.9158484
1/24/2015 1:00	233.9708102	1/24/2015 1:00	233.9378331
1/24/2015 2:00	234.0037873	1/24/2015 2:00	233.9708102
1/24/2015 3:00	234.0367644	1/24/2015 3:00	234.0147797
1/24/2015 4:00	234.0697415	1/24/2015 4:00	234.0477568
1/24/2015 5:00	234.1027186	1/24/2015 5:00	234.0807339
1/24/2015 6:00	234.1466881	1/24/2015 6:00	234.1247033
1/24/2015 7:00	234.1686728	1/24/2015 7:00	234.1466881
1/24/2015 8:00	234.1906575	1/24/2015 8:44	234.1247033
1/24/2015 9:46	234.1686728	1/24/2015 9:52	234.0807339
1/24/2015 10:56	234.1356957	1/24/2015 10:55	234.0367644
1/24/2015 11:52	234.1027186	1/24/2015 11:44	234.0037873
1/24/2015 12:50	234.0697415	1/24/2015 12:43	233.9708102
1/24/2015 13:48	234.0367644	1/24/2015 13:32	233.9488255
1/24/2015 14:40	234.0147797	1/24/2015 14:39	233.9268407
1/24/2015 15:35	233.9927949	1/24/2015 15:23	233.9158484
1/24/2015 16:41	233.9708102	1/24/2015 16:36	233.8938636
1/24/2015 17:52	233.9488255	1/24/2015 17:50	233.8718789
1/24/2015 18:25	233.9378331	1/24/2015 18:40	233.8608865
1/24/2015 19:11	233.9268407	1/24/2015 19:47	233.8498942
1/24/2015 20:00	233.9158484	1/24/2015 20:00	233.8498942
1/24/2015 21:00	233.9158484	1/24/2015 21:00	233.8498942
1/24/2015 22:00	233.9158484	1/24/2015 22:00	233.8608865
1/24/2015 23:00	233.9158484	1/24/2015 23:00	233.8718789
1/25/2015 0:00	233.9268407	1/25/2015 0:00	233.8938636
1/25/2015 1:00	233.9488255	1/25/2015 1:00	233.9268407
1/25/2015 2:00	233.9818026	1/25/2015 2:00	233.9598178
1/25/2015 3:00	234.0147797	1/25/2015 3:00	233.9927949
1/25/2015 4:00	234.0587491	1/25/2015 4:00	234.0367644
1/25/2015 5:00	234.0917262	1/25/2015 5:00	234.0697415
1/25/2015 6:00	234.1247033	1/25/2015 6:00	234.1027186
1/25/2015 7:00	234.1576804	1/25/2015 7:00	234.1356957
1/25/2015 8:00	234.1796652	1/25/2015 8:43	234.1247033
1/25/2015 9:43	234.1686728	1/25/2015 9:53	234.0807339
1/25/2015 10:54	234.1356957	1/25/2015 10:51	234.0367644
1/25/2015 11:49	234.1027186	1/25/2015 11:42	234.0037873
1/25/2015 12:45	234.0697415	1/25/2015 12:41	233.9708102
1/25/2015 13:46	234.0367644	1/25/2015 13:53	233.9378331
1/25/2015 14:55	234.0037873	1/25/2015 14:57	233.9158484
1/25/2015 15:54	233.9818026	1/25/2015 15:34	233.904856
1/25/2015 16:46	233.9598178	1/25/2015 16:41	233.8828713
1/25/2015 17:56	233.9378331	1/25/2015 17:34	233.8608865
1/25/2015 18:56	233.9158484	1/25/2015 18:56	233.8279094
1/25/2015 19:46	233.8938636	1/25/2015 19:54	233.8059247
1/25/2015 20:47	233.8718789	1/25/2015 20:47	233.7949323
1/25/2015 21:25	233.8608865	1/25/2015 21:00	233.7949323
1/25/2015 22:00	233.8608865	1/25/2015 22:00	233.7949323
1/25/2015 23:00	233.8608865	1/25/2015 23:00	233.8059247

Maclean Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	North Reservoir	Timestamp	South Reservoir
1/26/2015 0:00	233.8718789	1/26/2015 0:00	233.8389018
1/26/2015 1:00	233.904856	1/26/2015 1:00	233.8828713
1/26/2015 2:00	233.9378331	1/26/2015 2:00	233.9158484
1/26/2015 3:00	233.9708102	1/26/2015 3:00	233.9488255
1/26/2015 4:00	234.0147797	1/26/2015 4:00	233.9927949
1/26/2015 5:00	234.0477568	1/26/2015 5:00	234.025772
1/26/2015 6:00	234.0807339	1/26/2015 6:51	234.0147797
1/26/2015 7:53	234.0587491	1/26/2015 7:42	233.9818026
1/26/2015 8:26	234.0477568	1/26/2015 8:10	233.9708102
1/26/2015 9:46	234.025772	1/26/2015 9:16	233.9598178
1/26/2015 10:26	234.0147797	1/26/2015 10:37	233.9378331
1/26/2015 11:44	233.9927949	1/26/2015 11:50	233.9158484
1/26/2015 12:23	233.9818026	1/26/2015 12:43	233.904856
1/26/2015 13:04	233.9708102	1/26/2015 13:39	233.8938636
1/26/2015 14:01	233.9598178	1/26/2015 14:00	233.8938636
1/26/2015 15:03	233.9488255	1/26/2015 15:04	233.8828713
1/26/2015 16:05	233.9378331	1/26/2015 16:47	233.8608865
1/26/2015 17:46	233.9158484	1/26/2015 17:44	233.8389018
1/26/2015 18:48	233.8938636	1/26/2015 18:59	233.8059247
1/26/2015 19:47	233.8718789	1/26/2015 19:32	233.7949323
1/26/2015 20:51	233.8498942	1/26/2015 20:11	233.78394
1/26/2015 21:48	233.8389018	1/26/2015 21:18	233.7729476
1/26/2015 22:00	233.8389018	1/26/2015 22:00	233.7729476
1/26/2015 23:00	233.8389018	1/26/2015 23:00	233.78394

E12g McPhillips Minimum Reservoir Levels Jan 12-26, 2015

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/12/2015 0:25	233.9674305	1/12/2015 0:00	233.9601022
1/12/2015 1:00	234.0187282	1/12/2015 1:00	233.9930793
1/12/2015 2:00	234.07369	1/12/2015 2:00	234.0480412
1/12/2015 3:00	234.1286518	1/12/2015 3:00	234.0920106
1/12/2015 4:00	234.1726213	1/12/2015 4:00	234.1469725
1/12/2015 5:00	234.2275831	1/12/2015 5:00	234.2019343
1/12/2015 6:52	234.2459038	1/12/2015 6:00	234.2459038
1/12/2015 7:39	234.2129267	1/12/2015 7:52	234.2349114
1/12/2015 8:45	234.1836137	1/12/2015 8:59	234.2019343
1/12/2015 9:53	234.1616289	1/12/2015 9:56	234.1799496
1/12/2015 10:56	234.1249877	1/12/2015 10:53	234.1579648
1/12/2015 11:38	234.1176595	1/12/2015 11:44	234.1359801
1/12/2015 12:59	234.0846824	1/12/2015 12:39	234.1139954
1/12/2015 13:28	234.07369	1/12/2015 13:35	234.0920106
1/12/2015 14:07	234.0626977	1/12/2015 14:44	234.0700259
1/12/2015 15:47	234.0407129	1/12/2015 15:33	234.0590335
1/12/2015 16:46	234.0223923	1/12/2015 16:50	234.0370488
1/12/2015 17:31	234.0004076	1/12/2015 17:52	234.0150641
1/12/2015 18:39	233.9784228	1/12/2015 18:49	233.9930793
1/12/2015 19:43	233.9564381	1/12/2015 19:49	233.9710946
1/12/2015 20:35	233.9417816	1/12/2015 20:27	233.9601022
1/12/2015 21:47	233.9344534	1/12/2015 21:15	233.9491099
1/12/2015 22:15	233.9307893	1/12/2015 22:00	233.9491099
1/12/2015 23:12	233.9417816	1/12/2015 23:00	233.9491099
1/13/2015 0:31	233.9381175	1/13/2015 0:00	233.9601022
1/13/2015 1:00	234.0150641	1/13/2015 1:00	233.982087
1/13/2015 2:00	234.0590335	1/13/2015 2:00	234.0370488
1/13/2015 3:00	234.1139954	1/13/2015 3:00	234.0810183
1/13/2015 4:00	234.1579648	1/13/2015 4:00	234.1249877
1/13/2015 5:00	234.2019343	1/13/2015 5:00	234.1799496
1/13/2015 6:55	234.2165908	1/13/2015 6:00	234.223919
1/13/2015 7:45	234.1726213	1/13/2015 7:44	234.2019343
1/13/2015 8:53	234.1469725	1/13/2015 8:47	234.1689572
1/13/2015 9:35	234.1359801	1/13/2015 9:42	234.1469725
1/13/2015 10:55	234.103003	1/13/2015 10:41	234.1249877
1/13/2015 11:26	234.0920106	1/13/2015 11:40	234.103003
1/13/2015 12:27	234.0700259	1/13/2015 12:41	234.0810183
1/13/2015 13:45	234.0480412	1/13/2015 13:51	234.0590335
1/13/2015 14:24	234.0370488	1/13/2015 14:32	234.0480412
1/13/2015 15:39	234.0187282	1/13/2015 15:19	234.0370488
1/13/2015 16:22	234.0077358	1/13/2015 16:50	234.0150641
1/13/2015 17:47	233.9747587	1/13/2015 17:58	233.9930793
1/13/2015 18:34	233.952774	1/13/2015 18:52	233.9710946
1/13/2015 19:48	233.9307893	1/13/2015 19:52	233.9491099
1/13/2015 20:22	233.9197969	1/13/2015 20:30	233.9381175
1/13/2015 21:36	233.9161328	1/13/2015 21:18	233.9271251
1/13/2015 22:01	233.9088045	1/13/2015 22:00	233.9271251
1/13/2015 23:06	233.9197969	1/13/2015 23:00	233.9271251

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/14/2015 0:37	233.9307893	1/14/2015 0:00	233.9381175
1/14/2015 1:00	233.982087	1/14/2015 1:00	233.9601022
1/14/2015 2:00	234.0370488	1/14/2015 2:00	234.0040717
1/14/2015 3:00	234.0920106	1/14/2015 3:00	234.0590335
1/14/2015 4:00	234.1469725	1/14/2015 4:00	234.1139954
1/14/2015 5:00	234.1909419	1/14/2015 5:00	234.1579648
1/14/2015 6:16	234.2129267	1/14/2015 6:00	234.2129267
1/14/2015 7:54	234.1799496	1/14/2015 7:52	234.2019343
1/14/2015 8:19	234.1689572	1/14/2015 8:47	234.1799496
1/14/2015 9:09	234.1579648	1/14/2015 9:23	234.1689572
1/14/2015 10:56	234.1359801	1/14/2015 10:59	234.1469725
1/14/2015 11:34	234.1249877	1/14/2015 11:46	234.1359801
1/14/2015 12:23	234.1139954	1/14/2015 12:39	234.1249877
1/14/2015 13:17	234.103003	1/14/2015 13:31	234.1139954
1/14/2015 14:52	234.0920106	1/14/2015 14:56	234.103003
1/14/2015 15:10	234.0883465	1/14/2015 15:00	234.103003
1/14/2015 16:21	234.0883465	1/14/2015 16:00	234.103003
1/14/2015 17:43	234.07369	1/14/2015 17:19	234.0920106
1/14/2015 18:36	234.0626977	1/14/2015 18:18	234.0810183
1/14/2015 19:43	234.0480412	1/14/2015 19:55	234.0590335
1/14/2015 20:56	234.0333847	1/14/2015 20:00	234.0590335
1/14/2015 21:14	234.0370488	1/14/2015 21:20	234.0480412
1/14/2015 22:00	234.0407129	1/14/2015 22:00	234.0480412
1/14/2015 23:26	234.0370488	1/14/2015 23:00	234.0480412
1/15/2015 0:00	234.0773541	1/15/2015 0:00	234.0590335
1/15/2015 1:00	234.132316	1/15/2015 1:00	234.1139954
1/15/2015 2:00	234.1872778	1/15/2015 2:00	234.1579648
1/15/2015 3:00	234.2422396	1/15/2015 3:00	234.2129267
1/15/2015 4:00	234.2862091	1/15/2015 4:00	234.2568961
1/15/2015 5:00	234.3411709	1/15/2015 5:00	234.311858
1/15/2015 6:56	234.3375068	1/15/2015 6:00	234.3448351
1/15/2015 7:44	234.3045297	1/15/2015 7:58	234.3228503
1/15/2015 8:04	234.2972015	1/15/2015 8:52	234.3008656
1/15/2015 9:04	234.2898732	1/15/2015 9:46	234.2898732
1/15/2015 10:42	234.2678885	1/15/2015 10:36	234.2788809
1/15/2015 11:33	234.2568961	1/15/2015 11:24	234.2678885
1/15/2015 12:24	234.2422396	1/15/2015 12:15	234.2568961
1/15/2015 13:10	234.2312473	1/15/2015 13:56	234.2349114
1/15/2015 14:05	234.223919	1/15/2015 14:00	234.2349114
1/15/2015 15:00	234.223919	1/15/2015 15:19	234.223919
1/15/2015 16:30	234.2129267	1/15/2015 16:00	234.223919
1/15/2015 17:22	234.1982702	1/15/2015 17:06	234.2129267
1/15/2015 18:04	234.1872778	1/15/2015 18:46	234.1909419
1/15/2015 19:42	234.1652931	1/15/2015 19:33	234.1799496
1/15/2015 20:07	234.1652931	1/15/2015 20:33	234.1689572
1/15/2015 21:00	234.1652931	1/15/2015 21:00	234.1689572
1/15/2015 22:01	234.1652931	1/15/2015 22:00	234.1689572
1/15/2015 23:00	234.1872778	1/15/2015 23:00	234.1689572

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Timestamp	West Reservoir	Timestamp	East Reservoir
1/16/2015 0:00	234.2202549	1/16/2015 0:00	234.1909419
1/16/2015 1:00	234.2642244	1/16/2015 1:00	234.2349114
1/16/2015 2:00	234.3081938	1/16/2015 2:00	234.2788809
1/16/2015 3:00	234.3631557	1/16/2015 3:00	234.3338427
1/16/2015 4:00	234.4181175	1/16/2015 4:00	234.3778122
1/16/2015 5:00	234.462087	1/16/2015 5:00	234.4217816
1/16/2015 6:33	229.3139954	1/16/2015 6:33	229.3139954
1/16/2015 7:00	229.3139954	1/16/2015 7:00	229.3139954
1/16/2015 8:27	234.4144534	1/16/2015 8:56	234.4217816
1/16/2015 9:17	234.403461	1/16/2015 9:28	234.4107893
1/16/2015 10:29	234.3814763	1/16/2015 10:39	234.3888045
1/16/2015 11:55	234.3558274	1/16/2015 11:49	234.3668198
1/16/2015 12:36	234.3448351	1/16/2015 12:25	234.3558274
1/16/2015 13:57	229.3139954	1/16/2015 13:57	229.3139954
1/16/2015 14:00	229.3139954	1/16/2015 14:00	229.3139954
1/16/2015 15:00	234.3155221	1/16/2015 15:00	234.3191862
1/16/2015 16:58	234.2935373	1/16/2015 16:18	234.3081938
1/16/2015 17:48	234.282545	1/16/2015 17:14	234.2972015
1/16/2015 18:45	234.2715526	1/16/2015 18:44	234.2752167
1/16/2015 19:00	234.2715526	1/16/2015 19:56	234.2642244
1/16/2015 20:00	234.2715526	1/16/2015 20:00	234.2642244
1/16/2015 21:00	234.2715526	1/16/2015 21:00	234.2642244
1/16/2015 22:06	234.2788809	1/16/2015 22:00	234.2752167
1/16/2015 23:42	234.2862091	1/16/2015 23:00	234.2752167
1/17/2015 0:00	234.3155221	1/17/2015 0:00	234.2862091
1/17/2015 1:00	234.3484992	1/17/2015 1:00	234.3191862
1/17/2015 2:00	234.3814763	1/17/2015 2:00	234.3521633
1/17/2015 3:00	234.4144534	1/17/2015 3:00	234.3851404
1/17/2015 4:00	234.4474305	1/17/2015 4:00	234.4181175
1/17/2015 5:00	234.4804076	1/17/2015 5:00	234.4510946
1/17/2015 6:00	234.5133847	1/17/2015 6:00	234.4840717
1/17/2015 7:00	234.5463618	1/17/2015 7:00	234.5170488
1/17/2015 8:59	234.5280412	1/17/2015 8:36	234.5280412
1/17/2015 9:47	234.4950641	1/17/2015 9:51	234.4950641
1/17/2015 10:53	234.4401022	1/17/2015 10:55	234.4510946
1/17/2015 11:36	234.403461	1/17/2015 11:53	234.4071251
1/17/2015 12:50	234.3594915	1/17/2015 12:56	234.3631557
1/17/2015 13:46	234.3265144	1/17/2015 13:46	234.3301786
1/17/2015 14:36	234.2935373	1/17/2015 14:42	234.2972015
1/17/2015 15:52	234.2642244	1/17/2015 15:51	234.2642244
1/17/2015 16:41	234.2422396	1/17/2015 16:40	234.2422396
1/17/2015 17:56	234.2092625	1/17/2015 17:52	234.2092625
1/17/2015 18:53	234.1872778	1/17/2015 18:42	234.1872778
1/17/2015 19:28	234.1762854	1/17/2015 19:35	234.1652931
1/17/2015 20:59	234.1543007	1/17/2015 20:57	234.1433083
1/17/2015 21:00	234.1543007	1/17/2015 21:00	234.1433083
1/17/2015 22:00	234.1543007	1/17/2015 22:01	234.132316
1/17/2015 23:40	234.132316	1/17/2015 23:00	234.132316

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/18/2015 0:00	234.1689572	1/18/2015 0:00	234.132316
1/18/2015 1:00	234.1909419	1/18/2015 1:00	234.1652931
1/18/2015 2:00	234.223919	1/18/2015 2:00	234.1982702
1/18/2015 3:00	234.2568961	1/18/2015 3:00	234.2202549
1/18/2015 4:00	234.2898732	1/18/2015 4:00	234.253232
1/18/2015 5:00	234.3228503	1/18/2015 5:00	234.2862091
1/18/2015 6:00	234.3448351	1/18/2015 6:00	234.3191862
1/18/2015 7:00	234.3778122	1/18/2015 7:00	234.3411709
1/18/2015 8:31	234.3778122	1/18/2015 8:39	234.3631557
1/18/2015 9:59	234.3228503	1/18/2015 9:55	234.3301786
1/18/2015 10:53	234.2678885	1/18/2015 10:51	234.2862091
1/18/2015 11:52	234.1872778	1/18/2015 11:59	234.2202549
1/18/2015 12:59	234.1066671	1/18/2015 12:55	234.1543007
1/18/2015 13:56	234.0407129	1/18/2015 13:58	234.0773541
1/18/2015 14:53	234.0187282	1/18/2015 14:44	234.0333847
1/18/2015 15:52	233.9857511	1/18/2015 15:58	233.9894152
1/18/2015 16:50	233.952774	1/18/2015 16:56	233.9564381
1/18/2015 17:50	233.9197969	1/18/2015 17:55	233.923461
1/18/2015 18:47	233.8868198	1/18/2015 18:53	233.8904839
1/18/2015 19:48	233.8538427	1/18/2015 19:53	233.8575068
1/18/2015 20:41	233.831858	1/18/2015 20:41	233.8355221
1/18/2015 21:17	233.8208656	1/18/2015 21:43	233.8135373
1/18/2015 22:15	233.8098732	1/18/2015 22:34	233.802545
1/18/2015 23:33	233.8062091	1/18/2015 23:00	233.802545
1/19/2015 0:00	233.8355221	1/19/2015 0:00	233.8135373
1/19/2015 1:00	233.8684992	1/19/2015 1:00	233.8465144
1/19/2015 2:00	233.9124686	1/19/2015 2:00	233.8904839
1/19/2015 3:00	233.9674305	1/19/2015 3:00	233.9344534
1/19/2015 4:00	234.0113999	1/19/2015 4:00	233.9894152
1/19/2015 5:00	234.0663618	1/19/2015 5:00	234.044377
1/19/2015 6:00	234.0956748	1/19/2015 6:00	234.0883465
1/19/2015 7:46	234.0626977	1/19/2015 7:53	234.0883465
1/19/2015 8:24	234.0517053	1/19/2015 8:54	234.0663618
1/19/2015 9:20	234.0407129	1/19/2015 9:40	234.0553694
1/19/2015 10:40	234.0187282	1/19/2015 10:21	234.044377
1/19/2015 11:58	233.9967435	1/19/2015 11:40	234.0223923
1/19/2015 12:51	233.9857511	1/19/2015 12:21	234.0113999
1/19/2015 13:00	233.9857511	1/19/2015 13:09	234.0004076
1/19/2015 14:55	233.9674305	1/19/2015 14:06	233.9894152
1/19/2015 15:33	233.9674305	1/19/2015 15:00	233.9894152
1/19/2015 16:59	233.9564381	1/19/2015 16:10	233.9784228
1/19/2015 17:45	233.9491099	1/19/2015 17:37	233.9674305
1/19/2015 18:27	233.9381175	1/19/2015 18:31	233.9564381
1/19/2015 19:17	233.9271251	1/19/2015 19:16	233.9454457
1/19/2015 20:41	233.9124686	1/19/2015 20:14	233.9344534
1/19/2015 21:53	233.9197969	1/19/2015 21:00	233.9344534
1/19/2015 22:06	233.9197969	1/19/2015 22:00	233.9344534
1/19/2015 23:06	233.9344534	1/19/2015 23:00	233.9344534

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/20/2015 0:00	233.9857511	1/20/2015 0:00	233.9564381
1/20/2015 1:00	234.0407129	1/20/2015 1:00	234.0113999
1/20/2015 2:00	234.0846824	1/20/2015 2:00	234.0663618
1/20/2015 3:00	234.1396442	1/20/2015 3:00	234.1103312
1/20/2015 4:00	234.194606	1/20/2015 4:00	234.1652931
1/20/2015 5:00	234.2385755	1/20/2015 5:00	234.2202549
1/20/2015 6:42	234.2605602	1/20/2015 6:00	234.2642244
1/20/2015 7:45	234.2275831	1/20/2015 7:44	234.253232
1/20/2015 8:06	234.2165908	1/20/2015 8:35	234.2312473
1/20/2015 9:53	234.194606	1/20/2015 9:59	234.2092625
1/20/2015 10:23	234.1762854	1/20/2015 10:41	234.1982702
1/20/2015 11:47	234.1689572	1/20/2015 11:47	234.1762854
1/20/2015 12:17	234.1579648	1/20/2015 12:59	234.1543007
1/20/2015 13:54	234.1359801	1/20/2015 13:38	234.1433083
1/20/2015 14:49	234.1249877	1/20/2015 14:26	234.132316
1/20/2015 15:00	234.1249877	1/20/2015 15:00	234.132316
1/20/2015 16:22	234.1139954	1/20/2015 16:20	234.1213236
1/20/2015 17:55	234.0920106	1/20/2015 17:38	234.1103312
1/20/2015 18:37	234.0810183	1/20/2015 18:27	234.0993389
1/20/2015 19:46	234.0700259	1/20/2015 19:12	234.0883465
1/20/2015 20:00	234.0700259	1/20/2015 20:03	234.0773541
1/20/2015 21:00	234.0700259	1/20/2015 21:00	234.0773541
1/20/2015 22:00	234.0700259	1/20/2015 22:00	234.0773541
1/20/2015 23:27	234.0773541	1/20/2015 23:00	234.0773541
1/21/2015 0:00	234.1286518	1/21/2015 0:00	234.1103312
1/21/2015 1:00	234.1836137	1/21/2015 1:00	234.1543007
1/21/2015 2:00	234.2275831	1/21/2015 2:00	234.2092625
1/21/2015 3:00	234.282545	1/21/2015 3:00	234.253232
1/21/2015 4:00	234.3375068	1/21/2015 4:00	234.3081938
1/21/2015 5:00	234.3814763	1/21/2015 5:00	234.3521633
1/21/2015 6:33	234.403461	1/21/2015 6:00	234.3961328
1/21/2015 7:52	234.3484992	1/21/2015 7:54	234.374148
1/21/2015 8:33	234.3375068	1/21/2015 8:37	234.3521633
1/21/2015 9:46	234.3155221	1/21/2015 9:35	234.3301786
1/21/2015 10:57	229.3139954	1/21/2015 10:57	229.3139954
1/21/2015 11:00	229.3139954	1/21/2015 11:00	229.3139954
1/21/2015 12:00	229.3139954	1/21/2015 12:00	229.3139954
1/21/2015 13:00	229.3139954	1/21/2015 13:00	229.3139954
1/21/2015 14:00	229.3139954	1/21/2015 14:00	229.3139954
1/21/2015 15:00	229.3139954	1/21/2015 15:00	229.3139954
1/21/2015 16:00	229.3139954	1/21/2015 16:00	229.3139954
1/21/2015 17:59	234.1616289	1/21/2015 17:42	234.1799496
1/21/2015 18:29	234.1506366	1/21/2015 18:42	234.1579648
1/21/2015 19:48	234.1286518	1/21/2015 19:43	234.1359801
1/21/2015 20:27	234.1176595	1/21/2015 20:45	234.1139954
1/21/2015 21:15	234.1066671	1/21/2015 21:24	234.103003
1/21/2015 22:00	234.1066671	1/21/2015 22:27	234.0920106
1/21/2015 23:00	234.1066671	1/21/2015 23:00	234.0920106

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/22/2015 0:00	234.0956748	1/22/2015 0:00	234.103003
1/22/2015 1:00	234.1616289	1/22/2015 1:00	234.1359801
1/22/2015 2:00	234.2055984	1/22/2015 2:00	234.1689572
1/22/2015 3:00	234.2385755	1/22/2015 3:00	234.2129267
1/22/2015 4:00	234.282545	1/22/2015 4:00	234.2568961
1/22/2015 5:00	234.3155221	1/22/2015 5:00	234.2898732
1/22/2015 6:59	234.3155221	1/22/2015 6:00	234.3228503
1/22/2015 7:40	234.2752167	1/22/2015 7:49	234.2898732
1/22/2015 8:48	234.2459038	1/22/2015 8:41	234.2568961
1/22/2015 9:47	234.223919	1/22/2015 9:55	234.223919
1/22/2015 10:57	234.1909419	1/22/2015 10:44	234.2019343
1/22/2015 11:50	234.1689572	1/22/2015 11:38	234.1799496
1/22/2015 12:50	234.1469725	1/22/2015 12:57	234.1469725
1/22/2015 13:42	234.1249877	1/22/2015 13:53	234.1249877
1/22/2015 14:23	234.1139954	1/22/2015 14:59	234.103003
1/22/2015 15:47	234.0920106	1/22/2015 15:40	234.0920106
1/22/2015 16:54	234.0700259	1/22/2015 16:54	234.0700259
1/22/2015 17:41	234.0480412	1/22/2015 17:58	234.0480412
1/22/2015 18:32	234.0260564	1/22/2015 18:51	234.0260564
1/22/2015 19:31	234.0040717	1/22/2015 19:45	234.0040717
1/22/2015 20:08	233.9930793	1/22/2015 20:57	233.982087
1/22/2015 21:02	233.982087	1/22/2015 21:43	233.9710946
1/22/2015 22:00	233.982087	1/22/2015 22:00	233.9710946
1/22/2015 23:26	233.9710946	1/22/2015 23:00	233.9710946
1/23/2015 0:00	234.0187282	1/23/2015 0:00	233.9930793
1/23/2015 1:00	234.0517053	1/23/2015 1:00	234.0260564
1/23/2015 2:00	234.0956748	1/23/2015 2:00	234.0590335
1/23/2015 3:00	234.1396442	1/23/2015 3:00	234.103003
1/23/2015 4:00	234.1726213	1/23/2015 4:00	234.1469725
1/23/2015 5:35	231.9228503	1/23/2015 5:00	234.1799496
1/23/2015 6:22	234.2055984	1/23/2015 6:00	234.2019343
1/23/2015 7:44	234.1689572	1/23/2015 7:47	234.1799496
1/23/2015 8:53	234.1359801	1/23/2015 8:42	234.1469725
1/23/2015 9:54	234.1103312	1/23/2015 9:58	234.1139954
1/23/2015 10:35	234.0883465	1/23/2015 10:45	234.0920106
1/23/2015 11:31	234.0663618	1/23/2015 11:35	234.0700259
1/23/2015 12:45	234.0333847	1/23/2015 12:57	234.0370488
1/23/2015 13:53	234.0113999	1/23/2015 13:54	234.0150641
1/23/2015 14:52	233.9930793	1/23/2015 14:27	234.0040717
1/23/2015 15:29	233.9784228	1/23/2015 15:41	233.982087
1/23/2015 16:58	233.9454457	1/23/2015 16:45	233.9601022
1/23/2015 17:59	233.923461	1/23/2015 17:45	233.9381175
1/23/2015 18:53	233.9014763	1/23/2015 18:42	233.9161328
1/23/2015 19:54	233.8831557	1/23/2015 19:48	233.894148
1/23/2015 20:32	233.8794915	1/23/2015 20:38	233.8831557
1/23/2015 21:50	233.8648351	1/23/2015 21:00	233.8831557
1/23/2015 22:16	233.8648351	1/23/2015 22:04	233.8721633
1/23/2015 23:22	233.8721633	1/23/2015 23:00	233.8721633

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/24/2015 0:00	233.9271251	1/24/2015 0:00	233.894148
1/24/2015 1:00	233.9601022	1/24/2015 1:00	233.9381175
1/24/2015 2:00	234.0040717	1/24/2015 2:00	233.9710946
1/24/2015 3:00	234.0480412	1/24/2015 3:00	234.0150641
1/24/2015 4:00	234.0810183	1/24/2015 4:00	234.0590335
1/24/2015 5:00	234.1249877	1/24/2015 5:00	234.0920106
1/24/2015 6:00	234.1579648	1/24/2015 6:00	234.1359801
1/24/2015 7:00	234.2019343	1/24/2015 7:00	234.1689572
1/24/2015 8:48	234.1909419	1/24/2015 8:41	234.1909419
1/24/2015 9:59	234.1469725	1/24/2015 9:41	234.1689572
1/24/2015 10:45	234.103003	1/24/2015 10:47	234.1249877
1/24/2015 11:54	234.0517053	1/24/2015 11:46	234.0810183
1/24/2015 12:59	234.0077358	1/24/2015 12:48	234.0370488
1/24/2015 13:46	233.9857511	1/24/2015 13:57	233.9930793
1/24/2015 14:55	233.952774	1/24/2015 14:40	233.9710946
1/24/2015 15:46	233.9307893	1/24/2015 15:50	233.9381175
1/24/2015 16:35	233.9088045	1/24/2015 16:42	233.9161328
1/24/2015 17:28	233.8831557	1/24/2015 17:32	233.894148
1/24/2015 18:42	233.8611709	1/24/2015 18:59	233.8611709
1/24/2015 19:25	233.8501786	1/24/2015 19:35	233.8501786
1/24/2015 20:58	233.8391862	1/24/2015 20:29	233.8391862
1/24/2015 21:00	233.8391862	1/24/2015 21:00	233.8391862
1/24/2015 22:00	233.8391862	1/24/2015 22:00	233.8391862
1/24/2015 23:38	233.8465144	1/24/2015 23:00	233.8391862
1/25/2015 0:45	233.8208656	1/25/2015 0:00	233.8391862
1/25/2015 1:00	233.8758274	1/25/2015 1:00	233.8501786
1/25/2015 2:00	233.9197969	1/25/2015 2:00	233.894148
1/25/2015 3:00	233.9637664	1/25/2015 3:00	233.9271251
1/25/2015 4:00	233.9967435	1/25/2015 4:00	233.9710946
1/25/2015 5:00	234.0407129	1/25/2015 5:00	234.0150641
1/25/2015 6:00	234.0846824	1/25/2015 6:00	234.0590335
1/25/2015 7:00	234.1176595	1/25/2015 7:00	234.0920106
1/25/2015 8:43	234.1286518	1/25/2015 8:00	234.1249877
1/25/2015 9:51	234.0663618	1/25/2015 9:43	234.103003
1/25/2015 10:59	234.0223923	1/25/2015 10:47	234.0590335
1/25/2015 11:58	233.9784228	1/25/2015 11:45	234.0150641
1/25/2015 12:53	233.9417816	1/25/2015 12:47	233.9710946
1/25/2015 13:47	233.9088045	1/25/2015 13:53	233.9271251
1/25/2015 14:34	233.8868198	1/25/2015 14:52	233.894148
1/25/2015 15:57	233.8538427	1/25/2015 15:39	233.8721633
1/25/2015 16:44	233.831858	1/25/2015 16:52	233.8391862
1/25/2015 17:56	233.7988809	1/25/2015 17:43	233.8172015
1/25/2015 18:37	233.7768961	1/25/2015 18:52	233.7842244
1/25/2015 19:57	233.743919	1/25/2015 19:39	233.7622396
1/25/2015 20:32	233.7329267	1/25/2015 20:37	233.7402549
1/25/2015 21:46	233.7219343	1/25/2015 21:11	233.7292625
1/25/2015 22:00	233.7219343	1/25/2015 22:26	233.7182702
1/25/2015 23:27	233.7292625	1/25/2015 23:00	233.7182702

McPhillips Minimum Reservoir Levels Jan 12-26, 2015

Timestamp	West Reservoir	Timestamp	East Reservoir
1/26/2015 0:46	233.7219343	1/26/2015 0:00	233.7292625
1/26/2015 1:00	233.7622396	1/26/2015 1:00	233.7402549
1/26/2015 2:00	233.8062091	1/26/2015 2:00	233.7842244
1/26/2015 3:00	233.8501786	1/26/2015 3:00	233.8172015
1/26/2015 4:00	233.894148	1/26/2015 4:00	233.8611709
1/26/2015 5:00	233.9271251	1/26/2015 5:00	233.9051404
1/26/2015 6:35	233.9381175	1/26/2015 6:00	233.9381175
1/26/2015 7:38	233.8831557	1/26/2015 7:52	233.9051404
1/26/2015 8:38	233.8648351	1/26/2015 8:52	233.8721633
1/26/2015 9:59	233.831858	1/26/2015 9:43	233.8501786
1/26/2015 10:37	233.8098732	1/26/2015 10:53	233.8172015
1/26/2015 11:43	233.7768961	1/26/2015 11:59	233.7842244
1/26/2015 12:48	233.743919	1/26/2015 12:41	233.7622396
1/26/2015 13:38	233.7219343	1/26/2015 13:52	233.7292625
1/26/2015 14:46	233.6999496	1/26/2015 14:48	233.7072778
1/26/2015 15:48	233.6779648	1/26/2015 15:52	233.6852931
1/26/2015 16:35	233.6559801	1/26/2015 16:51	233.6633083
1/26/2015 17:42	233.623003	1/26/2015 17:43	233.6413236
1/26/2015 18:56	233.5863618	1/26/2015 18:48	233.6083465
1/26/2015 19:26	233.5753694	1/26/2015 19:38	233.5863618
1/26/2015 20:35	233.5533847	1/26/2015 20:35	233.564377
1/26/2015 21:25	233.5423923	1/26/2015 21:58	233.5423923
1/26/2015 22:00	233.5423923	1/26/2015 22:00	233.5423923
1/26/2015 23:00	233.5533847	1/26/2015 23:00	233.5423923

E13 Reservoir Washing History

E13a Reservoir Washing History Data

This section has been intentionally removed.

E13b Reservoir Washing History Schedule

This section has been intentionally removed.

E14 Standard Operating Procedures (SOPs) Related to Distribution System Maintenance

E14a List of Standard Operating Procedures (SOP) and Safe Work Procedures (SWP)

Standard Operating Procedures (SOP) and Safe Work Procedures (SWP)

SOP/SWP	Reviewed?
SOP-Residual Chlorine Readings	✓
SOP-Equipment Disinfection	✓
SOP-Turbidity Readings	✓
L-SOP-004-South Reservoir Isolating, Draining, and Refilling	✓
P-SOP-004-West Reservoir Isolating, Draining, and Refilling	✓
SOP-Slug Disinfection After Repair	✓
S-SWP-001-Water Reservoir Maintenance	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-01 of 09-Investigating and Controlling New Leaks	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-02 of 09-Clearances for Excavation Area	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-03 of 09-Testing for the Leak with Test Truck	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-04 of 09-Repairing the Water Main	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-05 of 09-Installing and Removing Trench Cages	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-06 of 09-Changing the Excavator Bucket on the Backhoe	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-07 of 09-Transporting Excavated Material with a Tandem Dump Truck	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-08 of 09-Charging the System (Putting the Main back in Service)	✓
SWP-WS-LS-Repairing a Water Main Break or Leak-09 of 09-Filling Cuts to Grade	✓
SWP-WS-LS-Backhoe-01 of 02-Front Bucket Work.doc	
SWP-WS-LS-Backhoe-02 of 02-Driving, Transporting and Mobilizing.doc	
SWP-WS-LS-Cleaning Service Boxes with Air Compressor-01 of 01-Cleaning Service Boxes with Air Compressor.doc	
SWP-WS-LS-Hiab Lift Crane Use-01 of 01-Hiab Lift Crane Use.doc	
SWP-WS-LS-Inspecting Fire Hydrants-01 of 01-Inspecting Fire Hydrants.doc	
SWP-WS-LS-Installing and Removing Temporary Hose Lines-01 of 01-Installing and Removing Temporary Hose Lines.doc	
SWP-WS-LS-Installing or Replacing Water Meters-01 of 01-Installing or Replacing Water Meters.doc	
SWP-WS-LS-Major Hydrant Repairs-01 of 04-Replacing a Hydrant Body.doc	
SWP-WS-LS-Major Hydrant Repairs-02 of 04-Internal Maintenance for a Mechanical Hydrant.doc	
SWP-WS-LS-Painting Fire Hydrants-01 of 01-Painting Fire Hydrants.doc	
SWP-WS-LS-Repairing A Service Box-01 of 03-Repairing or Replacing the Service Box.doc	
SWP-WS-LS-Repairing a Service Box-02 of 03-Installing and Removing Excavation Shoring.doc	
SWP-WS-LS-Repairing a Service Box-03 of 03-Replacing a Service Box Special.doc	
SWP-WS-LS-Replacing a Valve Box Cover-01 of 01-Replacing a Valve Box Cover.doc	
SWP-WS-LS-Turning Services On or Off from Non Payment-01 of 02-Turning Services Off.doc	
SWP-WS-LS-Turning Services On or Off from Non Payment-02 of 02-Turning Services On.doc	

E14b Chlorine Readings After Watermain Repair SOP

Winnipeg
Water and Waste Department

Division		Facility	Area
Division Water Services		**Facility** Water Distribution	**Area** Winnipeg
Creation Date Jul 15, 2014	**Revision Date** Jul 17, 2014	**Revision Number** 01	**SOP #** N/A
Procedure Name Residual Chlorine Readings			

Controlled Document

Original Authors:

1. Tim Shanks, P.Eng. Manager, Water Services *print name, position*	2. Jennifer Graham, Training Coordinator *print name, position*
3. ______________ *print name, position*	4. ______________ *print name, position*

Reviewed By:

		YYYY	MM	DD
Reviewer	1. ______________ *print name, position*			
Safety	2. ______________ *print name, position*			
Environment	3. ______________ *print name, position*			

Tested By:

		YYYY	MM	DD
Tester	1. ______________ *print name, position*			
Safety	2. ______________ *print name, position*			
Environment	3. ______________ *print name, position*			

Authorized By:

		YYYY	MM	DD
	1. ______________			
	2. ______________			

1. Location

- City of Winnipeg Water Distribution Facility

2. Objectives

- The purpose is to ensure that water quality in the distribution system is maintained at acceptable standards after water mains are repaired.

3. Warning

- Confirm all personnel have read the MSDS on the DPD Free Chlorine Agent

4. Personnel Qualifications

- General Maintenance Worker Training

5. Discussion

- N/A

6. Hazards

- Avoid ingesting DPD Free Chlorine Agent

7. Abbreviations

ABBREVIATION	DESCRIPTION	DEFINITION
AWWA	American Water Works Association	N/A
MSDS	Material Safety Data Sheet	N/A
pdf	Portable Document Format	N/A
PPE	Personal Protective Equipment	N/A
SOP	Standard Operating Procedure	Specified way to perform a routine activity (work instructions)
SWP	Safe Work Procedure	Description of all safety considerations, hazards present, and protective measures such as PPE and training which must be in place to perform a particular activity

8. Equipment and Supplies

- HACH Pocket Colorimeter II
- 10ml Chlorine Reading Vials
- DPD Free Chlorine Agent pillow packs
- Silicone oil and buffing cloth
- AAA batteries
- Kimwipes

9. Preparation

- After repairs are complete, flush the water main towards the break, through a hydrant, until water is running clear.
- If valve and hydrant locations permit, flush towards the work from both directions.

10. Procedure

NO.	LOCATION	ACTIVITY DESCRIPTION	RESPONSIBILITY	DATA TO RECORD
1	Site of Watermain Repair	• Run the water from the venting hydrant for a minimum of 2-5 minutes. When the water runs clear take a sample and bring it to a sheltered area to perform the readings, such as the crew mobile or trailer	Excavation Crew	N/A
2	Crew mobile or trailer	PREPARE THE VIAL FOR TESTING: • Wipe down the vial with the water sample using a Kimwipe • If the vial has minor scratches put a drop of silicone oil on the vial and wipe with the buffing cloth. • If the vial has major scratches, discard and use a new vial	Excavation Crew	N/A
3	Crew mobile or trailer	BLANK THE COLORIMETER: • Turn the Colorimeter II on • Remover the reading slot cover, insert the sample (without reagent) into the reading slot and put the cover on • Press the ‘0’ button • Wait for the result. If the reading equals 0, proceed to step 4 • If the blank does not read 0, check the vial, retest, and if it fails again, notify your immediate supervisor	Excavation Crew	N/A
4	Crew mobile or trailer	ADD THE REAGENT: • Remove the blank vial, and add a DPD Free Chlorine Reagent Pillow pack to the vial. • Slowly stir the reagent into the water sample by gently tipping the vial back and forth.	Excavation Crew	N/A

NO.	LOCATION	ACTIVITY DESCRIPTION	RESPONSIBILITY	DATA TO RECORD
5	Crew mobile or trailer	TEST THE WATER SAMPLE: • Place the prepared vial from step 4 into the reading slot and put the cover on • Press the 'checkmark' button to initiate a reading • If the reading is 0.10 mg/L or more, record the number on the timecard then discard and rinse the vial, clean and store the Colorimeter II for next use. • If the reading is less than 0.10 mg/L , continue flushing and take another reading until the result is at least 0.10 mg/L • If the reading continues to return less than 0.10 mg/L, contact your immediate supervisor.	Excavation Crew	Record the result as mg/L on the timecard

11. Facility Equipment/Parts Numbers

- See 552 Plinguet Stores and/or Supervisor for supplies

12. Related Procedures

- Safe Work Procedures
- AWWA C651

13. Environmental

- N/A

14. References

- HACH Pocket Colorimeter™ II Instruction Manual

Appendix A: Procedure Review Form

Complete the following information and include with the proposed document revisions.

Document number	
Document name	
Existing revision #	
Proposed revision #	
Author of changes	
Summary of rationale for changes	

Route through the following personnel for review and approval.

Mark (X) all applicable	Signature	Date	Comments	Training requirements (Check if either applies)
☐ Systems Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Operations Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Operations Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Maintenance Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Process Control Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Aqueduct and Railway Supervisor				☐ Hold revision until notified ☐ Allow _______ for training

Note: Designates may also review and comment, as required.

E14c Disinfection SOP

Winnipeg
Water and Waste Department

Division		Facility	Area
Division Water Services		**Facility** Water Distribution	**Area** Winnipeg
Creation Date May 01, 2012	**Revision Date** Jul 15, 2014	**Revision Number** 01	**SOP #** N/A
Procedure Name Equipment Disinfection			

Controlled Document

Original Authors:

1. Tim Shanks, P.Eng. Senior Project Engineer *print name, position*	2. Jennifer Graham, Training Coordinator *print name, position*
3. ____________________________ *print name, position*	4. ____________________________ *print name, position*

Reviewed By:

Reviewer	1. ____________________________ *print name, position*	YYYY	MM	DD
Safety	2. ____________________________ *print name, position*			
Environment	3. ____________________________ *print name, position*			

Tested By:

Tester	1. ____________________________ *print name, position*	YYYY	MM	DD
Safety	2. ____________________________ *print name, position*			
Environment	3. ____________________________ *print name, position*			

Winnipeg
Water and Waste Department

Division Water Services		Facility Water Distribution	Area Winnipeg
Creation Date May 01, 2012	**Revision Date** Jul 15, 2014	**Revision Number** 01	**SOP #** N/A
Procedure Name Equipment Disinfection			

Controlled Document

Authorized By:

		YYYY	MM	DD
	1. ______________________________			
	2. ______________________________			

1. Location

- City of Winnipeg Water Distribution Facility

2. Objectives

- The purpose is to ensure that water quality in the distribution system is maintained at acceptable standards after water mains are repaired.

3. Warning

- Confirm all personnel have read the MSDS on sodium hypochlorite

4. Personnel Qualifications

- General Maintenance Worker Training

5. Discussion

- N/A

6. Hazards

- Use proper ventilation to minimize exposure to product vapour or mist
- Gloves and eye protection is recommended
- See MSDS pdf file located on crew mobile laptops and in SWP binders for more information

7. Abbreviations

ABBREVIATION	DESCRIPTION	DEFINITION
AWWA	American Water Works Association	N/A
MSDS	Material Safety Data Sheet	N/A
pdf	Portable Document Format	N/A
PPE	Personal Protective Equipment	N/A
SOP	Standard Operating Procedure	Specified way to perform a routine activity (work instructions)
SWP	Safe Work Procedure	Description of all safety considerations, hazards present, and protective measures such as PPE and training which must be in place to perform a particular activity

8. Equipment and Supplies

- 32 oz spray bottle
- Funnel
- 5% sodium hypochlorite solution: Clorox
- PPE: protective gloves, eye protection
- Portable eyewash station

Preparation

- The excavation is to be dewatered to below the invert of the water main, and maintained in as sanitary a condition as possible.
- Pipe and fittings are to be kept in a clean condition during storage and delivery.
- Prevent entry of trench water into pipe and fittings.

9. Procedure

NO.	LOCATION	ACTIVITY DESCRIPTION	RESPONSIBILITY	DATA TO RECORD
1	Operations Yard	• Decant 5% sodium hypochlorite solution from the parent bottle of Clorox Liquid Bleach into a 32 oz spray bottle that is labeled with the Clorox Liquid Bleach MSDS label.	Excavation Crew	N/A
2	Excavation Site	• Before installation, the interior of pipe and fittings are to be wiped with a clean cloth and then sprayed with a 5% sodium hypochlorite solution.	Excavation Crew	N/A
3	Excavation Site	• Clean all tools used for repairs by scraping off loose mud and debris • Spray with 5% sodium hypochlorite solution. • Wipe with a clean rag and spray with a 5% sodium hypochlorite solution, ensuring at least a 20 second contact time. • Lubricate with a food grade biodegradable oil if required.	Excavation Crew	N/A

10. Facility Equipment/Parts Numbers

- See 552 Plinguet Stores and/or Supervisor for supplies

11. Related Procedures

- N/A

12. Environmental

- Avoid spilling large quantities of sodium hypochlorite into open waterways.

13. References

- AWWA C651

Appendix A: Procedure Review Form

Complete the following information and include with the proposed document revisions.

Document number	
Document name	
Existing revision #	
Proposed revision #	
Author of changes	
Summary of rationale for changes	

Route through the following personnel for review and approval.

Mark (X) all applicable	Signature	Date	Comments	Training requirements (Check if either applies)
☐ Systems Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Operations Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Operations Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Maintenance Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Process Control Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Aqueduct and Railway Supervisor				☐ Hold revision until notified ☐ Allow _______ for training

Note: Designates may also review and comment, as required.

E14d Turbidity Readings After Watermain Repair SOP

Water and Waste Department

Division		Facility	Area
Division Water Services		Facility Water Distribution	Area Winnipeg
Creation Date May 01, 2012	Revision Date Jul 15, 2014	Revision Number 01	SOP #
Procedure Name Turbidity Readings			

Controlled Document

Original Authors:

1. Tim Shanks, P.Eng. Senior Project Engineer *print name, position*	2. Jennifer Graham, Training Coordinator *print name, position*
3. ____________ *print name, position*	4. ____________ *print name, position*

Reviewed By:

Reviewer	1. ____________ *print name, position*	YYYY	MM	DD
Safety	2. ____________ *print name, position*			
Environment	3. ____________ *print name, position*			

Tested By:

Tester	1. ____________ *print name, position*	YYYY	MM	DD
Safety	2. ____________ *print name, position*			
Environment	3. ____________ *print name, position*			

Authorized By:

	1. ____________	YYYY	MM	DD
	2. ____________			

1. Location

- City of Winnipeg Water Distribution Facility

2. Objectives

- The purpose is to ensure that water quality in the distribution system is maintained at acceptable standards after water mains are repaired.

3. Warning

- N/A

4. Personnel Qualifications

- General Maintenance Worker Training

5. Discussion

- N/A

6. Hazards

- N/A

7. Abbreviations

ABBREVIATION	DESCRIPTION	DEFINITION
AWWA	American Water Works Association	N/A
MSDS	Material Safety Data Sheet	N/A
pdf	Portable Document Format	N/A
PPE	Personal Protective Equipment	N/A
SOP	Standard Operating Procedure	Specified way to perform a routine activity (work instructions)
SWP	Safe Work Procedure	Description of all safety considerations, hazards present, and protective measures such as PPE and training which must be in place to perform a particular activity

8. Equipment and Supplies

- HACH 2100Q Portable Turbidity Meter
- Glass Turbidity Reading Vials
- Silicone oil and buffing cloth
- AA batteries
- Kimwipes

9. Prepara tion

- After repairs are complete, flush the water main towards the break, through a hydrant, until water is running clear.
- If valve and hydrant locations permit, flush towards the work from both directions.

10. Procedure

NO.	LOCATION	ACTIVITY DESCRIPTION	RESPONSIBILITY	DATA TO RECORD
1	Site of Watermain Repair	• Run the water from the venting hydrant for a minimum of 2-5 minutes. When the water runs clear take a sample and bring it to a sheltered area to perform the readings, such as the crew mobile or trailer	Excavation Crew	N/A
2	Crew mobile or trailer	PREPARE THE VIAL FOR TESTING: • Wipe down the vial with the water sample using a Kimwipe • If the vial has minor scratches put a drop of silicone oil on the vial and wipe with the buffing cloth. • If the vial has major scratches, discard and use a new vial	Excavation Crew	N/A
3	Crew mobile or trailer	VERIFY STANDARD: • Turn the turbidimeter on • Insert the 10NTU standard into the reading slot and close the lid • Press the 'read' button • Wait for the verification result. If the standard passes, proceed to step 4 • If the standard fails, retest, and if it fails again, notify your immediate supervisor	Excavation Crew	N/A

NO.	LOCATION	ACTIVITY DESCRIPTION	RESPONSIBILITY	DATA TO RECORD
4	Crew mobile or trailer	TEST THE WATER SAMPLE: • Place the prepared vial from step 2 into the reading slot and close the lid • Press the 'read' button. • If the reading is 5.0 NTU or less, record the number on the timecard then clean and store the turbidimeter for next use. • If the reading is 5.0 NTU or more, continue flushing and take another reading until the result is below 5.0 NTU.	Excavation Crew	Record the result as NTUs on the timecard

11. Facility Equipment/Parts Numbers

- See stores and/or Supervisor for supplies

12. Related Procedures

- N/A

13. Environmental

- N/A

14. References

- HACH 2100Q User Manual

Appendix A: Procedure Review Form

Complete the following information and include with the proposed document revisions.

Document number	
Document name	
Existing revision #	
Proposed revision #	
Author of changes	
Summary of rationale for changes	

Route through the following personnel for review and approval.

Mark (X) all applicable	Signature	Date	Comments	Training requirements (Check if either applies)
☐ Systems Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Operations Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Operations Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Maintenance Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Process Control Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Aqueduct and Railway Supervisor				☐ Hold revision until notified ☐ Allow _______ for training

Note: Designates may also review and comment, as required.

E14e Maclean Reservoir Washing SOP

This section has been intentionally removed.

E14f P-SOP-004 West Reservoir Isolating, Draining and Refilling

This section has been intentionally removed.

E14g SOP-Slug Disinfection After Repair

Water and Waste Department

Division Water Services		Facility Winnipeg WD4	Area
Creation Date 14-Nov-2014	**Revision Date**	**Revision Number**	**SOP #**
Procedure Name Slug Disinfection After Repair			

Controlled Document

Original Authors:

1. Louis Rivard, Supervisor M/H/V/S *print name, position*	2. Jennifer Graham, Cert & Training Coordinator *print name, position*
3. ______________________________ *print name, position*	4. ______________________________ *print name, position*

Reviewed By:

Reviewer	1. ______________________________ *print name, position*	YYYY	MM	DD
Safety	2. ______________________________ *print name, position*			
Environment	3. ______________________________ *print name, position*			

Tested By:

Tester	1. ______________________________ *print name, position*	YYYY	MM	DD
Safety	2. ______________________________ *print name, position*			
Environment	3. ______________________________ *print name, position*			

Authorized By:

	1. ______________________________	YYYY	MM	DD
	2. ______________________________			

1. Loca tion

- in COW WD4 Facility

2. Objectiv es

-

3. Warning

- Without keeping the flow rate consistent at 66.6LPM you run the risk of insufficient contact time for disinfection

4. Personn el Qualifications

- B2, MB Provincial Level 2 WD Certification

5. Discus sion

-

6. Ha zards

- PPE (for chlorine) must be worn prior to job commencing: gloves, face protection
- Refer to MSDS for Clorox and for Vita-D-Chlor associated hazards

7. Abbrev iations

ABBREVIATION	DESCRIPTION
AWWA	American Water Works Association
ESOP	Emergency Special Operating Procedure
JHA	Job Hazard Analysis
O&M	Operations and Maintenance
pdf	Portable Document Format
PPE	Personal Protective Equipment
SOP	Standard Operating Procedure
SWP	Safe Work Procedure
WTP	Water Treatment Plant

8. Equipment and Supplies

- Water tank
- Sodium hypochlorite (household bleach)
- Hose Monster diffuser
- Dechlorination equipment and supplies
- Colorimeter and Turbidimeter
- Free chlorine test kit
- Slug insertion pump
- Water meter (is there any other equipment available to us to measure flowrate??)

9. Prepara tion

- Lead operator shall conduct a tailgate meeting before the activities begin and shall inform all parties on the procedure being performed.

PROCEDURE DEFINITION	
ESOP	<u>Emergency Special Operating Procedure:</u> • Instruction for an operational activity to be performed as immediate disaster prevention or recovery
JHA	<u>Job Hazard Analysis:</u> • Process that breaks down the job or task into steps and identifies the hazards in each step so that controls or procedures can be identified to mitigate or stop the hazard • JHA should be performed for all jobs in order of priority, new jobs, new processes, new equipment, after an incident occurs, and for infrequent jobs
O&M manual reference	<u>Operations and Maintenance manual reference documents:</u> • Overarching guidance to O&M manuals for particular groups of equipment or processes
SOP	<u>Standard Operating Procedure:</u> • Specified way to perform a routine activity (work instructions)
SWP	<u>Safe Work Procedure:</u> • Description of all safety considerations, hazards present, and protective measures such as PPE and training which must be in place to perform a particular activity • Examples of SWP are Fall Arrest, Lockout-Tagout (LOTO), Work Alone, and Confined Entry

Winnipeg
Water and Waste Department

Division		Facility	Area
Water Services		Winnipeg WD4	
Creation Date 14-Nov-2014	**Revision Date**	**Revision Number**	**SOP #**
Procedure Name Slug Disinfection After Repair			

Controlled Document

10. Procedure

NO.	LOCATION	ACTIVITY DESCRIPTION	DURATION / TIME	RESPONSIBILITY	DATA TO RECORD
1		• Initial preparation and site visit: o List affected appurtenances and service connections o Notify any affected customers of pending watermain disinfection			
2		• Prepare data: o Choose an entry and exit point for the slug o Calculate volumes of pipes involved o Determine overall duration of slug contact time o Consider site specific conditions requiring further procedures o			
3		• Prepare the site for slug insertion			
4		• Flush the section of affected pipe: o Flush long enough for 2-3 complete changes in water within the pipeline o (Refer to flushing tables)			

NO.	LOCATION	ACTIVITY DESCRIPTION	DURATION / TIME	RESPONSIBILITY	DATA TO RECORD
5		• Prepare slug of 300mg/L sodium hypochlorite • (picture of set up) • Make WHMIS label • Lock the draw • Make training aid with the mix instructions			
6		• Set up equipment at slug insertion point			
7		• Set up dechlorination equipment and sampling station at slug exit point			
8		• Insert slug no greater than a rate of 90 LPM			
9		• Test water at exit point sampling station to determine when the slug has passed			

Winnipeg
Water and Waste Department

Division		Facility	Area
Division Water Services		**Facility** Winnipeg WD4	**Area**
Creation Date 14-Nov-2014	**Revision Date**	**Revision Number**	**SOP #**
Procedure Name Slug Disinfection After Repair			

Controlled Document

NO.	LOCATION	ACTIVITY DESCRIPTION	DURATION / TIME	RESPONSIBILITY	DATA TO RECORD
10		• Increase flow rate to flushing velocity of 2.5 feet/sec or 0.8m/s			
11		• After chlorination resume flushing and test water until residual chlorine concentration is no higher than the prevailing water in the distribution system or that which is acceptable for domestic use. o Record results			
12		• Take bacteriological samples and submit to Environmental Standards for testing (ideally lab personnel will be on site)			
13		• Return portion of pipe into service (?or do we wait for lab results first?).			
14		•			
15		•			

Winnipeg
Water and Waste Department

Division		Facility	Area
Water Services		Winnipeg WD4	
Creation Date 14-Nov-2014	**Revision Date**	**Revision Number**	**SOP #**
Procedure Name Slug Disinfection After Repair			

Controlled Document

NO.	LOCATION	ACTIVITY DESCRIPTION	DURATION / TIME	RESPONSIBILITY	DATA TO RECORD
16		•			
17		•			
18		•			

NO.	LOCATION	ACTIVITY DESCRIPTION	DURATION / TIME	RESPONSIBILITY	DATA TO RECORD
19					

11. Facility Equipment/Parts Numbers

-

12. Related Procedures

-

13. Environmental

- Prevent large spills from entering drains and waterways

14. References

- AWWA Standard 651

Appendix A: Procedure Review Form

Complete the following information and include with the proposed document revisions.

Document number	
Document name	
Existing revision #	
Proposed revision #	
Author of changes	
Summary of rationale for changes	

Route through the following personnel for review and approval.

Mark (X) all applicable	Signature	Date	Comments	Training requirements (Check if either applies)
☐ Water Distribution Engineer				☐ Hold revision until notified ☐ Allow _______ for training
☐ Superintendent of Water Distribution				☐ Hold revision until notified ☐ Allow _______ for training
☐ Excavation Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Hydrant/Valves/ Meters/Services Supervisor				☐ Hold revision until notified ☐ Allow _______ for training
☐ Training &Cert Coordinator				☐ Hold revision until notified ☐ Allow _______ for training
☐ Emergency Services Supervisor				☐ Hold revision until notified ☐ Allow _______ for training

Note: Designates may also review and comment, as required.

E14h Reservoir Maintenance SOP

SAFE WORK PROCEDURE

Water Reservoir Maintenance

This Task may only be performed by trained Water Services Personnel

Facility	Author	Creation Date	Revision Date	SWP Number
Stations		Oct 26/07	Mar 11/15	S-SWP-001

Hazards Present	Personal Protective Equipment (PPE)	Additional Training Requirements
• Falling or slipping • Drowning • Air quality • Fall hazard • Electrical	• Atmospheric Tester and Monitor • Portable Ventilation Equipment • Personal Protective Equipment • Full Body Harness • Ground Fault Interrupters (GFI) for electric tools • Explosion Proof Lighting • Two-Way radios • Flash Lights for power failures • SCBA if required	• W-SWP-001 PPE • Emergency and Evacuation Procedures • Confined Entry Procedures • Valid First Aid • Instrument Training • Chemical Handling

Protective Measures / Required Steps

CONFINED ENTRY PROCEDURES

All new employees will take a Confined Entry Procedure course offered by the City of Winnipeg. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following confined entry procedure shall apply:

1. Properly Lock and tag energy source before entering (water supply)
2. A multiple gas tester will be used to ensure that the reservoir is free of toxic gases; that the oxygen level is in an acceptable range and is safe for entry
3. Recommended one person will remain within the immediate area of the reservoir to act as Safety/Standby Personnel (among other duties) in case of an emergency using communication with staff in reservoir
4. A confined Entry Permit" needs to be completed and posted at the entrance
5. When safe to enter do so (using uni-hoist with harness)
6. Continuous monitoring is required while work is performed, ventilate if required

DISINFECTION OF EQUIPMENT AND CONTACT SURFACES BEFORE ENTRY

All equipment and contact surfaces on personnel attire must be disinfected prior to entry into the reservoir as follows. Prepare a solution of > 200 mg/L available chlorine solution in a spray bottle by collecting 40 mL of 0.8% sodium hypochlorite from the WTP chemical storage system and diluting with 760 mL of water. Be sure to label the spray bottle with a WHMIS workplace label. Use this spray on all surfaces which will enter the reservoir, immediately prior to entry. For example, all footwear surfaces, hoses, wheels of carts, tools, and containers should be sprayed before entry into the reservoir

EMERGENCY AND EVACUATION PROCEDURES

An appropriate number of safety/standby employees (a minimum of one) trained in First Aid (CPR) and rescue procedures must be in attendance and continuously monitor the employee(s) in the confined space. At all times, the safety/standby employee must be prepared and be appropriately equipped to carry out a rescue. In the event of an emergency or rescue the following shall apply:

1. When the two way radios are used, request for medical assistance in case of an accident can be made immediately. The Ambulance or Fire Department will be called directly using the closest phone in the Reservoir. Phone Deacon WTP Control Room or call **911**
2. If the accident is not life threatening, first aid would be administered at the location and the injured worker would not be moved until Fire Dept or Ambulance has arrived

ALWAYS CONSIDER CONFINED SPACES TO BE IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH)

If an emergency situation occurs while conducting this task call Control Room via radio or at or 911.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents / Standards / Applicable Legislation / Other

Guidance Documents

- N/A

Manitoba Workplace Safety and Health Regulation, M.R. 217/2006

- 2.1 Safe Work Procedures
- 6.13 Eye and Face Protectors
- 8.1 Musculoskeletal Injuries
- Part 15 Confined Spaces
- 16.4 Machine and Tool Safety

Supervisor Responsibility

- Provide all staff with proper equipment, training and tools
- Ensure that all safe work practices are followed
- Offer refresher training as new employees are hired
- Review procedure any time the task, equipment, or materials change, or at a minimum every three years. Correct deficiencies as required
- Ensure a first aid kit is on site
- Ensure employees have First Aid (CPR) training and renew their training every three years

Worker Responsibility

- Follow Safe Work Procedure. Ask Supervisor for clarification as required
- Wear appropriate personal protective equipment
- Report any hazardous situations or injuries to your supervisor

E14i SWP-WS-LS-Repairing a Water Main Break or Leak-01 of 09-Investigating and Controlling New Leaks

SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break
Task #: 01 of 09
Activity: Investigating and Controlling New Leaks

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	T. Shanks, P.Eng	02 09 2010	Mar 19 2014

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• MSI strains to body, • Heat/ cold stress • Slips/falls, • Violence towards workers • Local traffic concerns • Local animals • Paint Inhalation	• Work Safety Gloves • CSA approved Safety Glasses • CSA approved Safety Work Boots • CSA approved Hard Hats • High Visibility Reflective Vests • All Weather Clothing	Skilled Maintenance Worker Level B2 Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who are involved in repairing a water main break.

This procedure is to be followed when investigating and controlling new leaks.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for investigating and controlling new leaks shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting) and always dress appropriately for weather conditions.

Follow all traffic/pedestrian rules and bylaws. Ensure proper traffic control has been set up prior to beginning work.

If doing this task during the winter season, avoid walking over ice and use the short spade shovel to break up snow and ice covered area/equipment.

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse.

1. Set up all traffic barriers/signage to reduce traffic to the area. Block off street/ worksite if it is substantially flooded and investigate the potential source of the water main break/leak.
2. Use electronic locator to find service box valve cover, install the valve key and use both hands to close the valve and shut off the water. Do not jerk the key as this can damage the valve stem. If the turn key is difficult to move, get help from a co-worker with one person to push and the other to pull the rotate valve to open/close it.
3. Determine if the water is still rising up out of the ground or if it has ceased.
4. Using the computer on the service truck and its main water mapping system, locate the water main valves. Drive the vehicle slowly through the water (and ice - winter). Use the electronic locator to find valve covers and expose the valve cover (in the winter you must shovel it out). Use the short spade to reduce strains to the body and bend at the knees when shovelling while keeping a firm grip on the handle
5. Open the valve cover with either the frost-bar (winter) or another prying tool keeping a firm grasp on the handle.
6. Control the leak by shutting off the water main valves on either side of the area of the (suspected) leak and close the valves and paint the covers blue. If the valves are frozen you will need to thaw them with the boiler unit/steamer hose located on the supply truck. If this is necessary ensure that you keep your hands and feet away from the steamer end of the steam hose and always point the steamer end at the ground. Never leave the steam hose unattended.
7. Shut off the valves with the valve key by closing the valves slowly. Use both hands when turning the key. If the valve key is difficult to move, get help from a co-worker with one person to push and the other to pull the rotate valve to open/close it.
8. Locate the fire hydrant and bleed out any pressure from the isolated part of the water main system. Use the hydrant wrench key by gripping it near the end of the handle for better torque to remove the service cap and install the gate valve to control the hydrants water flow. Stand clear of the water escaping from the valve.
9. Using the radio connection and the bib-tap, trace the services believed to be near the suspected leak and spray paint the location of the service line blue. Always try to inform the resident before entering their yard and ensure there are no aggressive animals prior to proceeding onto residential property. When spray painting, hold the aerosol nozzle as close as possible to the desired area and stay down wind of the spray if possible.
10. Once the water leak has been isolated, proceed to inform home owners that the water has been shut off. Do not go to homes where pets/animals appear aggressive.
11. Visually inspect the street to confirm the condition from the water main break. If you need to walk out, stay away from the deeper water and follow the sidewalks to maintain footing if possible.
12. Pump out the excess water in the fire hydrant using a gas powered pump (supply truck) draining it into the nearest catch basin. Ensure good ergonomics are used when lifting heavy materials.
13. Fill out required report while on-site and phone dispatch to send out the required services (i.e. sanding truck, temporary water supply, fire hydrant services) to the leak site.

First aid
Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when investigating and controlling new water main leaks:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:
Workplace Safety and Health Act W210
Manitoba Regulation 217/2006

- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 10 Harassment
- 11 Violence in the Workplace
- 20 Vehicular and Pedestrian Traffic
- 22 Powered Mobile Equipment
- 35 Workplace hazardous Materials Information Systems
- 36 Chemical and Biological Substances

Supervisor Responsibility

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

Worker Responsibility

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14j SWP-WS-LS-Repairing a Water Main Break or Leak-02 of 09-Clearances for Excavation Area

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SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task #: 02 of 09
Activity: Clearances for Excavation Area

This Task may only be performed by trained personnel

Division/Branch/Area/Crew: Water Services/Local Services	**Approved by:** **T. Shanks, P.Eng**	**Creation Date:** 01 29 2010	**Revision Date:** **Mar 19, 2014**

Hazards Present:	**Personal Protective Equipment (PPE)** **Or devices required**	**Personnel Training Requirements:**
• Hot /Cold environments • Slippery surfaces • Traffic • Paint inhalation	• Safety Glasses • All weather clothing • Work Boots • Work Gloves • Hard Hats • Reflective Vests	Skilled Maintenance Worker Level A Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who are involved in repairing a water main break.

This procedure is to be followed when obtaining clearances for an excavation area.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for obtaining clearances for an excavation area shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting).

Follow all traffic/pedestrian rules and bylaws. Ensure proper traffic control has been set up prior to beginning work.

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse.

1. Drive to the site location and identify the service point required with the electronic locator. If the service point needs to be physically uncovered, ensure a good grip on the shovel and use good ergonomics (bend at the knees) to get close to the area. Use the PC computer/maps of service for measuring references.
2. Paint the ground with blue paint to mark the area to identify service boxes and points for other crews who may come to the site. Hold the aerosol nozzle as close as possible to the desired area and stay downwind of the spray if possible.
3. Identify utilities that are at or may affect the service point or excavation. Always phone the appropriate utility to come out and perform their service.
4. Prepare the cut area for excavation. Phone Local Services to remove existing trees or to clear the site of any debris.
5. Prepare a completed report of the utilities that have been identified and submit to the office in order for the excavation permit and to begin work.

First aid
Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when obtaining clearances for an excavation area:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:
Workplace Safety and Health Act W210
Manitoba Regulation 217/2006

- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 20 Vehicular and Pedestrian Traffic
- 35 Workplace hazardous Materials Information Systems
- 36 Chemical and Biological Substances

<u>Supervisor Responsibility</u>

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

<u>Worker Responsibility</u>

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14k SWP-WS-LS-Repairing a Water Main Break or Leak-03 of 09-Testing for the Leak with Test Truck

Winnipeg
Embrace the spirit

SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or leak
Task #: 03 of 09
Activity: Testing for the Leak with Test Truck

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	T. Shanks, P.Eng	02 22 2010	Mar 19, 2014

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• Oncoming Traffic • Extreme Weather Conditions (cold, rain, heat) • Slips and trips • Moving machinery parts • Musculoskeletal Injury Hazards • Paint absorption/ Inhalation • Compressed Air	• N95 dust mask/ respirator • High visibility reflective clothing • CSA approved hard hat and steel toe footwear • CSA approved safety glasses • Hearing protection • Clothing appropriate for weather conditions	Skilled Maintenance Worker Level C2 Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who repair water main breaks or leaks.

This procedure is to be followed when testing for leaks with the test truck.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for testing for leaks with the test truck shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting). A Hard hat and required PPE must be worn at all times.

Follow all traffic/pedestrian rules and bylaws. Ensure proper traffic control has been set up prior to beginning work.

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse.

1. Drive to the leak location, verify traffic control has been set, if not, call for a traffic control service crew to come to the site and set up before work begins. Read and understand utility clearance documentation. Keep clearance sheets on site.
2. Locate the water main and measure the distance between the valve and the sidewalk. If the sidewalk is snow/ice covered, measure the distance between the valve and the street curb. If you must walk through deep water that has been leaking, walk slowly and carefully.
3. Locate the area to be drilled and using the measurement from step 2, measure the drill spot. In winter you can mark the spot with a pry bar or hammer and use the hammer to lightly tap on the drill spot if it is covered in ice. Use a pry bar or shovel to create a divot in the boulevard. Bend your knees, keep your back straight and avoid using quick jerky movements when using the pry bar. If the drill spot is on the road mark the area with a dot of blue spray paint, holding the aerosol nozzle as close as possible to the desired area and staying downwind of the spray if possible.
4. Position the drill truck right in front of the drilling area. One worker should stand beside the drill truck to guide the driver while other workers perform traffic control if the drill truck needs to leave the construction site to reposition. Traffic controllers should use a handheld stop sign and stand more to one side of the road avoiding the middle if possible. When moving the drill truck, ensure the drill arm is in the down position and keep the truck as level as possible to the ground to reduce the risk of missing the water main and having to drill again.
5. Before turning the drill on ensure that all levers and turn-crank handles that activate the drill are in the “off” or “inactive” position and that no one is in or around the area when the drill is powered up. Turn the drill on. If drill parts begin to move or activate, turn the drill off immediately and turn levers and crank handles off.
6. Ensure all persons are clear of the drill truck and extend the drill boom arm up and outwards with the black levers at the rear of the truck. Keep your body, hair and loose clothing away from the drill bit while working near it and DO NOT wave your hand under the drill bit while it is rotating.
7. Verify that workers are clear of the drill bit when it is entering or exiting the ground. Drill a hole that reaches the top of the water main. Remove and re-insert the drill bit from the ground every few feet that have been drilled. When removing the drill bit deactivate it from rotating and pour water into the drilled hole to help the drill to churn up the ground. Once a depth has been reached that is close to the water main, slowly lower the drill. Stop drilling when the water main has been reached and remove the drill bit from the ground and lower the drill boom arm back into the truck. Never touch the drill bit under any circumstances if it is powered on.
8. Sand the working area if necessary to allow for better traction. Insert test rods into the drilled hole until the main is contacted. If the main can not be contacted with a straight rod, use a rod that has been bent, then attempt to contact the main. When pulling the rod out of the hole grasp it with both hands at waste height. Keep your back straight and bend your legs when pulling the rod out of the hole. Get help from a co-worker to pull and push the rod when possible. Watch how you handle the rod so that you don’t hit any one while turning or carrying it.
9. Listen for the leak at every rod that has been inserted with an aqua phone or digital aqua phone. The loudest rod should determine that the leak is on that part of the main. Spray paint the drilled hole blue above the section of the main that is suspected to be leaking. When spray painting hold the aerosol nozzle as close as possible to the desired area and stay downwind of the spray if possible.
10. Remove all test rods from the drilled hole and place them back into the drill truck.
11. Drive to the next job or back to the office ensuring you follow all traffic rules and bylaws.

First aid

Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when testing for leaks with the test truck:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:

Workplace Safety and Health Act W210
Manitoba Regulation 217/2006

- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 12 hearing Conservation and Noise Control
- 20 Vehicular and Pedestrian Traffic
- 22 Powered Mobile Equipment
- 26 Excavations and Tunnels
- 35 Workplace hazardous Materials Information Systems
- 36 Chemical and Biological Substances

Supervisor Responsibility

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

Worker Responsibility

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14I SWP-WS-LS-Repairing a Water Main Break or Leak-04 of 09-Repairing the Water Main

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SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task #: 04 of 09
Activity: Repairing the Water Main

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	T.Josephson	01 22 2010	Mar 19, 2014

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• Working in and around open excavations. • Water/ Waste Engulfment • Trips, Slips & Falls • Improper Lifting • Musculoskeletal Injury • Confined Space Entry • Extreme Cold (winter) • Heavy Mobile Equipment • Slippery Ground • Oncoming Traffic • Paint absorption	• Shoring cage, plywood & planks • CSA approved Hardhat, Safety Glasses/Face Shield, and Steel-toe Footwear (ice cleats when slippery) • Chainsaw chaps/pants • High Visibility Standard Issue Clothing (Winter & Summer Wear) • Hearing Protection • Full Body Harness • Clothing Appropriate for Weather Conditions	Skilled Maintenance Worker Level B2 Job Class Training

Safe Work Procedure

Training

Supervisors are responsible for the training of all personnel who repair a water main break or leak. This procedure is to be followed when repairing the water main. All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for repairing the water main shall be followed:

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting). All workers in and around the excavation area must wear all required PPE at all times.

All workers are to be aware of the backhoe at all times. Workers walking in and around the excavation vicinity should ensure eye contact with the backhoe operator to establish their presence. The backhoe operator must ensure all workers are clear from the backhoe's range of motion before moving or operating the machinery.

Follow all traffic/pedestrian rules and bylaws. Ensure proper traffic control has been set up prior to beginning work.

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse

1. Ensure the Workplace Safety and Health division is notified that work will be performed in an excavation within 48 hours before the day of excavation work OR as soon as reasonably possible before the excavation occurs. Monday to Friday 8-4:30 (Tel: 204-945-3446) After hours, weekends and Holidays (Tel: 204-945-0581)
2. Ensure the excavation area is properly barricaded from traffic/public and that proper street signage is in place. Draw the excavation area with blue spray paint around the designated drilled holes from the test truck crew. Hold the aerosol nozzle as close as possible to the desired area and upwind of the spray if possible.
3. All workers in and around the excavation area must wear all PPE at all times. Ensure all clearances for underground utilities have been marked before beginning to dig. All clearance papers must be on site and up to date. Jack hammer the designated digging area with the backhoe using extreme caution when working under overhead utilities (power lines). If the backhoe comes into contact with an energized overhead electrical line, the worker in the backhoe should remain inside until help can arrive. If backhoe operator must evacuate the machine, then they should jump clear of the backhoe so that no part of their body touches a part of the backhoe and the ground at the same time.
4. Ensure backhoe has all stabilizers engaged when excavating and that all workers are outside the excavator arm's range of motion and are in the backhoe operators line of sight at all times when in operation. Excavate loosened debris in the digging area with the backhoe. Dump Truck must be at least 1m from excavation. Dump the excavated material into a dump truck box. If excavating without Dump Truck, spoil pile must be at least 1m from excavation. Continue to jack hammer and excavate until you are close to where the water main is located.
5. Stand a few feet back from the edge of the excavation and find the water main by probing with a test rod. Ensure a good ergonomic stance and avoid overreaching. The backhoe operator should rest the excavator arm on the ground, lock out controls and sit away from all controls while the worker outside probes for the main.
6. If Necessary, open the water main valve a small amount to locate the exact spot the leak is originating from (if necessary get a cut on the key). While turning the service key to close valve, use both hands, one on each side of the T at the top and push with one hand and pull with the other to increase force on key rotating valve open or closed. Two workers may operate the valve key to increase the force; one to push and one to pull to rotate the valve open or closed. Do not jerk key on valve stem as this can damage valve stem stripping drive or breaking it off.
7. Close the valve again once leak is spotted, remove the key and place it back into the service truck. Ensure no worker or person is inside the excavation when the valve is to be turned open and that the valve is locked out by removing and placing the valve key inside the service truck. NEVER leave the key on the valve unattended anytime.
8. Retrieve the gas water pump from the service truck trailer. Have two workers bring the pump to the excavation, attach the pump intake hose and discharge hose. The discharge hose should be positioned out of the walking path of workers and a few feet away from the excavation. Roll out the discharge hose into a catch basin, drop the intake hose into the water in the excavation and start the pump. Pump the excess water out of excavation.
9. Once the water main has been cleared of debris install a trench cage according to engineer's specifications, City of Winnipeg manual on shoring procedures, and "Installing and Removing Trench Cages" SOP/JHA/SWP. If a worker is required or permitted to enter an excavation that is more than 1.5m deep, a support structure must be installed. If an

excavation is 1.5m deep or less but there is danger of a cave-in, collapse or material sliding or rolling into the excavation, a support structure must be installed. Reference MR 217/ 2006 for exceptions to this statement. DO NOT enter excavation on any circumstance without proper shoring system in place.

10. One worker will enter the excavation by ladder while another worker is designated to retrieve equipment/tools for the worker in the excavation. The ladder must extend 1m above the top of the excavation and located no more than 3m from the worker in the excavation. The backhoe must not be driven, operated or located next to the excavation so that it endangers the stability of the walls of the excavation. When an excavation is more than 1.5m deep, a competent person must be located at the surface of the excavation to alert the worker inside the excavation of any potentially unsafe condition and provide assistance in an emergency. The worker in the excavation must also be in direct communication with the watchperson at the top of the excavation and their safety equipment must also be rigged so that the worker can be immediately removed from the excavation if a hazardous situation occurs.
11. Verify that all excess water has been pumped out or is being pumped out of the excavation and manually dig and expose the water main of mud/debris with a spade shovel. Dig about 1m or more in length around the leak point. Dig to make room for the clamps or couplings that will be installed. Workers should stand on a piece of wood packing so their feet don't stick in the mud in the event they need to vacate the excavation immediately. Worker must always stay in the support structure when working inside the excavation (if trench cages are used, then work must be done inside the trench cage).
12. Using a hatchet, file, or scrapers; de-scale the section of the water main that will be repaired. If the water main is suspected/confirmed to be AC pipe allow the contractors to de-scale and cut the pipe or continuously wet the pipe while de-scaling and wear an appropriate respirator rated for asbestos fibre. Smooth the main with a wet rag by removing the entire grade. If rags were used on AC pipe, treat and dispose them as exposed to asbestos.
13. The worker must exit the excavation prior to clamps being lowered via rope or excavation bucket. Install the clamp over a small hole in the water main and insert wood packing beneath the clamp for support (use a hammer to tap the packing into place, keeping your fingers and hands away from the contact point). Ensure the packing is solid and is supporting the water main.
14. Using a quickie saw and proper PPE, cut out the section of the main that needs to be replaced and cut the section of PVC pipe for the repair. Ensure no workers are standing down from or in the path of a piece of cut water main pipe that may roll in the excavation. Always cut the pipe by standing to the side of the cut with the stable/supported water main pipe. If pipe is suspected/confirmed to be AC, continuously wet the pipe and use AC pipe cutters to cut the pipes.
15. Install a new section of PVC pipe on the water main. Have workers up top lower the cut PVC pipe down with 2 couplings to the worker in the hole. Then remove the cut piece of water main pipe from the excavation. If the materials are large/heavy then the backhoe must be used to lower/remove pipe and worker must exit the excavation before this is done. Ensure proper graded chain is used for the weight of the material being moved.
16. Install the couplings and new PVC pipe to the water main. Never stand downhill of the coupling even during the lift. Handle/lift the couplings from its silver fastener screws on the outside of the coupling keeping fingers clear of the pinch points between the water main and the inside lip of the coupling.
17. Once the main has been repaired, remove all materials, tools, and excavation caging (See Installing and Removing trench Cages SOP/JHA). Practice safe lifting techniques, small materials/tools can be placed in a bucket and lifted by rope. Maintain a 3 point contact when climbing the ladder.
18. Backhoe operator will verify that all workers are outside of the excavator arm's range of motion and backfill the repaired section of the water main to weigh it down if necessary.

19. Visually inspect the water main from the outside of the excavation to determine the integrity

of the repair. Charge the system (refer to Charging the System SOP/JHA)

First aid
Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when repairing the water main:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:
Workplace Safety and Health Act W210
Manitoba Regulation 217/2006

- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 12 hearing Conservation and Noise Control
- 13 Entrances, Exits, Stairways and Ladders
- 14 Fall Protection
- 20 Vehicular and Pedestrian Traffic
- 22 Powered Mobile Equipment
- 25 Work in the Vicinity of Overhead Electrical Lines
- 26 Excavations and Tunnels
- 35 Workplace hazardous Materials Information Systems
- 36 Chemical and Biological Substances

Supervisor Responsibility

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

Worker Responsibility

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14m SWP-WS-LS-Repairing a Water Main Break or Leak-05 of 09-Installing and Removing Trench Cages

SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task #: 05 of 09
Activity: Installing and Removing Trench Cages

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	**T. Josephson**	02 22 2010	**Mar 19, 2014**

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• Trips, slips and falls • Struck by traffic • Improper lifting • Musculoskeletal Injuries • Confined Entry Conditions • Ground Collapse • Water/ Waste Water Engulfment	• CSA approved hard hat and steel toe footwear • CSA approved safety glasses • Hearing protection • Gloves • High visibility reflective clothing • Confined entry equipment as required	Skilled Maintenance Worker Level B2 Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who repair a water main break or leak.

This procedure is to be followed when installing or removing trench cages.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for installing or removing trench cages shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting).

Follow all traffic/pedestrian rules and bylaws. Ensure proper traffic control has been set up prior to beginning work.

All workers are to be aware of the backhoe at all times. Workers walking in and around the excavation vicinity should ensure eye contact with the backhoe operator to establish their presence. The backhoe operator must ensure all workers are clear from the backhoe’s range of motion before moving or operating the machinery.

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse

1. Ensure the Workplace Safety and Health division is notified that work will be performed in an excavation within 48 hours before the day of excavation work OR as soon as reasonably possible before the excavation occurs. Monday to Friday 8-4:30 (Tel: 204-945-3446) After hours, weekends and Holidays (Tel: 204-945-0581)
2. Position the trench cage trailer with the service truck parallel with the backhoe but at a distance from the excavation so that the integrity of the excavation's wall are not in jeopardy. Have workers perform traffic control if the vehicles must leave the construction site to reposition.
3. If not already present, attach a 5 hook graded lifting chain to the top 4 corners of the trench cage. Ensure that the chain is in good working order and the hooks are secure and will not detach once tension is applied from the backhoe boom. Use only chains and hooks that are meant specifically for lifting trench cages.
4. Attach the 5th hook lifting hook to the pin on the excavation bucket of the backhoe. Verify that the pin is secure and the chain attached is the properly rated to support the weight of the largest trench cage that may be used by the City of Winnipeg.
5. Verify that the backhoe's stabilizers are engaged prior to lifting the trench cage. Lift the trench cage out of the trailer with the backhoe and position it on the ground a safe distance away from the excavation. The backhoe operator must be aware of all surroundings before moving the trench cage in any direction. Once the trench cage is on the ground and the backhoe is safely stopped, inspect the cage for any deficiencies and ensure the cage will expand correctly. Do not use a defective trench cage.
6. Attach the cage pump and slightly expand the cage. Make sure the ball valves on the top of the cage are open and inspect again for any deficiencies. Check the cage walls, stabilizers, ball valves and the general structure. Notify the job foreman and supervisor immediately of any deficiencies. Do not continue to install the trench cage if it is suspected to be or is damaged. Verify that there is appropriate and sufficient trench caging fluid.
7. If you need to troubleshoot for a cage that will not expand, lightly tap the cage stabilizer's with a hammer if dried mud is sticking to the valves. Keep fingers and hands away from the contact point. Close the other valves on the cage and pump the trench cage pump a few times to cause pressure to a valve for it to open. Stand clear of the walls when attempting to expand the cage; if hammering is necessary, stand on the open side of the cage. Follow troubleshooting tactics for the expansion of the trench cage according to COW's manual on shoring procedures if there any trench cage expansion issues.
8. Use the backhoe to lift and position the trench cage over the excavation hole. If you must position it manually, ensure the backhoe boom has completely stopped moving and the cage has stopped swinging. Gently push the trench cage wall. Use a shovel or long tool to push the trench cage for safer body positioning. DO NOT push the wall with force if the cage appears to be stuck on something in the excavation. Stand back and allow the backhoe operator to reposition the trench cage and the re-approach the cage again when it is safe to do so to manually position it.
9. Using the backhoe, lower the cage halfway into the excavation. All workers should stand clear away from the excavation area until the backhoe has positioned the trench cage. The operator must ensure the backhoe is properly positioned to enable the best balance with the shoring cage and that the stabilizers and the front bucket are used to stabilize the backhoe during the lift. The backhoe should position the side of the cage where the pump attachment is as close to the wall of the excavation as possible so there is easy access for the worker to attach the pump hose.
10. Once it is safe to do so, manually attach the trench cage pump hose to the cage's valve box.
11. Install the trench cage by lowering the cage approx. 3 feet from the bottom of the

excavation. The trench cage or shoring walls MUST extent at least 300mm above the vertical walls of the excavation. If the excavation is so deep such that one trench cage cannot reach the required 300mm over the vertical excavation wall then install a stackable trench cage to reach the required height. These cages must be designed for stacking by and with a stacking method specified by a professional engineer. Perform this AFTER trench cages beneath are stable and secure in the excavation. Ensure that all walls of the excavation are shored with box shoring. (See COW manual on shoring procedures for box shoring).

12. Close the open sides of the cage with sheets of plywood. Have the plywood lowered by two people using safe lifting techniques. If required, cut a triangle into plywood for use of rope/chain. The plywood must reach a position behind both stabilizers on the side of the exposed excavation wall and secured. Ensure no part of the excavation wall is exposed to the inside of the trench cage.
13. Using the cage pump, expand and stabilize the trench cage. Operate the pump a safe distance from the excavation (the pump hose can extend to a safe length). If cage pump does not have a pressure indicator gauge, only pump until it becomes challenging to pump, get help from a co-worker once tension is felt during the pumping. If necessary, install extra shoring planks around the trench cage if more stabilization is needed. Do this before lowering the trench cage into the excavation. Do not stay in the excavation for an elongated period of time and the worker must stay within 3m of the ladder when in the excavation.
14. Have 2 workers insert the extension ladder so that it is 1m above the top of the excavation/trench and so that it is not more than 3m away from the worker at all times. Once the trench cage is secured in the excavation, detach the backhoe from the trench cage and remove the backhoe boom from the excavation.
15. To remove the trench cage: Attach the 5 hook graded chain to the excavator bucket from the backhoe, then to the top four corners of the trench cage. Relieve pressure from the trench cage walls with the trench cage pump just enough to collapse the cage so it can be lifted out of the excavation. Using the backhoe, lift only once all points of the chain are secured to the backhoe boom and trench cage and all workers have exited the excavation. Position and lower the trench cage on the ground a safe distance away from the excavation.
16. Collapse the trench cage completely. If necessary, use as many workers as possible to push the trench cage closed. The pump must be used to relieve pressure while the cage is being collapsed. If the cage does not close, refer to troubleshooting tactics for the trench cage according to COW's manual on shoring procedures. The backhoe boom can assist in the collapse if the trench cage is tipped on its side, if this is necessary workers must be clear of the tipping area and the backhoe should push on its stabilizers in small increments but not force its weight on the cage.
17. Use the backhoe boom to lift the cage back onto its trailer, once it is being held over the trailer workers can help position the cage using a long tool (i.e. shovel) so they do not get caught between the equipment. The backhoe must have come to a complete stop and the cage must not be swinging. Once the desired position has been attained, workers must back away and then signal the backhoe operator to lower the cage.

First aid
Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when installing or removing trench cages:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction,

<table>
<tr><td colspan="2">engage emergency stop and follow the lock out procedure.
REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR</td></tr>
<tr><td>Guidance Documents/ Standards / Applicable Legislation / Other:
Workplace Safety and Health Act W210
Manitoba Regulation 217/2006
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35 Workplace hazardous Materials Information Systems
36 Chemical and Biological Substances</td><td><u>Supervisor Responsibility</u>

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

<u>Worker Responsibility</u>

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.</td></tr>
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E14n SWP-WS-LS-Repairing a Water Main Break or Leak-06 of 09-Changing the Excavator Bucket on the Backhoe

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SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task: Changing the Excavator Bucket on the Backhoe
Task #: 06 of 09

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	T.Shanks, P.Eng	02 19 2010	Mar 19, 2014

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• Heavy Mobile equipment • Oncoming traffic • Slippery walking surfaces • Heavy lifting • Open flame • Possible extreme weather • Crush hazards	• CSA approved Hard Hat • CSA approved ankle high steel toe footwear. • CSA approved eye wear. • High Visibility Vest/Clothing. • Nitrile & Leather Work Gloves • Clothing appropriate for extreme weather (winter, rain)	Skilled Maintenance Worker Level B1 Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who repair water main breaks/leaks.

This procedure is to be followed when changing the excavator bucket on the backhoe.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for changing the excavator bucket on the backhoe shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting). Follow all traffic/pedestrian rules and bylaws. Ensure proper traffic control has been set up prior to beginning work.

All workers are to be aware of the backhoe at all times. Workers walking in and around the excavation vicinity should ensure eye contact with the backhoe operator to establish their presence. The backhoe operator must ensure all workers are clear from the backhoe’s range of motion before moving or operating the machinery.
Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse

1. Position the backhoe so it is away from the work area and lower the excavator bucket to the ground. If the backhoe must drive out of the construction zone to reposition, workers must perform traffic control so the backhoe can be safely guided to its desired location.
2. Open the quick coupler and remove the locking pin that secures the bucket, use a hammer to gently tap out the pin keeping your fingers away from the point of contact.
3. Use the backhoe boom to position the jackhammer next to the backhoe so that the hammer pin is facing the backhoe.
4. Remove the excavator bucket from the boom arm hooks and attach the jackhammer. Ensure the backhoe booms hooks to the jackhammer’s mechanism and hook shaft.
5. Use the backhoe boom to lift the jackhammer up until it is vertically straight and Install the jackhammer. Insert the locking pin into the jackhammer and verify that it is secured to the backhoe boom. Use a hammer to tap the pin into place if it doesn’t insert easily. Keep your fingers and hands clear of the hammer’s point of contact with the pin.
6. Once the backhoe boom lays the jackhammer horizontally on the ground, release the hydraulic pressure from the jackhammer lines and attach the hydraulic fluid hoses from the jackhammer to the backhoe boom’s hydraulic fluid hoses. Ensure you are wearing gloves and safety glasses and always release the hydraulic pressure from the jackhammer’s lines prior to attaching them to the backhoe.
7. Position the backhoe to begin the excavation. Follow all traffic control and traffic rules.
8. Return the backhoe to the excavation area to begin jack hammering. Follow this process in reverse order when changing the jack hammer to the excavation bucket.

First aid
Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when changing the excavator bucket on the backhoe:
1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:
Workplace Safety and Health Act W210
Manitoba Regulation 217/2006
- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 12 hearing Conservation and Noise Control
- 20 Vehicular and Pedestrian Traffic
- 22 Powered Mobile Equipment
- 26 Excavations and Tunnels
- 35 Workplace hazardous Materials Information Systems
- 36 Chemical and Biological Substances

Supervisor Responsibility

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

Worker Responsibility

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14o SWP-WS-LS-Repairing a Water Main Break or Leak-07 of 09-Transporting Excavated Material with a Tandem Dump Truck

SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task #: 07 of 09
Activity: Transporting Excavated Material with a Tandem Dump Truck

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	T.Shanks, P.Eng	02 11 2010	Mar 19, 2014

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• Musculoskeletal Injury • Slips, Trips, and Falls • Crush/ Pinch to parts of body • Heavy Mobile Equipment • Hazardous Driving Conditions • Extreme Weather Conditions • Dump Truck Tipping	• High Visibility Vest/ Clothing • Clothing appropriate for weather • CSA approved hard hat • CSA approved steel toe footwear. • Clothing appropriate for extreme weather conditions (cold, rain, and extreme heat).	Skilled Maintenance Worker Level A Job Class Training

Safe Work Procedure

Training

Supervisors are responsible for the training of all personnel who repair a water main break/leak.

This procedure is to be followed when transporting excavated materials with a tandem dump truck.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for transporting excavated materials with a tandem dump truck shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting).

Follow all traffic/pedestrian rules and bylaws and ensure proper traffic control has been set up prior to beginning work.

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Always maintain three-point contact when entering/exiting the truck cab.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse

1. Ensure the maxi break is set and then conduct a pre-trip inspection of the vehicle prior to leaving the garage. Walk around and visually inspect the vehicle's integrity. Check the condition of the glass, mirrors, tires, hydraulics and ensure the fluids are topped up. Report any visible defects to your supervisor immediately and do not use the vehicle if it is not up to standard.
2. Drive the truck to the excavation site. Follow all driving/pedestrian traffic rules and bylaws. Refer to COW Water and Waste department working alone policy if you are driving alone.
3. Once the backhoe is in position, reverse and position the truck towards the excavation area, near the backhoe, at a distance so that it does not put the integrity of the excavation's walls in jeopardy. Use a spotter/flag person to assist in direction the driver of the truck. Walk to the rear of the truck and ensure the clamps on the box gate are attached to the box.
4. Once the truck is full of excavated material, drive it away from the excavation area, park, walk around the truck to make sure the sides/edges are clear of mud/soil, then operate the tarp mechanism to cover the load. Whenever possible, avoid from assisting the mechanism arm, if you must assist the arm, push it (do not pull) and stay behind the direction the arm is moving. Keep fingers and hands outside the tarp mechanism arm. If the arm is malfunctioning, contact your supervisor or a COW mechanic.
5. Ensure the tarp is fully on especially when hauling fine particulate material or wet/sloppy/liquid material.
6. Drive at or below the speed limit to a designated dumping area (i.e. Landfill). Leave extra stopping room when driving as the truck box is full.
7. Find a level surface and apply the parking brake and park the truck. Remove the tarp from the vehicle (Refer to step 4 when operating the tarp mechanism arm).
8. Ensure that there is no other workers/people in the dumping are (step out of the truck to look). Activate the dumping switch in the truck's cab and dump the excavated material. Once all the material has been emptied from the truck, lower the truck box back to its resting position.
9. Once the box has been lowered into its resting position, exit the cab and climb up on all contact points (ensure 3-point contact with the vehicle at all times) to visually inspect the truck box to ensure the load has been dumped (do not do this if the truck box is still raised). Walk to the rear of the truck and verify the clamps on the box gate are attached to the box. If the clamps are not attached, use a crow bar or another pry tool to pry the gate open and let it drop closed. Always handle the pry tool with both hands and avoid jerky movements.
10. Drive to the designated supplier of hot sand and allow the supplier to load sand into the truck's box. (Refer to step 2)
11. Drive back to the excavation site. Reverse and position the truck towards the excavation, near the backhoe (Refer to step 3 above). Allow the backhoe to either remove the sand from the truck box, or continue to fill the truck box with more excavated material. Continue this process until the job is complete.
12. Drive back to the parking garage and perform a post-trip vehicle inspection. Notify your supervisor or mechanical staff if any piece of equipment /instruments on the truck are malfunctioning or suspected to need repair. If any fluid or air is low on the vehicle, fill to specification levels.
13. Wash down the reflective surfaces (lights and mirrors) with the power washer, keeping the washer nozzle pointed away from your body.

First aid

Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when transporting excavated materials with a tandem dump truck:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:

Workplace Safety and Health Act W210
Manitoba Regulation 217/2006

- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 12 Hearing Conservation and Noise Control
- 20 Vehicular and Pedestrian Traffic
- 22 Powered Mobile Equipment
- 26 Excavations and Tunnels
- 35 Workplace hazardous Materials Information Systems
- 36 Chemical and Biological Substances

Supervisor Responsibility

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

Worker Responsibility

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14p SWP-WS-LS-Repairing a Water Main Break or Leak-08 of 09-Charging the System (Putting the Main back in Service)

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SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task #: 08 of 09
Activity: Charging the System

This Task may only be performed by trained personnel

Division/Branch/Area/Crew:	Approved by:	Creation Date:	Revision Date:
Water Services/Local Services	T. Shanks, P.Eng	02 08 2010	Mar 19, 2014

Hazards Present:	Personal Protective Equipment (PPE) Or devices required	Personnel Training Requirements:
• Oncoming Traffic • High pressure water • Burns and scalds from the Steam hose (winter) • Large amount of ice build-up (winter)	• Warm clothes • High visibility clothing/ vest. • CSA approved Steel Toe Footwear • Spare change of clothes and winter wear	Skilled Maintenance Worker Level B2 Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who repair water main break/leaks.

This procedure is to be followed when charging the system.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for charging the system shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting).

Sand the work area if it is ice-covered or thought to be slippery. Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Follow all traffic/pedestrian rules and bylaws and ensure proper traffic control has been set up prior to beginning work.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse

1. For the section of the water main that is being repaired, verify that all valves are closed. If they are snow/ice covered, use a spade to first beak up the snow and ice, then shovel to clear out the valve box. Keep a firm grip on the shovel and avoid bending your back when

shovelling (bend your knees). If you must use the steamer hose and boiler unit to thaw the valve, ensure the steamer end is always pointed at the ground and keep your hands and feet away from the steamer end of the hose.

2. Use a fire hydrant on the water main to bleed out air when the charge occurs, if there is no hydrant on the system then branch out the repaired section of pipe by opening adjacent valves until a fire hydrant exists on the system.
3. Drive to the fire hydrant with the service truck when the system is ready to be charged. Follow all traffic rules/bylaws.
4. Attach the discharge hose and gate valve to an outlet nozzle on the hydrant and place the discharge end of the hose into a nearby catch basin.
5. Weigh the discharge end of the hose down with a sandbag or heavy piece of material. Use proper lifting techniques when lifting the sand bag/heavy material (bend knees when lifting, keep your back straight and avoid twisting at the torso).
6. Thaw the valves or catch basins with the boiler unit (on service truck). Use the steam hose to heat the valves or melt the ice in the catch basins. Always keep the steamer end pointed towards the ground and keep hands and feet clear of the steam end. If possible, avoid from using the boiler unit and steam hose for some points of this procedure to reduce the amount of ambient steam that can reduce the driver's visibility.
7. Bleed the water main of air by opening the gate valve attached to the fire hydrant then the hydrant valve. Use a hydrant wrench and keep a firm wide based stance, turn the operating nut very slowly (to avoid a water hammer event).
8. The worker at the valve will get a cut on the key (open the valve slowly), put their ear up to the key and listen for any water pressure. Turn the key slowly and in small increments. Always charge "through" your work and out the furthest hydrant first. The water main repair crew will inspect the main from outside the excavation during this procedure to ensure proper repair.
9. After all the air has been bled out from the hydrant, slowly close the gate vale at the hydrant followed by the hydrant valve by turning the operating nut slowly and in small increments. Be sure that the discharge hose is sufficiently weighed down and positioned away from the worker.
10. Attach a gas powered pump to an outlet nozzle on the fire hydrant and pump out the excess water from the hydrant. Use good lifting techniques (bend at the knees and avoid twisting at the torso). Always carry the pump with both hands and ensure it is primed before attempting to start it. Drain any excess water into the nearest catch basin.
11. Close the water main valve. Once the worker at the hydrant notifies the worker operating the valve that the hydrant valve is closed, the worker operating the valve must then open the water main valve turning the key slowly and in small increments until it has been opened completely.
12. Pack up all tools/materials and drive to reopen any other closed water main valves. If any flooding has occurred on the street from where the water was bled out of the hydrant, request a vactor truck to unclog catch basins or to pump water from the street. If ice has built up on the streets or sidewalks (winter), request a sand truck.
13. Open the valves that have been used to isolate the repaired water main. If the steam hose/boiler unit must be used, refer to safe actions in step 6. Turn the key slowly in small increments. Get a second worker to help turn the valve key if it is still difficult to turn after using the boiler unit.

First aid

Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when charging the system:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure.

REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR

Guidance Documents/ Standards / Applicable Legislation / Other:

Workplace Safety and Health Act W210
Manitoba Regulation 217/2006

- 2.1 Safe Work Procedures
- 5 First Aid
- 6 Personal Protective Equipment
- 8 Musculoskeletal injuries
- 12 Hearing Conservation and Noise Control
- 20 Vehicular and Pedestrian Traffic
- 22 Powered Mobile Equipment
- 26 Excavations and Tunnels

Supervisor Responsibility

Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed.

Worker Responsibility

Follow Safe Work Procedure
Wear appropriate PPE
This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E14q SWP-WS-LS-Repairing a Water Main Break or Leak-09 of 09-Filling Cuts to Grade

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SAFE WORK PROCEDURE

Job Name: Repairing a Water Main Break or Leak
Task #: 09 of 09
Activity: Filling Cuts to Grade

This Task may only be performed by trained personnel

Division/Branch/Area/Crew: Water Services/Local Services	**Approved by:** **T.Shanks, P.Eng**	**Creation Date:** 02 28 2010	**Revision Date:** **Mar 19, 2014**

Hazards Present:	**Personal Protective Equipment (PPE) Or devices required**	**Personnel Training Requirements:**
• Cold/ hot weather conditions • Roadway Traffic • Heavy equipment • Moderate to heavy lifts by personnel	• Work gloves • Safety glasses • Rubber insulated boots • Reflective vests • Hard hats • Winter work clothing	Skilled Maintenance Worker Level A Job Class Training

Safe Work Procedure

Training
Supervisors are responsible for the training of all personnel who repair a water main break/leak.

This procedure is to be followed when filling cuts to grade.

All employees will be trained on proper use before doing this task. As well, refresher training may be offered as new employees are hired and for the purposes of updating this procedure. The following procedures for filling cuts to grade shall be followed;

Don personal protective equipment before beginning the task. Ensure clothing fits appropriately (tight fitting).

Follow all traffic/pedestrian rules and bylaws and ensure proper traffic control has been set up prior to beginning work.

Sand the work area if it is ice-covered or thought to be slippery.

Inspect all tools/materials prior to use before beginning procedure. If any broken or defective equipment is found, do not use and remove from service immediately.

Note: Signs and symptoms of a musculoskeletal injury (MSI) can include pain, burning, swelling, numbness/ tingling, color changes, and loss of movement or strength in a body part. The worker should inform their supervisor and/ or the Safety and Health committee if they are experiencing these or other signs and symptoms so steps can be taken to avoid making the conditions worse

1. Do a pre-use inspection on all tools/materials required as well as the vehicles that will be used. Report any defects to your supervisor and do not use if tools/materials are defective or faulty.
2. Order concrete needed for the job at the beginning of the shift. All sites can be planned in advance for this work. Some ordering may take place during the day but orders should only be done from a parked service vehicle.
3. Once on-site, park the service vehicle away from traffic when possible and use hazard/warning lights. Always wear appropriate reflective traffic gear and exit the vehicle when there is no risk to the worker of being hit by on-coming traffic. Verify that traffic barriers are in place.
4. Remove any covers on the lumber/plywood and install plywood protection for the boulevards. When handling the supplies, wear work gloves at all times and when sliding the plywood off the cut areas or truck box by bending at the knees to help ease the load. Never carry more than you can easily handle, get a co-worker to help or if you need to travel a longer distance, move the service vehicle as close as possible to load/unload heavier supplies.
5. Prepare the cut area. Use a shovel to adjust the grade of the cut area and remove soil, gravel and snow. Rake out the grade for the fill for summer soils or any repairs for the boulevards. If required, use a tandem to tip and unload the required materials for the fill and then proceed to shovel off the pile to the cut area with a shovel or rake to reduce the risk for MSI injuries. Always clean up the tools once you are finished using them so they are not a hazard to workers if left lying on the ground.
6. Using traffic control techniques spot the cement truck on-site to fill the cut area. Be aware of your surroundings when having the cement truck back-up (i.e. poles, trees, buildings or utility services). Always use clear hand signals to spot and direct the cement truck to ensure there will be no damage to cut, boulevards, utilities or trees.
7. Allow the cement truck operator to operate the chutes and control the flow of the cement into the cut area. Fill the cut area with concrete stab mix, gravel or soil (in the summer months, some cuts will require more active repair such as sod, grass seed and topsoil) in order to repair the cut. For cement: rake the cement into corners from the inside to outside edge for grade to avoid standing in the mixture. For gravel and soils: first shovel the material from the pile into the cut area, then use the rake to adjust to grade. Reduce stress on the body while shovelling by keeping your knees slightly bent. Always wear insulated rubber boots and work gloves, if mixture contacts your skin wipe/wash off with clean water. If PPE gets saturated with the mix, replace. When working with gravel or soils, wear an APR dust mask.
8. Clear and complete the cut area. Before leaving make sure area is safe. Level surface and smooth as best as possible using cement tools. Follow all traffic control procedures when removing barriers from the site. Wear appropriate reflective vest and work gloves. If traffic controls have been leased or rented, call the retailer to remove them from the site. Drag all plywood to the vehicle instead of carrying it to avoid strains to your back or arms. Ensure all materials are loaded into the service vehicle first before traffic control is removed and loaded.

First aid

Every employee will be trained in First Aid (CPR) and will renew their training every three (3) years on a regular basis. A first aid kit must be on site at all times.

Work requirements when filling cuts to grade:

1. All safety equipment as stated above.
2. Qualified and trained operators.
3. Work area is clear of all hazards.

If an emergency situation occurs while conducting this task call 911, or there is an equipment malfunction, engage emergency stop and follow the lock out procedure. ***REPORT ANY HAZARDOUS SITUATIONS TO YOUR SUPERVISOR***	
Guidance Documents/ Standards / Applicable Legislation / Other: Workplace Safety and Health Act W210 Manitoba Regulation 217/2006 • 2.1 Safe Work Procedures • 5 First Aid • 6 Personal Protective Equipment • 8 Musculoskeletal injuries • 12 Hearing Conservation and Noise Control • 20 Vehicular and Pedestrian Traffic • 22 Powered Mobile Equipment • 35 Workplace hazardous Materials Information Systems • 36 Chemical and Biological Substances	**Supervisor Responsibility** Supervisors are responsible to provide all staff with proper instruction, equipment, and tools. Supervisors are responsible to ensure that all safe work practices are followed. **Worker Responsibility** Follow Safe Work Procedure Wear appropriate PPE This Procedure will be reviewed any time the task, equipment, or materials change, or at a minimum every three years.

E15 Upstream Areas of Positive Samples

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
NE-01			74.26	78.48	42123.41	0
NE-01	*UNKNOWN	1994	1.22			
NE-01	*UNKNOWN	9999	3			
NE-01	AC	1965	2566.665	31725.973		75
NE-01	AC	1966	432.67			
NE-01	AC	1972	539.049			
NE-01	AC	1973	4228.165			
NE-01	AC	1974	8370.421			
NE-01	AC	1975	5462.671			
NE-01	AC	1976	6316.345			
NE-01	AC	1977	886.672			
NE-01	AC	1978	1099.319			
NE-01	AC	1979	1323.6			
NE-01	AC	1980	98.988			
NE-01	AC	1984	297.257			
NE-01	AC	1985	83.477			
NE-01	AC	1986	20.674			
NE-01	CI	1966	882.98	1735.584		4
NE-01	CI	1971	279.616			
NE-01	CI	1972	256.743			
NE-01	CI	1976	17.046			
NE-01	CI	1982	83.789			
NE-01	CI	9999	215.41			
NE-01	CU	1979	52.98	53.18		0
NE-01	CU	2009	0.2			
NE-01	DI	1971	635.141	977.533		2
NE-01	DI	1973	82.6			
NE-01	DI	1974	73.616			
NE-01	DI	1976	97.007			
NE-01	DI	1977	67.769			
NE-01	DI	1986	21.4			
NE-01	FRC	1979	214.91	387.298		1
NE-01	FRC	1981	172.388			
NE-01	PB	1980	87.59	87.59		0
NE-01	PVC	1979	782.867	7077.772		17
NE-01	PVC	1980	1869.797			
NE-01	PVC	1982	78.709			
NE-01	PVC	1983	201.859			
NE-01	PVC	1984	85.846			
NE-01	PVC	1985	746.727			
NE-01	PVC	1986	144.812			
NE-01	PVC	1990	183.319			
NE-01	PVC	1991	489.556			
NE-01	PVC	1994	207.486			
NE-01	PVC	1996	578.923			

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
NE-01	PVC	1997	320.894			
NE-01	PVC	1998	278.531			
NE-01	PVC	1999	2.403			
NE-01	PVC	2000	138.483			
NE-01	PVC	2001	3.8			
NE-01	PVC	2002	3			
NE-01	PVC	2004	213.8			
NE-01	PVC	2005	132.17			
NE-01	PVC	2006	94.27			
NE-01	PVC	2007	166.97			
NE-01	PVC	2010	34.06			
NE-01	PVC	2011	201.98			
NE-01	PVC	2012	2.2			
NE-01	PVC	2013	2.81			
NE-01	PVC	2014	1.8			
NE-01	PVC	9999	110.7			
SE-03	*UNKNOWN	9999	0.6	0.6	5902.753	0
SE-03	AC	1980	982.25	982.25		17
SE-03	CU	1987	89.25	272.511		5
SE-03	CU	1990	84.785			
SE-03	CU	1992	98.476			
SE-03	PVC	1987	2754.67	4647.392		79
SE-03	PVC	1990	65.502			
SE-03	PVC	1992	48.294			
SE-03	PVC	1994	186.33			
SE-03	PVC	1997	758.861			
SE-03	PVC	1999	831.935			
SE-03	PVC	2008	1.8			
SE-04		2002	105.15	170.046	17876.124	1
SE-04	*UNKNOWN	1988	64.896	2.83		0
SE-04	CONCRETE	1988	2.83	2.83		0
SE-04	CU	1987	267.586	1032.318		6
SE-04	CU	1988	87.959			
SE-04	CU	1992	75.235			
SE-04	CU	1998	285.598			
SE-04	CU	2002	71.5			
SE-04	CU	2003	160.1			
SE-04	CU	2005	84.34			
SE-04	DI	2006	7.63	7.63		0
SE-04	PVC	1987	5319.712	16659.57		93
SE-04	PVC	1988	1492.838			
SE-04	PVC	1989	955.312			
SE-04	PVC	1990	103.426			
SE-04	PVC	1992	37.206			

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
SE-04	PVC	1994	842.183			
SE-04	PVC	1996	293.746			
SE-04	PVC	1998	1051.048			
SE-04	PVC	1999	543.478			
SE-04	PVC	2000	1655.411			
SE-04	PVC	2001	657.36			
SE-04	PVC	2002	508.45			
SE-04	PVC	2003	992.46			
SE-04	PVC	2005	1954.83			
SE-04	PVC	2006	124.54			
SE-04	PVC	2008	0.8			
SE-04	PVC	9999	126.77			
SE-04	STEEL	1988	0.9	0.9		0
SE-07			26.006	8098.067	84441.439	10
SE-07	*UNKNOWN		27.22			
SE-07	*UNKNOWN	1962	1.227			
SE-07	*UNKNOWN	1968	62			
SE-07	*UNKNOWN	1970	6.112			
SE-07	*UNKNOWN	1971	39.839			
SE-07	*UNKNOWN	1972	71.151			
SE-07	*UNKNOWN	1973	145.135			
SE-07	*UNKNOWN	1974	3.33			
SE-07	*UNKNOWN	1975	218.502			
SE-07	*UNKNOWN	1976	732.892			
SE-07	*UNKNOWN	1977	772.638			
SE-07	*UNKNOWN	1978	426.273			
SE-07	*UNKNOWN	1979	4541.091			
SE-07	*UNKNOWN	1980	185.321			
SE-07	*UNKNOWN	1981	139.449			
SE-07	*UNKNOWN	1982	154.616			
SE-07	*UNKNOWN	1983	19.444			
SE-07	*UNKNOWN	1984	6.094			
SE-07	*UNKNOWN	1985	227.921			
SE-07	*UNKNOWN	1986	164.127			
SE-07	*UNKNOWN	1987	1.55			
SE-07	*UNKNOWN	1990	8.95			
SE-07	*UNKNOWN	1991	32.11			
SE-07	*UNKNOWN	2008	0.6			
SE-07	*UNKNOWN	2014	0.51			
SE-07	*UNKNOWN	9999	83.959			
SE-07	AC	1961	1557.765	24276.881		29
SE-07	AC	1962	306.02			
SE-07	AC	1965	148.87			
SE-07	AC	1967	730.756			

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
SE-07	AC	1971	385.603			
SE-07	AC	1972	1171.877			
SE-07	AC	1973	254.687			
SE-07	AC	1974	3181.028			
SE-07	AC	1975	1050.246			
SE-07	AC	1976	156.27			
SE-07	AC	1977	3047.49			
SE-07	AC	1978	957.644			
SE-07	AC	1979	4852.321			
SE-07	AC	1980	141.4			
SE-07	AC	1981	255.967			
SE-07	AC	1982	1629.387			
SE-07	AC	1983	1692.779			
SE-07	AC	1984	1114.709			
SE-07	AC	1985	785.973			
SE-07	AC	1987	273.951			
SE-07	AC	1989	256.137			
SE-07	AC	2007	0.64			
SE-07	AC	2014	0.5			
SE-07	AC	9999	324.861			
SE-07	CI	1961	14.84	1686.512		2
SE-07	CI	1965	35.828			
SE-07	CI	1967	235.616			
SE-07	CI	1968	399.81			
SE-07	CI	1969	49.493			
SE-07	CI	1970	260.068			
SE-07	CI	1971	1.548			
SE-07	CI	1972	177.53			
SE-07	CI	1973	39.182			
SE-07	CI	1974	17.525			
SE-07	CI	1975	170.08			
SE-07	CI	1985	29.931			
SE-07	CI	1988	113.63			
SE-07	CI	1992	2.181			
SE-07	CI	2002	61.55			
SE-07	CI	9999	77.7			
SE-07	CONCRETE	1959	2	2		
SE-07	CU	1982	62.15	1662.364		2
SE-07	CU	1983	40.07			
SE-07	CU	1985	82.771			
SE-07	CU	1987	512.833			
SE-07	CU	1988	190.624			
SE-07	CU	1989	72.01			
SE-07	CU	1991	267.276			
SE-07	CU	1993	173.97			

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
SE-07	CU	2001	84.23			
SE-07	CU	2004	176.43			
SE-07	DI	1971	55.53	834.236		1
SE-07	DI	1972	250.2			
SE-07	DI	1973	115.36			
SE-07	DI	1974	92.37			
SE-07	DI	1975	125.218			
SE-07	DI	1977	114.339			
SE-07	DI	1979	81.219			
SE-07	PVC	1980	3651.306	47818.303		57
SE-07	PVC	1981	1136.741			
SE-07	PVC	1982	417.231			
SE-07	PVC	1983	780.249			
SE-07	PVC	1984	2124.757			
SE-07	PVC	1985	2591.747			
SE-07	PVC	1986	3736.367			
SE-07	PVC	1987	7890.115			
SE-07	PVC	1988	3514.671			
SE-07	PVC	1989	1843.263			
SE-07	PVC	1990	1755.268			
SE-07	PVC	1991	1637.184			
SE-07	PVC	1992	1197.735			
SE-07	PVC	1993	2289.923			
SE-07	PVC	1994	4528.309			
SE-07	PVC	1995	1976.195			
SE-07	PVC	1996	1558.162			
SE-07	PVC	1997	910.222			
SE-07	PVC	1998	542.358			
SE-07	PVC	2000	259.06			
SE-07	PVC	2001	199.02			
SE-07	PVC	2002	1245.99			
SE-07	PVC	2003	137.3			
SE-07	PVC	2004	255.03			
SE-07	PVC	2005	66.58			
SE-07	PVC	2006	424.23			
SE-07	PVC	2007	249.16			
SE-07	PVC	2008	461.77			
SE-07	PVC	2009	2			
SE-07	PVC	2010	3.6			
SE-07	PVC	2011	347.2			
SE-07	PVC	2012	7.8			
SE-07	PVC	2013	24.1			
SE-07	PVC	2014	15.1			
SE-07	PVC	9999	38.56			
SE-07	STEEL	1960	10.316	63.076		0

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
SE-O7			29.8			
SE-O7		2002	21.57			
SE-O7		2006	1.39			
SW-07	*UNKNOWN	1960	1.5	1127.68	58018.86	2
SW-07	*UNKNOWN	1963	87.171			
SW-07	*UNKNOWN	1964	123.448			
SW-07	*UNKNOWN	1967	115.916			
SW-07	*UNKNOWN	1980	9.035			
SW-07	*UNKNOWN	1985	396.304			
SW-07	*UNKNOWN	1986	335.044			
SW-07	*UNKNOWN	2001	14.86			
SW-07	*UNKNOWN	9999	44.402			
SW-07	AC	1963	970.29	10008.743		17
SW-07	AC	1966	268.39			
SW-07	AC	1980	4602.766			
SW-07	AC	1981	598.616			
SW-07	AC	1982	2200.68			
SW-07	AC	1984	1198.227			
SW-07	AC	1988	54.403			
SW-07	AC	1989	78.081			
SW-07	AC	9999	37.29			
SW-07	CI	1962	168.99	1480.019		3
SW-07	CI	1963	352.734			
SW-07	CI	1964	958.295			
SW-07	CU	1986	170.803	1825.783		3
SW-07	CU	1987	139.829			
SW-07	CU	1989	254.475			
SW-07	CU	1999	183.931			
SW-07	CU	2000	89.265			
SW-07	CU	2001	184.04			
SW-07	CU	2002	713.41			
SW-07	CU	2003	90.03			
SW-07	DI	1981	59.007	126.667		0
SW-07	DI	1983	67.66			
SW-07	PB	1985	93.949	93.949		0
SW-07	PE	1985	110.589	126.409		0
SW-07	PE	2005	15.82			
SW-07	PVC		14.21	43229.61		75
SW-07	PVC	1975	353.6			
SW-07	PVC	1980	1.774			
SW-07	PVC	1984	1964.661			
SW-07	PVC	1985	4630.041			
SW-07	PVC	1986	2926.041			
SW-07	PVC	1987	4410.837			

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
SW-07	PVC	1988	2280.027			
SW-07	PVC	1989	3315.298			
SW-07	PVC	1990	1187.147			
SW-07	PVC	1991	1449.092			
SW-07	PVC	1992	1205.871			
SW-07	PVC	1993	291.238			
SW-07	PVC	1994	1415.977			
SW-07	PVC	1995	626.024			
SW-07	PVC	1997	5.433			
SW-07	PVC	1998	832.774			
SW-07	PVC	1999	2208.406			
SW-07	PVC	2000	626.288			
SW-07	PVC	2001	1593.86			
SW-07	PVC	2002	1943.55			
SW-07	PVC	2003	2014.37			
SW-07	PVC	2004	1859.5			
SW-07	PVC	2005	848.91			
SW-07	PVC	2006	1551.32			
SW-07	PVC	2007	517.6			
SW-07	PVC	2008	632.83			
SW-07	PVC	2009	4.98			
SW-07	PVC	2010	2492.1			
SW-07	PVC	2011	3.1			
SW-07	PVC	2012	6.8			
SW-07	PVC	2013	5.62			
SW-07	PVC	2014	1.49			
SW-07	PVC	9999	8.841			
SW-12			2.6	295.605	5826.486	5
SW-12	*UNKNOWN	1953	92.28			
SW-12	*UNKNOWN	1960	165.63			
SW-12	*UNKNOWN	1962	34.555			
SW-12	*UNKNOWN	2006	0.54			
SW-12	AC	1962	130.551	913.908		16
SW-12	AC	1963	601.29			
SW-12	AC	1977	66.417			
SW-12	AC	1980	115.65			
SW-12	CI	1962	1314.6	1567.418		27
SW-12	CI	9999	252.818			
SW-12	PVC		4.61	3049.555		52
SW-12	PVC	1980	6.887			
SW-12	PVC	1982	314.161			
SW-12	PVC	1983	1486.549			
SW-12	PVC	1985	96.855			
SW-12	PVC	1992	136.121			

UPSTREAM _AREA	MATERIAL	YEAR	Sum Of LENGTH	Total Sum of each material	Total Sum for each site	Material Percentages
SW-12	PVC	1994	53.744			
SW-12	PVC	1997	403.249			
SW-12	PVC	1998	29.839			
SW-12	PVC	2002	1.52			
SW-12	PVC	2006	7.04			
SW-12	PVC	2007	351.56			
SW-12	PVC	2010	141.82			
SW-12	PVC	2011	11.6			
SW-12	PVC	2012	4			