THE CITY OF WINNIPEG

TENDER

TENDER NO. 224-2020

HURST PUMPING STATION STRUCTURAL REPAIRS AND DRAINAGE BUILDING UPGRADES

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 HURST PUMPING STATION STRUCTURAL REPAIRS AND DRAINAGE BUILDING UPGRADES

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, July 23rd, 2020.

B2.2 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

B3.1 Further to C3.1, the Contract Administrator or an authorized representative will be available to provide Bidders access to the Site on the following days, at the indicated time and location:

(a) July 15th, 2020 from 9:00 a.m. to 11:00 a.m. at the Hurst Pumping Station – 60 Hurst Way, Winnipeg, MB.

(b) July 15th, 2020 from 1:00 p.m. to 3:00 p.m. at the Hurst Pumping Station – 60 Hurst Way, Winnipeg, MB.

B3.2 For each Site investigation session mentioned in B3.1 above, a maximum of 25 people will be allowed in total (including City, Contract Administrator, and Contractor personnel). Contractors are requested to send no more than two (2) representatives to the session they attend. The Contract Administrator will endeavor to register Contractors for the Site investigation at the time of their choice, however depending on the number of attendees, may request Contractors to choose an alternative Site investigation time.

B3.3 The Bidder is advised that Site access into facilities is restricted and Site viewing is limited. The City will provide access into facilities where the Work will be done.

B3.4 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation or is provided by the Contract Administrator in writing.

B3.5 Although attendance at the Site investigation is not mandatory, the City strongly suggests that the Bidder attend.

B3.6 The Bidder is required to register for the Site investigation at least forty-eight (48) hours in advance by contacting the Contract Administrator identified in D5.1.

B3.7 Bidders registered for the Site investigation must provide the Contract Administrator identified in D5.1 with a Public Safety Verification check obtained not earlier than one (1) year prior to the Site investigation.

(a) The Public Safety Verification check can be obtained from Sterling BackCheck. Bidders will need to setup a Sterling BackCheck account prior to requesting individual background checks. This process should be done seventy-two (72) hours prior to requesting the first check. The account can be setup using the following link:

https://forms.sterlingbackcheck.com/partners/platform2-en.php?&partner=winnipegcity

Note that the check will take up to forty eight (48) hours to complete. Refer to PART F - Security Clearance for further information.

(b) The results of the Public Safety Verification Check must be received by the City directly through Sterling Talen Solutions. Bidders must set up an account with Sterling Talent Solutions under their company name and grant Sterling Talent Solutions permission to share the results of the Public Safety Verification Check with the City of Winnipeg.

(c) A Police Information Check is not required for the Site investigation.

B3.8 CSA approved safety footwear are required for all personnel attending the Site investigation.

B3.9 Bidders will not be allowed to take pictures at the Site investigation. The Bidder may request pictures of specific areas from the Contract Administrator. The pictures will be then issued as an addendum.

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D5.1.

B4.2 If the Bidder finds errors, discrepancies, or omissions in the Tender, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy, or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.

B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Tender will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Tender will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

B4.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B5. CONFIDENTIALITY

B5.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:

(a) was known to the Bidder before receipt hereof; or

(b) becomes publicly known other than through the Bidder; or

(c) is disclosed pursuant to the requirements of a governmental authority or judicial order.

B5.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Tender to the media or any member of the public without the prior written authorization of the Contract Administrator.

B6. ADDENDA

B6.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies, or omissions in the Tender, or clarifying the meaning or intent of any provision therein.

B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline or provide at least two (2) Business Days by extending the Submission Deadline.

B6.3 Addenda will be available on the on the MERX website at www.merx.com.

B6.4 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B6.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B6.6 Notwithstanding B4, enquiries related to an addendum may be directed to the Contract Administrator indicated in D5.1.

B7. SUBSTITUTES

B7.1 The Work is based on the Plant, Materials, and methods specified in the Tender.

B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:

(a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material, or method as either an approved equal or alternative;

(b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;

(c) identify any anticipated cost or time savings that may be associated with the substitute;

(d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified, and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;

(e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified, and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.

B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

B7.6.1 The Contract Administrator will issue an addendum, disclosing the approved materials, equipment, methods, and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but

may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B18.

B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

B8.1 The Bid shall consist of the following components:

(a) Form A: Bid/Proposal;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond.

B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.

B8.3 All components of the Bid shall be fully completed or provided and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.

B8.4 The Bid shall be submitted electronically through MERX at www.merx.com

B8.4.1 Bids will **only** be accepted electronically through MERX.

B8.5 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B18.1(a).

B9. BID

B9.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.

B9.2 Paragraph 2 of Form A: Bid/Proposal shall be completed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;

(b) if the Bidder is a partnership, the full name of the partnership shall be inserted;

(c) if the Bidder is a corporation, the full name of the corporation shall be inserted;

(d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B9.2.1 If a Bid is submitted jointly by two (2) or more persons, each and all such persons shall identify themselves in accordance with B9.2.

B9.3 In Paragraph 3 of Form A: Bid/Proposal, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B9.4 Paragraph 13 of Form A: Bid/Proposal shall be signed in accordance with the following requirements:

(a) if the Bidder is a sole proprietor carrying on business in his/her own name, it shall be signed by the Bidder;

(b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;

(c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers;

(d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B9.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.

B9.5 If a Bid is submitted jointly by two (2) or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B10.1.1 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in D28. Any such costs shall be determined in accordance with D28.

B10.2 The Bidder shall state a price in Canadian funds for each of the following items of Work on Form B: Prices:

(a) “Item No. 16 – Structural / Architectural Trade – Exterior Pre-Cast Concrete Cladding Repairs - Hurst Pumping Station” shall be the amount to be deducted from the amount (extended price) if the exterior pre-cast concrete cladding repairs at the Hurst Pumping Station is removed from the Contract scope of Work in accordance with Drawings 1-0650M-S0009-001 and 1-0650M-S0010-001;

(b) “Item No. 15 – Structural / Architectural Trade – Safety Railing (Guardrail) Upgrades - Hurst Pumping Station” shall be the amount to be deducted from the amount (extended price) if the safety railing (guardrail) upgrades at the Hurst Pumping Station is removed from the Contract scope of Work in accordance with Drawings 1-0650M-S0004-001 and 1-0650M-S0011-001.

(c) “Item No. 22 – Cash Allowance for Additional Work” shall be the amount to be deducted from the amount (extended price) if the Cash Allowance for Additional Work is removed from the Contract scope of Work.

B10.3 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.

B10.4 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

B10.5 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B10.6 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B10.6.1 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B11. DISCLOSURE

B11.1 Various Persons provided information or services with respect to this Work. In the City’s opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B11.2 The Persons are:

(a) Able Crane Services Ltd.

(b) AECOM Canada Ltd.

(c) WSP Canada Inc.

(d) Dillon Consulting Ltd.

B11.3 Additional Material:

(a) Lifting Plan included in the Pipe Loading Assessment included in Appendix C.

(b) Reports prepared by AECOM, WSP, and Dillon:

(i) Hurst Pumping Station Structural Repairs – Preliminary Design (AECOM, 2012)

(ii) Hurst Pumping Station Rooftop Equipment Relocation (AECOM, 2014)

(iii) Hurst Drainage Station Feasibility Report (WSP, 2017)

(iv) Short Term Recommendations for Gas Chlorine Facilities (Dillon, 2018)

B12. CONFLICT OF INTEREST AND GOOD FAITH

B12.1 Further to C3.2, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.

B12.2 Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:

(a) other commitments;

(b) relationships;

(c) financial interests; or

(d) involvement in ongoing litigation;

that could or would be seen to:

(i) exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or

(ii) compromise, impair, or be incompatible with the effective performance of a Bidder's obligations under the Contract;

(e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of its participation in the Tender process or the Work; or

(f) has knowledge of confidential information (other than confidential information disclosed by the City in the normal course of the Tender process) of strategic and/or material relevance to the Tender process or to the Work that is not available to other Bidders and that could or would be seen to give that Bidder an unfair competitive advantage.

B12.3 In connection with its Bid, each entity identified in B12.2 shall:

(a) avoid any perceived, potential, or actual Conflict of Interest in relation to the procurement process and the Work;

(b) upon discovering any perceived, potential, or actual Conflict of Interest at any time during the Tender process, promptly disclose a detailed description of the Conflict of Interest to the City in a written statement to the Contract Administrator; and

(c) provide the City with the proposed means to avoid or mitigate, to the greatest extent practicable, any perceived, potential or actual Conflict of Interest and shall submit any additional information to the City that the City considers necessary to properly assess the perceived, potential or actual Conflict of Interest.

B12.4 Without limiting B12.3, the City may, in its sole discretion, waive any and all perceived, potential or actual Conflicts of Interest. The City's waiver may be based upon such terms and conditions as the City, in its sole discretion, requires to satisfy itself that the Conflict of Interest has been appropriately avoided or mitigated, including requiring the Bidder to put into place such policies, procedures, measures and other safeguards as may be required by and be acceptable to the City, in its sole discretion, to avoid or mitigate the impact of such Conflict of Interest.

B12.5 Without limiting B12.3, and in addition to all contractual or other rights or rights at law or in equity or legislation that may be available to the City, the City may, in its sole discretion:

(a) disqualify a Bidder that fails to disclose a perceived, potential, or actual Conflict of Interest of the Bidder or any of its employees proposed for the Work;

(b) require the removal or replacement of any employees proposed for the Work that has a perceived, actual, or potential Conflict of Interest that the City, in its sole discretion, determines cannot be avoided or mitigated;

(c) disqualify a Bidder or employees proposed for the Work that fails to comply with any requirements prescribed by the City pursuant to B12.4 to avoid or mitigate a Conflict of Interest; and

(d) disqualify a Bidder if the Bidder, or one of its employees proposed for the Work, has a perceived, potential, or actual Conflict of Interest that, in the City's sole discretion, cannot be avoided or mitigated, or otherwise resolved.

B12.6 The final determination of whether a perceived, potential, or actual Conflict of Interest exists shall be made by the City, in its sole discretion.

B13. QUALIFICATION

B13.1 The Bidder shall:

(a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed, or permitted by law to carry on business in Manitoba; and

(b) be financially capable of carrying out the terms of the Contract; and

(c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.

B13.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

(a) be responsible and not be suspended, debarred, or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

B13.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

(a) have successfully carried out work similar in nature, scope, and value to the Work; and

(b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and

(c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);

(d) have a Licenced Electrical Contractor and a M-Prime Licenced Mechanical Contractor as defined in D4; and

(e) ensure that all personnel working at the Site have security clearances as described in PART F - Security Clearance that have been reviewed and accepted by the City.

B13.4 Further to B13.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

(a) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) in the form of:

(i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/.

B13.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B13.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B14. BID SECURITY

B14.1 The Bidder shall include in its Bid Submission bid security in the form of a digital bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in Form G1: Bid Bond and Agreement to Bond, available on The City of Winnipeg, Corporate Finance, Materials Management Division website at https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf.

B14.2 Bid security shall be submitted in a digital format meeting the following criteria:

(a) The version submitted by the Bidder must have valid digital signatures and seals;

(b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) The version submitted must be viewable, printable, and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) The results of the verification must provide a clear, immediate, and printable indication of pass or fail regarding B14.2(b).

B14.3 Bonds failing the verification process will not be considered to be valid and the Bid shall be determined to be non-responsive in accordance with B18.1(a).

B14.4 Bonds passing the verification process will be treated as original and authentic.

B14.4.1 If the Bidder submits alternative Bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B14.5 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B14.6 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Tender.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

B15.1 Bids will not be opened publicly.

B15.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated and pending review and verification of conformance with requirements) will be available on the MERX website at www.merx.com.

B15.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.

B15.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).

B15.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

B16. IRREVOCABLE BID

B16.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B16.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly formed and the contract securities have been furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B17. WITHDRAWAL OF BIDS

B17.1 A Bidder may withdraw his/her Bid without penalty prior to the Submission Deadline.

B18. EVALUATION OF BIDS

B18.1 Award of the Contract shall be based on the following bid evaluation criteria:

(a) compliance by the Bidder with the requirements of the Tender, or acceptable deviation there from (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B13 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B7.

B18.2 Further to B18.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations, or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.

B18.3 Further to B18.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is qualified.

B18.4 Further to B18.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices adjusted, if necessary, as follows:

(a) if the lowest evaluated responsive Bid submitted by a responsible and qualified Bidder is within the budgetary provision for the Work, no adjustment will be made to the Total Bid Price; or

(b) if the lowest evaluated responsive Bid submitted by a responsible and qualified Bidder exceeds the budgetary provision for the Work, the Total Bid Price of all responsive Bids submitted by responsible and qualified Bidders will be adjusted by progressively deducting prices in the order listed in B10.2 until a Total Bid Price within the budgetary provision is achieved, i.e., Total Bid Price = Total Bid Price – (Item No. 16) – (Item No. 15) – (Item No. 22).

B18.4.1 Further to B18.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B18.4.2 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B19. AWARD OF CONTRACT

B19.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B19.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be qualified, and the Bids are determined to be responsive.

B19.2.1 Without limiting the generality of B19.2, the City will have no obligation to award a Contract where:

(a) the prices exceed the available City funds for the Work;

(b) the prices are materially in excess of the prices received for similar work in the past;

(c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;

(d) only one Bid is received; or

(e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

B19.3 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D28 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.

B19.4 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B18.

B19.4.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

C0.1 The *General Conditions for Construction* (Revision 2020-01-31) are applicable to the Work of the Contract.

C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

C0.2 A reference in the Tender to a section, clause or subclause with the prefix "**C**" designates a section, clause, or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

D1.1 In addition to the *General Conditions for Construction*, these Supplemental Conditions are applicable to the Work of the Contract.

D2. FORM OF CONTRACT DOCUMENTS

D2.1 Notwithstanding C4.1(c) and C4.4, the Contract Documents will be provided to the Contractor electronically and there will be no requirement for execution and return to the City by the Contractor. Accordingly, the provisions under C4.4(a) and C4.4(b) are no longer applicable.

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of building and Site improvements at both the Hurst Pumping Station and at the Drainage Lift Station, both located within the same site limits.

D3.2 The major components of the Work are as follows:

(a) Mobilization and demobilization;

(b) Replacement of roofing on the original 1969 Hurst Pumping Station and 1993 building addition;

(c) Mitigation of sloughing soils and water infiltration into the Hurst Pumping Station crawlspace;

(d) Modification of the mechanical and electrical components within the Hurst Pumping Station including the Chlorine, Chlorine Storage, and Chlorinator Rooms;

(e) Remediation of surface drainage problems around the Hurst Pumping Station;

(f) Encapsulation of the existing cork insulation within the Hurst Pumping Station;

(g) Removal of asbestos ceiling tiles within the Hurst Pumping Station;

(h) Localized repairs to the Hurst Pumping Station's exterior pre-cast concrete cladding;

(i) Provision of new guardrails on the mezzanine level and roof level of the Hurst Pumping Station;

(j) Upgrades to the mechanical and electrical systems for the Drainage Lift Station;

(k) Miscellaneous structural/architectural upgrades for the Hurst Pumping Station and Drainage Lift Station;

(l) For details, refer to Drawings and Technical Specifications.

D3.3 The following shall apply to the Work:

(a) City of Winnipeg Green Building Policy: New City-Owned Buildings and major additions;
http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=5989

(b) Universal Design Policy;
http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=3604

(c) City of Winnipeg Water & Waste Department Identification Standard; and
https://winnipeg.ca/waterandwaste/pdfs/dept/IdentificationStandard.pdf

(d) City of Winnipeg Water & Waste Department Electrical Design Guide.
https://winnipeg.ca/waterandwaste/pdfs/dept/ElectricalDesignGuide.pdf

D3.4 The pre-bid estimate for this work is $2,009,000.00 (including MRST).

D4. DEFINITIONS

D4.1 When used in this Tender:

(a) "**Authority Having Jurisdiction**" or **"AHJ"** means an organization, office, or individual responsible for enforcing the requirements of a code, standard, or by-law, or for approving equipment, materials, and installation or a procedure, which is typically in reference to the local inspection authority;

(b) "**As-Built**" means an accurate and complete record of the construction Work undertaken by the Contractor, resulting in adjustments and markups made to the construction set of documents;

(c) "**Certificate of Final Inspection**" means the certificate of final inspections, obtained from the City of Winnipeg inspections department;

(d) "**Code**" or "code" means the latest local code applicable at the project location;

(e) "**C.P.M.**" means critical path method;

(f) "**Conflict of Interest**" is as defined in B12.2;

(g) "**CSA**" means Canadian Standards Association;

(h) "**HVAC**" means Heating, Ventilation and Air Conditioning;

(i) "**Licenced Electrical Contractor**" means an individual meeting the requirements of the Manitoba Electricians' Licence Act (C.C.S.M. c E50) and the Manitoba Electricians' Licensing Regulation (186-87 R);

(j) "**Licenced Mechanical Contractor**" means a M-Prime contractor licensed by the City. M-Prime contractors may obtain permits for any work on HVAC systems, hazardous process systems, or fire protection systems where the work is to be performed by a M1 licenced contractor and/or a M2 licenced contractor;

(k) "**PDF**" means Portable Document Format;

(l) "**provide**" means to supply, install, and leave in working order all materials and necessary equipment, wiring, supports, access panels, etc., as necessary for item or system indicated;

(m) "**Record Drawing**" means an accurate and complete record of the construction Work undertaken by the Contractor, and prepared by the reviewing professional after verifying in detail the actual conditions of the completed project as a result of adjustments and markups made to the construction set of documents. The drawings shall bear the seal of the responsible professional;

(n) "**Standard**" or "standard" means the latest standard that is in effect at the project location;

(o) "**Total Bid Price**" means the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices;

(p) "**Wilkes Reservoir**" means the Wilkes Reservoir facility generally defined as the area within the perimeter security fencing bound as follows:

(i) Hurst Way to the north;

(ii) Hurst Way to the east;

(iii) Wilson Place / Edderton Avenue to the south;

(iv) The Winnipeg Soccer Complex to the west.

D5. CONTRACT ADMINISTRATOR

D5.1 The Contract Administrator is Kontzamanis Graumann Smith MacMillan Inc. dba KGS Group, represented by:

Lunide Milius-Alphonse, M.Sc., P.Eng.
Structural Engineer and Project Manager
Telephone No. 204-896-1209
Email Address Lunidemilius-alphonse@kgsgroup.com

D5.2 At the pre-construction meeting, Lunide Milius-Alphonse will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D6. CONTRACTOR'S SUPERVISOR

D6.1 At the pre-construction meeting, the Contractor shall identify his/her designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D7. NOTICES

D7.1 Except as provided for in C22.4, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents, or other communications to the Contractor shall be sent to the facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid/Proposal.

D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents, or other communications to the City, except as expressly otherwise required in D7.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D5.1.

D7.3 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents, or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services
Facsimile No.: 204-947-9155

D8. FURNISHING OF DOCUMENTS

D8.1 Upon award of the Contract, the Contractor will be provided with ‘issued for construction’ Contract Documents electronically, including Drawings in PDF formal only.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

D9.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed, or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D10. SAFE WORK PLAN

D10.1 The Contractor shall attend a general Site awareness orientation at the Hurst Pumping Station prior to developing their Safe Work Plan. The orientation will be approximately one (1) hour in length and will include an overview of the facility, potential hazards present, warning systems, and site muster point. The Contractor shall ensure that all people performing Work at Site are aware of the requirements of the general site awareness orientation and the requirements are incorporated into their Safe Work Plan.

D10.2 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Document, if applicable.

D10.3 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D10.4 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

D11.1 The Contractor shall provide and maintain the following insurance coverage :

(a) wrap up liability insurance in the amount of at least two million dollars ($2,000,000) inclusive, written in the name of the Contractor, Subcontractors, consultants, subconsultants and the City. Such policy to include coverage for damage to existing structures, cross-liability clause, contractual liability, unlicensed motor vehicle liability, non-owned automobile liability products and completed operations and if available provide coverage for asbestos abatement and pollution liability. If a crane is to be used in the connection of the work, then evidence of riggers/hook liability will be required. Wrap Up Liability to include 24 months completed operations endorsement which will take effect after Total Performance.

(b) if applicable, Automobile Liability Insurance covering all motor vehicles, owned, and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than $2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.

(c) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, including testing and commissioning, written in the name of the Contractor, Subcontractors, and the City, at all times during the performance of the Work and until the date of Substantial Performance.

D11.2 If there is no coverage under the Wrap Up Liability policy for asbestos abatement, then the contractor or subcontractor involved in the asbestos abatement is to provide evidence of the following in addition to D11.1 (b)

(a) Commercial general liability insurance in the amount of at least $2,000,000 with the City to be added as an additional insured. Such policy to include cross liability clause, contractual liability, non-owned automobile liability and products and completed operations endorsement.

(b) Contractors pollution liability in the amount of at least $1,000,000 per occurrence with confirmation that coverage includes asbestos abatement, clean-ups costs and transported cargo.

D11.3 Deductibles shall be borne by the Contractor.

D11.4 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D11.5 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D11.6 All policies shall be taken out with insurers licensed to carry on business in the Province of Manitoba.

D12. CONTRACT SECURITY

D12.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond until the expiration of the warranty period in the form of:

(a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; and

(b) a labour and material payment bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H2: Labour and Material Payment Bond), in an amount equal to fifty percent (50%) of the Contract Price.

D12.2 The Contractor shall provide the City Solicitor with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D12.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:

(a) give the Subcontractor written notice of the existence of the labour and material payment bond in D12.1(b); and

(b) post a notice of the bond and/or a copy of that bond in a conspicuous location at the Site of the Work.

D13. SUBCONTRACTOR LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D14. DETAILED WORK SCHEDULE

D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, as applicable.

D14.2 The detailed work schedule shall consist of the following:

(a) a critical path method (C.P.M.) schedule for the Work;

(b) a Gantt chart for the Work based on the C.P.M. schedule; and

(c) a daily manpower schedule for the Work.

All shall be reviewed by and shall be acceptable to the Contract Administrator. The Contractor shall make all requested changes to the documents as required by the Contract Administrator and re-submit as needed prior to executing the Work.

D14.3 Further to D14,2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path.

(a) Mobilization and demobilization;

(b) Roof demolition and replacement work;

(c) Mechanical work within the Hurst Pumping Station;

(d) Mechanical work within the Drainage Lift Station;

(e) Electrical and Instrumentation work within the Hurst Pumping Station;

(f) Electrical and Instrumentation work associated with the Drainage Lift Station;

(g) Mitigation of sloughing soils and water infiltration into the Hurst Pumping Station crawlspace;

(h) Remediation of surface drainage problems around the Hurst Pumping Station;

(i) Encapsulation of the existing cork insulation within the Hurst Pumping Station;

(j) Removal of asbestos ceiling tiles within the Hurst Pumping Station;

(k) Localized repairs to the Hurst Pumping Station's exterior pre-cast concrete cladding;

(l) Provision of new guardrail on the mezzanine level and roof level of the Hurst Pumping Station;

(m) Miscellaneous structural/architectural upgrades in the Hurst Pumping Station;

(n) Miscellaneous structural/architectural upgrades in the Drainage Lift Station;

(o) Equipment start-up;

(p) Commissioning;

(q) Training;

(r) Submission of operation and maintenance manuals and As-Built Drawings;

(s) Substantial Performance;

(t) Total Performance.

D14.4 Further to D14.2(b), the Gantt chart shall show the time, on a weekly basis, required to carry out the Work of each trade or Specification division. The time shall be on the horizontal axis and the type of trade shall be on the vertical axis.

D14.5 Further to D14.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

SCHEDULE OF WORK

D15. COMMENCEMENT

D15.1 The Contractor shall not commence any Work until he/she is in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

D15.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:

(i) evidence of authority to carry on business specified in D9;

(ii) evidence of the workers compensation coverage specified in C6.15;

(iii) the Safe Work Plan specified in D10;

(iv) evidence of the insurance specified in D11;

(v) the contract security specified in D12;

(vi) the Subcontractor list specified in D13;

(vii) the detailed work schedule specified in D14;

(viii) all completed Police Information Checks and Public Safety Verifications as specified in PART F - Security Clearance.

(b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.

D15.3 The City intends to award this Contract by September 3, 2020.

D15.3.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D16. RESTRICTED WORK HOURS

D16.1 The Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 20:00 hours and 07:00 hours, or on Saturdays, Sundays, Statutory Holidays, and or the Civic Holidays.

D17. DAMAGE TO EXISTING STRUCTURE AND PROPERTY

D17.1 Special care shall be taken to avoid damage to the existing structures and properties during the course of the Work.

D17.2 Any damage caused by the Contractor or his Subcontractors to any part of the Hurst Pumping Station or Drainage Lift Station or to the adjacent structures of properties shall be promptly repaired by the Contractor as his own expense to the satisfaction of the Contract Administrator. Prior to Total Performance of the Project, the Contractor, the City, and the Contract Administrator will ensure that the Site has been restored to its pre-construction state. Any remaining damage shall be repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

D18. CRITICAL STAGES

D18.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Roofing work – November 7th, 2020 if roofing work is conducted in 2020 or June 1, 2021 if roofing work is conducted in 2021.

(b) All work associated with the Drainage Lift Station – February 1st, 2021.

D19. SUBSTANTIAL PERFORMANCE

D19.1 The Contractor shall achieve Substantial Performance by June 1st, 2021.

D19.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend, and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D19.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D20. TOTAL PERFORMANCE

D20.1 The Contractor shall achieve Total Performance by July 1st, 2021.

D20.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend, and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D20.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D21. LIQUIDATED DAMAGES

D21.1 If the Contractor fails to achieve critical stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

(a) Roofing work – five hundred dollars ($500);

(b) All work associated with the Drainage Lift Station – five hundred dollars ($500);

(c) Roofing work and Substantial Performance – five hundred dollars ($500);

(d) Substantial Performance – five hundred dollars ($500);

(e) Total Performance – five hundred dollars ($500);

(f) Roofing work, Substantial Performance, and Total Performance five hundred dollars ($500);

(g) Substantial Performance and Total Performance – five hundred dollars ($500).

D21.2 The amounts specified for liquidated damages in D21.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance, or Total Performance by the days fixed herein for same.

D21.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D22. COVID-19 SCHEDULE DELAYS

D22.1 The City acknowledges that the schedule for this Contract may be impacted by the COVID-19 pandemic. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the health and safety of workers and the public and directives from health authorities and various levels of government, and in close consultation with the Contract Administrator.

D22.2 If the Contractor is delayed in the performance of the Work by reason of the COVID-19 pandemic, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.

D22.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether COVID-19 will affect the start date. If the Contractor declares that COVID-19 will affect the start date, the Contractor shall provide sufficient evidence that the delay is directly related to COVID-19, including but not limited to evidence related to availability of staff, availability of Material, or work by others.

D22.4 For any delay related to COVID-19 and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D22.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D22.5 The Work schedule, including the durations identified in D18 to D20 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be

made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.

D22.6 Where Work not previously identified is being carried over solely as a result of delays related to COVID-19, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work is a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to COVID-19, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D22.7 Any time or cost implications as a result of COVID-19 and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

CONTROL OF WORK

D23. JOB MEETINGS

D23.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City, and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City, and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D23.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D23.3 The Contract Administrator will record meeting minutes and distribute to team members.

D24. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D24.1 Further to C6.26, the Contractor shall be the Prime Contractor and shall serve as and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D25. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D25.1 Further to B13.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B13.4.

D26. PAYMENT

D26.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D27. WARRANTY

D27.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) year thereafter, except where longer warranty periods are specified in the respective Specification sections and below, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D27.1.1 For the purpose of contract security, the warranty period shall be one (1) year.

D27.2 The membrane manufacturer will issue a written document in the City's name, valid for a minimum 15 year period, saying that it will repair any leaks in the roofing membrane to restore the roofing system to a dry and watertight condition, to the extent that the membrane manufacturing or defects caused the infiltration. The warranty must cover the entire cost of the repair(s) during the entire warranty period. The warranty must be transferrable, at no extra cost to subsequent building owners. The Contractor will issue a written and signed document in the City's name, certifying that the work executed will remain in place and free of workmanship defect for a period of two (2) years, starting from the date of Total Performance and/or the early start date of the warranty as per D27.3. The warranty certificate must reflect this requirement.

D27.3 Notwithstanding C13.2, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

D27.3.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

THIRD PARTY AGREEMENTS

D28. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D28.1 In the event that funding for the Work of the Contract is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, the following terms and conditions shall apply, as required by the applicable funding agreements.

D28.2 Further to D28.1, in the event that the obligations in D28 apply, actual costs legitimately incurred by the Contractor as a direct result of these obligations ("Funding Costs") shall be determined by the actual cost to the Contractor and not by the valuation method(s) outlined in C7.4. In all other respects Funding Costs will be processed in accordance with Changes in Work under C7.

D28.3 For the purposes of D28:

(a) **"Government of Canada"** includes the authorized officials, auditors, and representatives of the Government of Canada; and

(b) **"Government of Manitoba"** includes the authorized officials, auditors, and representatives of the Government of Manitoba.

D28.4 Modified Insurance Requirements

D28.4.1 If not already required under the insurance requirements identified in D11, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars ($2,000,000) inclusive per occurrence. Such policy will be written in the joint names of the City, Contractor, Consultants and all sub-contractors and sub-consultants and include twelve (12) months completed operations. The Government of Manitoba and its Ministers, officers, employees, and agents shall be added as additional insureds.

D28.4.2 If not already required under the insurance requirements identified in D11, the Contractor will be required to provide builders' risk insurance (including boiler and machinery insurance, as applicable) providing all risks coverage at full replacement cost, or such lower level of insurance that the City may identify on a case-by-case basis, such as an installation floater.

D28.4.3 The Contractor shall obtain and maintain third party liability insurance with minimum coverage of two million dollars ($2,000,000.00) per occurrence on all licensed vehicles operated at the Site. In the event that this requirement conflicts with another licensed vehicle insurance requirement in this Contract, then the requirement that provides the higher level of insurance shall apply.

D28.4.4 Further to D11.4, insurers shall provide satisfactory Certificates of Insurance to the Government of Manitoba prior to commencement of Work as written evidence of the insurance required. The Certificates of Insurance must provide for a minimum of thirty (30) days' prior written notice to the Government of Manitoba in case of insurance cancellation.

D28.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D28.5 Indemnification by Contractor

D28.5.1 In addition to the indemnity obligations outlined in C17 of the General Conditions for Construction, the Contractor agrees to indemnify and save harmless the Government of Canada and the Government of Manitoba and each of their respective Ministers, officers, servants, employees, and agents from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from this Contract or the Work, or from the goods or services provided or required to be provided by the Contractor, except those resulting from the negligence of any of the Government of Canada's or the Government of Manitoba's Ministers, officers, servants, employees, or agents, as the case may be.

D28.6 Records Retention and Audits

D28.6.1 The Contractor shall maintain and preserve accurate and complete records in respect of this Contract and the Work, including all accounting records, financial documents, copies of contracts with other parties and other records relating to this Contract and the Work during the term of the Contract and for at least six (6) years after Total Performance. Those records bearing original signatures or professional seals or stamps must be preserved in paper form; other records may be retained in electronic form.

D28.6.2 In addition to the record keeping and inspection obligations outlined in C6 of the General Conditions for Construction, the Contractor shall keep available for inspection and audit at all reasonable times while this Contract is in effect and until at least six (6) years after Total Performance, all records, documents, and contracts referred to in D28.6.1 for inspection, copying and audit by the City of Winnipeg, the Government of Manitoba and/or the Government of Canada and their respective representatives and auditors, and to produce them on demand; to provide reasonable facilities for such inspections, copying and audits, to provide copies of and extracts from such records, documents, or contracts upon request by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada and their respective representatives and auditors, and to promptly provide such other information and explanations as may be reasonably requested by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada from time-to-time.

D28.7 Other Obligations

D28.7.1 The Contractor consents to the City providing a copy of the Contract Documents to the Government of Manitoba and/or the Government of Canada upon request from either entity.

D28.7.2 If the Lobbyists Registration Act (Manitoba) applies to the Contractor, the Contractor represents and warrants that it has filed a return and is registered and in full compliance with the obligations of that Act, and covenants that it will continue to comply for the duration of this Contract.

D28.7.3 The Contractor shall comply with all applicable legislation and standards, whether federal, provincial, or municipal, including (without limitation) labour, environmental, and human rights laws, in the course of providing the Work.

D28.7.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
(hereinafter called the "Principal"), and

_____ ,
(hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), in the sum of

_____

_____ dollars ($_____.____)

of lawful money of Canada to be paid to the Obligee, or its successors or assigns, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee for

TENDER NO. 224-2020

HURST PUMPING STATION STRUCTURAL REPAIRS AND DRAINAGE BUILDING UPGRADES

which is by reference made part hereof and is hereinafter referred to as the “Contract”.

NOW THEREFORE the condition of the above obligation is such that if the Principal shall:

(a) carry out and perform the Contract and every part thereof in the manner and within the times set forth in the Contract and in accordance with the terms and conditions specified in the Contract;
(b) perform the Work in a good, proper, workmanlike manner;
(c) make all the payments whether to the Obligee or to others as therein provided;
(d) in every other respect comply with the conditions and perform the covenants contained in the Contract; and
(e) indemnify and save harmless the Obligee against and from all loss, costs, damages, claims, and demands of every description as set forth in the Contract, and from all penalties, assessments, claims, actions for loss, damages or compensation whether arising under "The Workers Compensation Act", or any other Act or otherwise arising out of or in any way connected with the performance or non-performance of the Contract or any part thereof during the term of the Contract and the warranty period provided for therein;

THEN THIS OBLIGATION SHALL BE VOID, but otherwise shall remain in full force and effect. The Surety shall not, however, be liable for a greater sum than the sum specified above.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable as Principal, and that nothing of any kind or matter whatsoever that will not discharge the Principal shall operate as a discharge or release of liability of the Surety, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

IN WITNESS WHEREOF the Principal and Surety have signed and sealed this bond the

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

FORM H2: LABOUR AND MATERIAL PAYMENT BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Principal"), and

_____ ,
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), for the use and benefit of claimants as herein below defined, in the amount of

_____

_____ dollars ($_____.____)

of lawful money of Canada, for the payment whereof we, the Principal and the Surety jointly and severally bind ourselves firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee for

TENDER NO. 224-2020

HURST PUMPING STATION STRUCTURAL REPAIRS AND DRAINAGE BUILDING UPGRADES

which is by reference made part hereof and is hereinafter referred to as the “Contract”.

NOW THEREFORE the condition of the above obligation is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labour, service and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(a) A claimant is defined as one having a direct contract with the Principal for labour, service and material, or any of them, used or reasonably required for use in the performance of the contract, labour, service and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment (but excluding rent of equipment where the rent pursuant to an agreement is to be applied towards the purchase price thereof) directly applicable to the Contract;

(b) The above-named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant’s work, labour or service was done or performed, or materials were furnished by such claimant, may sue on this bond, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon;

(c) No suit or action shall be commenced hereunder by any claimant

    (i) unless claimant shall have given written notice to the Principal and the Surety above-named, within one hundred and twenty (120) days after such claimant did or performed the last of the work, labour or service, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work, labour or service was done or performed. Such notice shall be served by mailing the same by registered mail to the Principal, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the Province of Manitoba;

(ii) after the expiration of one (1) year following the date on which Principal ceased work on said Contract; including work performed under the guarantees provided in the Contract;

(iii) other than in a court of competent jurisdiction in the Province of Manitoba.

(d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

(e) The Surety shall not be liable for a greater sum than the specified penalty of this bond.

The Principal and Surety hereby agree that The Guarantors' Liability Act (Manitoba) shall apply to this Bond.

IN TESTIMONY WHEREOF, the Principal has hereunto set its hand affixed its seal, and the Surety has caused these presents to be sealed and with its corporate seal duly attested by the authorized signature of its signing authority this

_____ day of _____ , 20____ .

SIGNED AND SEALED
in the presence of:

_____
(Witness as to Principal if no seal)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

FORM J: SUBCONTRACTOR LIST
(See D13)

HURST PUMPING STATION STRUCTURAL REPAIRS AND DRAINAGE BUILDING UPGRADES

Name	Address

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Spec/Default.stm

E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.2.3 Further to C2.4(d), Specifications included in the Tender shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B7. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B7.

E1.4 The following are applicable to the Work:

Specification No.	Specification Title
NMS SPECIFICATIONS	
DIVISION 01 –	**GENERAL REQUIREMENTS**
013300	Submittal Procedures
013526.06	Health and Safety Requirements
014500	Quality Control
015200	Construction Facilities
015600	Temporary Barriers and Enclosures
017411	Cleaning
017800	Closeout Submittals
019131	Commissioning (Cx) Plan
019133	Commissioning Forms
019141	Commissioning Training
DIVISION 02 –	**EXISTING CONDITIONS**
024199	Demolition for Minor Works
028210	Asbestos Abatement – General Provisions
028211	Asbestos Abatement – Type 1
028310	Lead-Based Abatement – Minimum Precautions
DIVISION 03 –	**CONCRETE**
031000	Concrete Forming and Accessories
032000	Concrete Reinforcement
033000	Cast-In-Place Concrete

DIVISION 25	**–**	**INTEGRATED AUTOMATION**
250501		Controls – General Requirements
253001.01		RTU Control Panel
253001.02		Fan Control Panel
253002		Controls Instrumentation
DIVISION 26	**–**	**ELECTRICAL**
260500		Common Work Results for Electrical
260520		Wire and Box Connectors
260521		Wires and Cables
260528		Grounding – Secondary
260529		Hangers and Supports for Electrical Systems
260531		Splitters, Junction, Pull Boxes and Cabinets
260532		Outlet Boxes, Conduit Boxes and Fittings
260534		Conduits, Conduit Fastening and Conduit Fittings
260536		Cable Trays for Electrical Systems
262716		Electrical Cabinets and Enclosures
262726		Wiring Devices
262823		Disconnect Switches – Fused and Non-Fused
262901		Contactors
262903		Control Devices
262416.01		Panelboards Breaker Type
262813.01		Fuses – Low Voltage
262816.02		Moulded Case Circuit Breakers
262910		Motor Starters (0-600V)
DIVISION 40	**–**	**PROCESS INTEGRATION**
409100		Automation Process Measurement Devices

APPENDIX A – GEOTECHNICAL SOIL REPORT
APPENDIX B – HAZARDOUS MATERIALS ASSESSMENTS
APPENDIX C – PIPE LOADING ASSESSMENT
APPENDIX D – MAJOR EQUIPMENT LIST

Drawing No.	Drawing Name/Title
1-0650A-D0001-001-00	Cover Sheet
1-0650A-C0001-001-00	Municipal Site Plan
1-0650A-C0002-001-00	Municipal Grading Plan
1-0650A-C0003-001-00	Municipal Sensitive Infrastructure Protection Plan
1-0650C-S0001-001-00	Structural Pump Station Chlorine Room Egress Partial Plan, Sections and Details
1-0650M-S0001-001-00	Structural Legends & General Notes
1-0650M-S0002-001-00	Structural Pump Station Roofing Demolition Plans and Sections
1-0650M-S0003-001-00	Structural Pump Station Roofing Plan and Details
1-0650M-S0004-001-00	Structural Pump Station Roofing Sections and Details
1-0650M-S0005-001-00	Structural Pump Station Crawlspace Modifications Partial Plan and Sections
1-0650M-S0006-001-00	Structural Pump Station Crawlspace Modifications Sections and Details
1-0650M-S0007-001-00	Structural Pump Station Cork Insulation Encapsulation Sections and Details
1-0650M-S0008-001-00	Structural Pump Station Asbestos Remediation Reflected Ceiling Plan and Details
1-0650M-S0009-001-00	Structural Pump Station Exterior Cladding Repairs Sections
1-0650M-S0010-001-00	Structural Pump Station Exterior Cladding Repairs Sections and Details
1-0650M-S0011-001-00	Structural Pump Station Handrail Replacement Plan, Sections and Details
1-0650Y-S0001-001-00	Structural Drainage Lift Station Plan, Section and Schedule
1-0650A-E0001-001-00	Electrical Legend
1-0650A-E0002-001-00	Electrical Network Diagram
1-0650A-E0003-001-00	Electrical Partial Site Plan
1-0650C-E0003-001-00	Electrical Pump Station CP-C800 Schematic and Connection Diagram
1-0650C-E0004-001-00	Electrical Pump Station MS-EFF-1 Schematic and Connection Diagram
1-0650M-E0003-001-04	Electrical Pump Station Single Line Diagram
1-0650M-E0018-001-01	Electrical Single Line Diagram PNL-EE
1-0650M-E0023-001-00	Electrical Pump Station Main and Pump Level Power Plan
1-0650M-E0024-001-00	Electrical Pump Station Roof Power Plan
1-0650Y-E0001-001-02	Electrical Drainage Lift Station Single Line Diagram
1-0650Y-E0003-001-00	Electrical Drainage Lift Station Power & Instrument Plan and Details
1-0650Y-E0004-001-00	Electrical Drainage Lift Station Panelboard Schedule
1-0650Y-E0005-001-00	Electrical Drainage Lift Station CP-Y800 Schematic and Connection Diagram
1-0650M-M0001-001-00	Mechanical Pump Station Pump Floor Plumbing Plan - New
1-0650M-M0002-001-00	Mechanical Pump Station Mezzanine Plumbing Plan - New
1-0650M-M0003-001-00	Mechanical Pump Station Roof Plumbing Plan - New

1-0650M-M0004-001-00	Mechanical Pump Station Roof HVAC Plan - Demolition
1-0650M-M0005-001-00	Mechanical Pump Station Roof HVAC Plan - New
1-0650M-M0006-001-00	Mechanical Pump Station Details (1 of 2)
1-0650M-M0006-002-00	Mechanical Pump Station Details (2 of 2)
1-0650Y-M0001-001-00	Mechanical Drainage Lift Station Equipment and Piping - Plan, Section and Details
1-0650Y-M0001-002-00	Mechanical Drainage Lift Station Equipment and Piping - Plan, Section & Details
1-0650Y-M0002-001-00	Mechanical Drainage Lift Station HVAC - Plan, Elevations and Section

E2. SOILS INVESTIGATION REPORT

E2.1 A geotechnical soils report titled “Soil Mechanics Investigation, Proposed Reservoir and Pumping Station Waverly Street, Wilkes Avenue, City of Winnipeg, Manitoba” is provided in Appendix A. The geotechnical soils report is provided for information only. Bidders are not to rely on the information given in the geotechnical soils report for the purposes of preparation of their Bid.

E3. EXPEDITED SHOP DRAWINGS

E3.1 In order to expedite Shop Drawings with critical timeliness, the lowest responsive Bidder, as outlined in B18, will be permitted, after receiving written approval from the Contract Administrator, to arrange for the preparation of Shop Drawings for the following items with critical timelines:

(a) All items specified in Section 07 52 00 – Modified Bituminous Membrane Roofing;

(b) All items specified in Section 07 62 00 – Sheet Metals Flashing and Trim;

(c) All items specified in Section 22 42 01 – Plumbing Specialities and Accessories.

E3.2 If award is made to the lowest responsive Bidder, then no specific payment for the preparation of Shop Drawings will be made.

E3.3 If no contract is awarded, then the City will pay the requested Bidder up to a maximum of five thousand dollars ($5,000.00) for the complete set of requested submissions noted above, for the preparation and delivery of Shop Drawings. Shop Drawings shall be prepared to a reasonable level of acceptance, subject to the Contract Administrator’s approval. Delivery of the Shop Drawings to the City and payment of the above amounts will constitute full and final consideration of each party to the other, and neither party will have any further liability to the other with respect to this Tender.

E4. WORK BY OTHERS

E4.1 Work on the Wilkes Reservoir may be undertaken by others at the same time as the Work of this Contract. The Contractor may be required to coordinate with the others at no additional cost to the Contract.

E4.2 The contractor for the work associated with the Wilkes Reservoir will use the access gate at the south of the Site (at Wilson Place) to minimize disruption of the Work of this Contract. The contractor for the work associated with the Wilkes Reservoir will be responsible for securing the south access gate.

E5. HAZARDOUS MATERIALS

E5.1 KGS Group completed a Hazardous Materials Assessment to identify areas of hazardous materials other than the previously identified presumed and confirmed asbestos within the Site. The Hazardous Materials Assessment is included in Appendix B.

(a) The Contractor shall note the presence of lead-based paints on metal fan hoods and gooseneck intake covers on the roof of the Hurst Pumping Station and take precautions during repainting activities refer to Section 02 83 10 – Lead-based paint abatement – minimum precautions for details.

(b) The existing cork insulation paint contains lead at low concentrations but is not considered a lead-based paint. The Contractor shall not sand the cork to ensure no release of lead is made into the Hurst Pumping Station unless special precautions are undertaken refer to Section 02 83 10 – Lead-based paint abatement – minimum precautions for details.

E5.2 Asbestos will be disturbed by the Work. Refer to Section 02 82 10 – Asbestos Abatement – General Provisions, Section 02 82 11 – Asbestos Abatement – Type 1, and the report titled" HMIS Confirmed Asbestos and Presumed Asbestos Report, W.D. Hurst Pumping Station 2019-02-01" included in Appendix B for details.

E5.3 If other previously undiscovered hazardous materials are encountered during the Work of the Contract, the Contractor shall stop all Work and notify the Contract Administrator immediately. Removal of hazardous materials shall be dealt with by the City and the Contractor shall await further instruction by the Contract Administrator.

E6. DANGEROUS WORK CONDITIONS

E6.1 Further to E5, the Contractor shall be aware that the following locations are considered confined spaces:

(a) Crawlspace under the Hurst Pumping Station.

(b) Wet well within the Drainage Lift Station.

(c) Any other areas labelled as 'confined space' at the Site.

E6.2 The Contractor shall follow the "Guidelines for Confined Entry Work" as published by the Manitoba Workplace Safety and Health Division for all work involving a confined space.

E6.3 The Contractor shall be aware of the potential hazards that can be encountered in confined spaces such as toxic gases and oxygen deficiency. The Contractor's Safe Work Plan should address these issues.

E6.4 The air in a confined space must be tested before entry and continuously during the time that personnel are inside the space. Equipment for continuous monitoring of gases must be explosion-proof and equipped with a visible and audible alarm. The principal tests are for oxygen deficiency and toxic gases. Testing equipment must be calibrated in accordance with manufacturer's specifications.

(a) The Contractor is responsible for all testing requirements.

E6.5 The Contractor shall ventilate all confined spaces including underground chambers, tunnels, and shafts as required and approved by the Manitoba Workplace Safety and Health Act (the "Act"). If no ventilation is supplied, a worker must wear a respirator or supplied air to enter the confined space.

E6.6 The Contract Administrator may issue a stop work order to the Contractor if the above guidelines are not being followed. The Contractor shall not resume operations until the Contract Administrator is satisfied the Contractor is following the appropriate procedures. The Contractor shall have no claim for extra time or costs due to the stop work order for not following these safety guidelines.

E7. SUPPLY AND INSTALLATION OF TEMPORARY SHORING

E7.1 Description

E7.1.1 This Specification shall cover shoring requirements for the Works related to the modifications of the crawlspace of the Hurst Pumping Station, as shown on the Drawings.

E7.2 Submittals

E7.2.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

E7.2.2 The Contractor shall submit Shop Drawings and design calculations sealed, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba as described in E7.3.3.

E7.3 Construction Methods

E7.3.1 Excavation

(a) Remove excavated material from the Site. Excavated material shall not be stockpiled on-Site unless it will be used as backfill.

(b) All working areas below grade shall be kept adequately and securely supported during and after excavation until the shoring and bracing is in place to prevent loss of ground or injury to any person from falling material.

E7.3.2 Excavation Safety Fence

(a) Further to Clause 3.1 of CW 1130, completely cover the excavation and provide a safety fence to completely surround the excavation when unattended generally in accordance with the following:

(i) Safety fence shall be chain link fence or approved equal in accordance with B7, a minimum 1.80 meters high with metal support posts embedded far enough into the ground and spaced close enough together so the fence will not sag or collapse.

(ii) Attach fencing securely to posts.

E7.3.3 Shoring

(a) The type, strength, and amount of shoring and bracing shall be such as the nature of the ground and attendance conditions may require, taking into account property lines, existing slopes, utilities, roadways, existing structures, and the Work required.

(b) Shoring and bracing shall be so spaced and dimensioned as to prevent caving, loss of ground, surface settlement, or squeezing of the soil beyond the neat lines of excavation. It shall be free from defects that might impair its strength or suitability for the Work. Sheeting/shoring and bracing shall conform to the latest revisions of the “Construction Safety Act” of the Department of Labour of the Government of Manitoba and in accordance with Province of Manitoba “W210 The Workplace Safety and Health Act” and “Guidelines for Excavation Work”.

(c) Provide supporting design calculations as required to facilitate review of the submission for conformance with the Contract Documents.

(d) Submit AutoCAD Shop Drawings and design calculations for the shoring/excavation system designed and sealed by a Professional Engineer registered or licensed to practice in the Province of Manitoba and experienced in the structural design of shoring systems. The designer of the shoring system shall inspect the system during construction and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.

(e) Shoring and bracing shall be installed such that the structure size and wall thickness shown on the Shop Drawings can be obtained subsequent to installation of the shoring system.

(f) Shoring and bracing shall be designed and installed to prevent settlement and damage to existing structures. In the event of damage, the Contractor will be held liable, and shall be required to provide appropriate restoration at his cost, to the satisfaction of the Contract Administrator.

E7.4 Measurement and Payment

E7.4.1 Shoring will be paid for at the Contract lump sum price for Item No. 19 “Municipal / Site Trade - Temporary Shoring for the Crawlspace Modifications - Hurst Pumping Station” on Form B: Prices. Payment shall be made in accordance with C12.

E8. SECURITY AND ACCESS TO HURST PUMPING STATION SITE

E8.1 Description

E8.1.1 This section describes the security requirements and access restrictions at the Hurst Pumping Station facility during construction.

E8.1.2 The Hurst Pumping Station facility is a critical component of the City’s water supply system. Work at and near the Hurst Pumping Station and surrounding piping shall be undertaken with an abundance of caution.

E8.2 General Considerations for Work at the Hurst Pumping Station

E8.2.1 The Hurst Pumping Station facility contains numerous water conduits that are critical components of the City’s water supply. Work around any of these pipelines shall be well planned and executed to ensure that the pipelines are not subjected to excessive construction related loads, including excessive vibrations and concentrated or asymmetrical lateral loads during the Work.

E8.2.2 Advance notice and written approval by the Contract Administrator will be required if access in/out of any of the Site is restricted due to construction efforts.

E8.2.3 Under no circumstances will traffic or equipment be permitted beyond designated areas unless stated otherwise in the Specifications.

E8.2.4 Employees of the Contractor or any Subcontractor that fail to comply with the conditions for working at the Site shall be promptly removed from the Site.

E8.2.5 The main access to the Site shall be from Hurst Way. A manual vehicle access gate is provided on the west side of the Hurst Pumping Station for access into the secured area of the Hurst Pumping Station.

E8.2.6 The Contractor’s Site supervisor is required to carry, at all times, a cellular telephone, with voice mail.

E8.3 Keys and Access to the Hurst Pumping Station

E8.3.1 The Contractor will be issued keys for access to the Site under the following conditions:

(a) The Contractor shall provide the name and contact information for the person in charge and responsible for the Site.

(b) The Contractor is to coordinate with the City on the number of keys that will be required for the Contractor’s employees and Subcontractors.

(c) The Contractor is to return all keys prior to Total Performance. On return of all keys including damaged keys, a ten thousand-dollar ($10,000.00) holdback will be released.

(d) The Contractor is to immediately report any lost keys and return any damaged or non-functioning keys for replacement.

E8.4 Site Security

E8.4.1 The Contractor is required to take measures necessary to secure the Work areas when the Work areas are vacated. When personnel are not within visual range of the access gates, the gates shall be closed and locked.

E8.4.2 The Contractor is responsible for all Plant and Material stored on the Site.

E8.4.3 All entry doors into the Hurst Pumping Station and the Drainage Lift Station are to remain locked at all times.

E8.4.4 Follow City procedures regarding entrance and exit.

E8.4.5 On a daily basis during the course of Work, the Contractor shall communicate with the **City of Winnipeg Deacon Control Centre at 204-986-4781** at the beginning of working hours and at the end of working hours, as to the status of the Site security and, in particular, when the Contractor staff leaves the Site.

E8.5 Emergency Response

(a) The following lists appropriate Emergency Response Contacts for the Site:

(i) Fire, Rescue, and Paramedics – City of Winnipeg, 911.

(ii) Police – City of Winnipeg, 911.

E8.6 Photographs

(a) All Site photographs required for construction documentation shall be approved by the City representative, as identified by the Contract Administrator.

E8.7 Measurement and Payment

E8.7.1 Access to Site will be considered incidental to "Mobilization and Demobilization" and no additional measurement or payment will be made.

E9. MOBILIZATION AND DEMOBILIZATION

E9.1 Description

E9.1.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E9.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works hereinafter specified.

E9.1.3 The unit price listed on Form B: Prices for Item No. 20 "Municipal / Site Trade – Surface Drainage Remediation – Hurst Pumping Station" includes all topsoil and sodding based on the areas requiring regrading as shown on Civil Drawings. All topsoil, seeding, and sodding required beyond Item No. 20 listed on Form B: Prices will be considered incidental to mobilization and demobilization, and no additional payment will be made for the additional quantities.

E9.2 Scope of Work

E9.2.1 The Work under this Specification shall include but not be limited to:

(a) Pre-construction meeting in accordance with D15.2(b).

(b) Mobilizing and demobilizing construction trailers.

(c) Supply and installation of temporary snow fence.

(d) Supply and installation of protection measures for sensitive infrastructure at the Site.

(e) Utility locates.

(f) Restoration of existing facilities and other miscellaneous Site works.

E9.3 References

E9.3.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(a) City of Winnipeg's Specification CW-1120 (latest edition) – Existing Services, Utilities and Structures.

(b) City of Winnipeg's Specification CW-1130 (latest edition) – Site Requirements.

(c) City of Winnipeg's Specification CW-3550 (latest edition) – Chain Link and Drift Control Fence.

E9.4 Materials

E9.4.1 The Contractor shall be responsible for the supply, safe storage, and handling of all Materials as set forth in this Specification. All Materials are to be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E9.4.2 All Materials supplied under this Specification shall be of a type approved by the Contract Administrator and shall be subject to inspection and testing by the Contract Administrator.

E9.4.3 The Contractor shall provide suitable portable toilet facilities on-Site for his/her use. The Hurst Pumping Station will not be available for washroom use.

E9.4.4 This section also includes travel and accommodation, set-up, and demobilization of storage conveniences and other temporary facilities, construction plant, and other items not required to form part of the permanent Works and not covered by other prices.

E9.5 Equipment

E9.5.1 All equipment shall be of a type acceptable to the Contract Administrator, shall conform to any requirements listed in these Specifications or on the Drawings for the type of Work being performed, and shall be kept in good working order.

E9.6 Temporary Snow Fence

E9.6.1 The Contractor shall install temporary snow fencing, otherwise known as drift control fencing, in accordance with CW-3550 along designated pathways and around the valve chambers with two meters offset from their perimeters and as shown on the Drawings. The purpose of the snow fence is to ensure that personnel and equipment maintain a safe working distance from the valve chambers, underground pipelines, and other sensitive infrastructure components.

E9.6.2 The Contractor shall install temporary snow fencing around utilities and other critical infrastructure components as directed by the Contract Administrator.

E9.6.3 The Contractor will not be permitted to commence any other Work activities until the snow fence is in place.

E9.6.4 The Contractor shall ensure that the snow fence remains in a good, working condition throughout the Works and shall immediately repair any damage to the snow fence upon discovery of damage.

E9.7 Protection Measures for Sensitive Infrastructure

E9.7.1 The Hurst Pumping Station facility contains numerous pieces of infrastructure that are critical components of the City's water supply. Work at the Hurst Pumping Station shall be well planned and executed to ensure that any structurally sensitive infrastructure, such as buried piping, is not subjected to construction related loads, including excessive vibrations, and asymmetrical lateral loads.

E9.7.2 The Contractor shall protect the sensitive components in strict accordance with the Drawings. Generally, the components requiring protection include, but are not limited to:

(a) Reservoir yard piping;

(b) Hurst Pumping Station discharge piping;

(c) Feeder mains;

(d) Drainage sewer;

(e) Valve chambers;

(f) Cooling tower and its associated infrastructure;

(g) Fire water supply line;

(h) Gas supply line;

(i) Any other components indicated on the Drawings or as directed by the Contract Administrator.

E9.7.3 The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing sensitive infrastructure as a result of the Contractor's operations, as determined by the Contract Administrator.

E9.7.4 All materials and protection systems installed shall be removed as part of the final clean- up unless they are to form a part of the permanent Work.

E9.8 Utility Locates

E9.8.1 The Contractor shall be responsible for contacting the appropriate utility authorities to locate all utilities prior to commencing any excavation works or any other works that may potentially damage buried utilities.

E9.8.2 The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations, as determined by the Contract Administrator.

E9.9 Restoration of Existing Facilities

E9.9.1 Upon completion of the Work and demobilization, the Contractor shall restore the Site.

E9.9.2 The Contractor shall be fully responsible to restore the project Site to the original, documented conditions prior to construction, unless as approved by the Contract Administrator. This may include but is not necessarily limited to the Contractor’s lay down area and removal of all temporary fencing.

E9.9.3 Topsoil and Sod

(a) Further to E9.1.3. where topsoil and sodding are required to restore laydown areas, or similar temporary work areas, it shall be considered incidental to mobilization and demobilization. No separate payment shall be made for topsoil and sod in these areas.

E9.10 Quality Control

E9.10.1 Inspection

(a) All workmanship and all Materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of Materials through to final acceptance of the specified Work.

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given.

(c) The Contract Administrator reserves the right to reject any materials or Works which are not in accordance with the requirements of this Specification.

E9.11 Access

(a) The Contractor shall always allow the Contract Administrator free access to all parts of the Work. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E9.12 Measurement and Payment

E9.12.1 Mobilization and demobilization will not be measured and will be paid for at the Contract lump sum price for Item No. 1 “Mobilization/Demobilization, of Form B: Prices which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E9.12.2 Mobilization and demobilization will be paid for as a percentage of the Contract lump sum price for Item No. 1 – "Mobilization/Demobilization" of Form B: Prices measured as specified herein. These percentages shall be as follows:

(a) 40% when the Contract Administrator is satisfied that construction has commenced.

(b) 40% at Substantial Performance.

(c) 20% at Total Performance.

E10. TEMPORARY USE OF CITY EQUIPMENT

E10.1 City facilities, systems, and equipment shall not be used during construction without the Contract Administrator's written permission. The Contract Administrator reserves the right to withdraw said permission if, in their opinion, proper care and maintenance are not provided.

E10.2 The Contractor may use the existing overhead crane at the Hurst Pumping Station under this Contract, subject to review of a Safe Work Plan applicable to the Work. The existing crane has not been inspected for compliance with applicable safety standards, however, where similar cranes exist at other City facilities, fall arrest upgrades have been required to use the crane as a work platform.

E10.2.1 The Contractor shall provide a qualified crane operator.

E10.2.2 Any lifts performed by the Contractor will need to be within the operating limit of the crane.

E10.2.3 Any modifications required to the crane to allow for its use under the Contract including fall arrest upgrades or any other repairs or maintenance as necessary will be the responsibility of the Contractor. The Contractor shall provide a Professional Engineer's stamped review of the modifications to the crane.

E10.2.4 As per C10.2, the Contractor shall be responsible for any losses or damages to the crane during the operation.

E11. CONSTRUCTION WORK PLAN

E11.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

E11.2 Submit a detailed work plan document for review and approval by the Contract Administrator on each Thursday, indicating the following:

(a) Detailed description of all work planned for the next week. Where required or requested by the Contract Administrator, provide:

(i) The proposed construction sequence to be followed including all methods to be employed to ensure that no damage or unintended service outages occur.

(ii) A description of all proposed methods of construction to be implemented.

(iii) Specialized equipment that may be used.

(iv) A detailed description, methods, and procedures for all testing (both factory-based testing and field testing).

(b) Any design revisions proposed to accommodate the Contractor's proposed method of construction.

(c) The Contractor shall respond to any concerns that may be raised by the Contract Administrator's review of the Contractor's construction methods submission.

E11.3 The Contractor must keep life safety systems, such as fire alarm systems, emergency lighting, gas detection systems operational at all times except for planned and approved outages. Include costs and provide a 24 hours per day / 7 day per week watch person and/or monitoring equipment (e.g. chlorine detection) where systems are made inoperable during the approved outage periods.

E11.4 No Work shall proceed without the inclusion of the Work on a detailed work plan and corresponding approval of the Work by the Contract Administrator.

E12. OPERATING CONSTRAINTS FOR WORK IN CLOSE PROXIMITY TO CRITICAL WATER INFRASTRUCTURE

E12.1 This section describes specific requirements for Work in close proximity to critical water infrastructure. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from a feeder main/water main, within 5 m of valve chambers and other appurtenances, and any other infrastructure identified below.

E12.2 The following shall be considered critical pipelines and water infrastructure for this project:

(a) Charleswood Feedermain, 750 mm Reinforced Concrete Water Pipe – Steel Cylinder Type, Not Prestressed, installed on the boulevard / sidewalk between the property line and back of the curb, and crossing the entrance driveway.

(b) Wilkes Avenue Feedermain, 900 mm Prestressed Concrete Pressure (PSC) Pipe installed on the boulevard and crossing the entrance driveway.

(c) Wilkes Avenue Reservoir Drainage Building Outlet Pipe, 600 mm Asbestos Cement (AC) Class II Sewer Pipe installed on the west of Hurst Pumping Station Building connecting the Drainage Lift Station to the City 1350 mm Concrete LDS.

(d) Wilkes Avenue Reservoir By-pass Piping, 1350 mm PSC Suction Pipe installed on the South side of the station crossing the driveway under the entrance gate.

(e) 900 mm PSC Suction Pipe on the south side of the Hurst Pumping Station Building supplying water from Wilkes Avenue Reservoir North Cell (Wilkes Avenue Reservoir No. 2) to the station crossing the gravel road.

(f) 900 mm PSC Interconnection Suction Pipe running diagonally on the south side of the Hurst Pumping Station Building.

(g) Two 1350 mm Steel Pipe in Concrete Suction Lines on the southwest & southeast of Hurst Pumping Station Building.

(h) 1200 mm Steel Pipe in Concrete Discharge Line on the northwest of Hurst Pumping Station Building.

E12.3 The above noted critical pipelines are critical components of the City's regional water supply system and work in close proximity to the critical pipelines shall be undertaken with an abundance of caution. The above noted critical pipelines and in particular pump station suction and discharge piping cannot typically be taken out of service for extended periods to facilitate construction. Inadvertent damage caused to these pipes would likely have catastrophic consequences.

E12.4 Work around critical water infrastructure shall be planned and implemented to minimize the time period that Work is carried out in close proximity to the critical water infrastructure and to ensure that the critical water infrastructure is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.

E12.5 Construction in close proximity to critical infrastructure shall not commence until both the equipment and construction method statements have been submitted, reviewed, and accepted by the Contract Administrator.

E12.6 The Contract Administrator reserves the right to issue a Stop Work Order if the Contractor uses equipment not previously approved, or if equipment is used in an area not previously approved by the Contract Administrator.

E12.7 KGS Group completed a pipe loading assessment for critical pipelines in the area surrounding the Hurst Pumping Station and Drainage Lift Station. The pipe loading assessment is included in Appendix C of this Tender.

(a) The Contractor is advised that the design vehicles used in the pipe loading assessment were based on probable design vehicles that would be used to execute the Work.

E12.8 Submittals:

(a) Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

(b) Submit an equipment travel path plan indicating travel paths for all vehicles that are required to travel off of paved portions of the Site (both gravel and concrete).

(c) Submit the proposed construction equipment specifications to the Contract Administrator for review a minimum of five (5) Business Days prior to commencing Work around critical water infrastructure. The equipment submission shall include:

(i) Equipment operating and payload weights;

(ii) Equipment dimensions, including wheel or track base, track length or axle spacing, and track widths or wheel configurations; and

(iii) Load distributions in the intended operating configuration.

(d) Submit a detailed craning plan including the location of setup, the rigging configuration and lifting devices, and probable ground pressures resulting below the crane wheels and all outriggers.

(e) Submit crane mat Shop Drawings sealed, signed, and dated by a Professional Engineer licensed to practice in the Province of Manitoba for all crane mats necessary to complete the Works.

(f) Submit a construction method statement to the Contract Administrator a minimum of five (5) Business Days prior to commencing Work around critical water infrastructure. The construction method statement shall contain the following minimum information:

(i) Proposed construction plan including excavation locations, haul routes, excavation equipment locations, and loading positions; and

(ii) Excavation plans, including shoring designs.

(g) Incomplete or partial submissions will not be reviewed and will be returned to the Contractor for re-submission.

(h) Allow five (5) Business Days for review by the Contract Administrator.

E12.9 Pre-Work Planning and General Execution

(a) No work shall commence in close proximity to critical infrastructure until the equipment specifications and construction method statement have been submitted and accepted, and critical infrastructure locations have been clearly delineated in the field. Work over piping shall only be carried out with equipment that has been reviewed and quantified in terms of its loading implications on the pipe.

(b) Contact the City of Winnipeg Water and Waste Department, Construction Services Coordinator prior to construction.

(c) Locate critical infrastructure and confirm their position horizontally and vertically prior to undertaking Work in close proximity to the identified critical infrastructure. Note, exact locations to be identified in the field. Deviations from the elevations noted on the drawings shall be reported to the Contract Administrator prior to proceeding with Work.

(d) Visually delineate all critical infrastructure identified herein on Site by use of paint, staking/flagging, construction fencing, snow fencing, or other suitable methods.

(e) Only utilize construction practices and procedures that do not impart excessive vibratory loads on critical infrastructure or that would cause settlement of the subgrade below critical infrastructure.

(f) Only equipment and construction practices stipulated in the accepted construction method statement and the supplemental requirements noted herein may be utilized in close proximity to critical infrastructure identified herein.

(g) Granular material, construction material, soil, and/or other material shall not be stockpiled on the pipelines or within 5 m of critical infrastructure identified herein.

(h) The Contractor shall ensure that all crew members understand and observe the requirements of working near critical infrastructure. Prior to commencement of on-Site work, the Contractor shall jointly conduct an orientation meeting with the Contract Administer, all superintendents, foreman, and heavy equipment operators to make all workers on the Site fully cognizant of the limitations of altered loading on, the ramifications of inadvertent damage to, and the constraints associated with work in close proximity to critical infrastructure. New personnel introduced after commencement of the project need to be formally orientated as outlined herein. It is recommended that restrictions associated with the crossing, consistent with the Contractor's submitted method statement be posted on Site and near the crossing.

E12.10 Demolition, Excavation, and Shoring

(a) Use of pneumatic concrete breakers within 3 m of a critical pipeline is prohibited. Pavement shall be full depth sawcut and carefully removed. Use of hand-held jackhammers for pavement removal will be allowed.

(b) Offset excavation equipment a minimum of 3 m from the center line of critical pipelines when undertaking excavations.

E12.11 Excavation

(a) Utilize only smooth edged excavation buckets, soft excavation, or hand excavation techniques where there is less than 1.5 m of earth cover over the pipeline.

(b) Where there is less than 1.0 m of soil cover above the pipeline, provide full time supervision and complete the excavation utilizing hand excavation, soft excavation methods, or machine excavation. Where machine excavation is to be used, the crown of the pipeline must be exposed (or suitable located) using hand or soft excavation methods a minimum of every 1.8 m.

(c) Where there is less than 0.5 m of soil cover above the pipeline, provide full time supervision and complete the excavation utilizing hand excavation or soft excavation methods only.

(d) Equipment should not be allowed to operate while positioned directly over suction inlet or discharge piping except were permitted herein, outlined in the reviewed and accepted construction method statement.

(e) Excavations within 3 m of the outside edge of critical infrastructure (hydrovac holes for confirming trenchless installations excluded) and which extend below obvert of piping shall utilize shoring methods that precludes the movement of native in-situ soils (i.e. a tight shoring system).

E12.12 Subgrade Construction

(a) Subgrade and backfill compaction within 3 metres (horizontal) of piping shall be limited to non-vibratory methods only. Small walk behind vibratory packers will be permitted.

(b) Subgrade, sub-base and base course construction shall be kept in a rut free condition at all times. Construction equipment is prohibited from crossing pipelines if the grade is insufficient to support the equipment without rutting.

(a) Fill material shall not be dumped directly on pipelines but shall be stockpiled outside the limits noted in these recommendations.

E12.13 Subbase and Base Construction

(a) Subbase or base course materials shall not be dumped directly on pipelines but shall be stockpiled outside limits noted in these recommendations.

(b) Subbase compaction within 3 m horizontal of a critical pipeline shall be either carried out by static methods (without vibration) or with smaller approved equipment such as hand-held plate packers or smaller roller equipment.

E12.14 Crane Mats

(a) The Contractor shall furnish of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all works associated with the crane mats.

(b) The Work associated with the crane mats shall include, but is not limited to:

(i) Design, supply, and installation of all crane mats necessary to complete the Works.

(ii) Removal of crane mats off-Site upon the completion of all crane Works.

(c) References

(i) All related Specifications and reference standards are in accordance with the most current issue or latest revision:

(i) City of Winnipeg's Specification CW-3130 (latest edition) – Supply and Installation of Geotextile Fabrics.

(d) Equipment

(i) The Contractor's equipment shall conform to the requirements of the Works and all notes shown on the Drawings.

(e) Measurement and Payment

(i) Crane mats will be considered incidental to Item No. 1 – "Mobilization and Demobilization" on Form B: Prices and no additional measurement or payment will be made.

E13. WORK RESTRICTIONS

E13.1 Items include:

(a) Roofing work in full sun conditions shall consider rescheduling work when the outdoor temperature reaches 33°C.

(b) Roofing work must be completed within a single calendar year in accordance with the critical stages defined in D18.1(a).

(c) Asbestos remediation must be completed prior to commencing any painting of the cork insulation.

(d) A minimum of one (1) HVAC unit for the Hurst Pumping Station must remain operational at all times.

E14. ENVIRONMENTAL PLAN

E14.1 The Contractor shall be aware that the Hurst Pumping Station Site is for potable water supply and no contamination by fuel, chemicals, etc. shall be permitted at any time. Fuels, chemicals, or any other hazardous substances which may compromise the safety of the potable water supply shall not be stored outside of the area designated by the Contract Administrator.

E14.2 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the environmental protection measures as herein specified.

E14.3 Submittals

(a) Submit an Environmental Protection Plan two (2) weeks prior to start of Work in accordance with Section 01 33 00 – Submittals.

(b) Environmental Protection Plan to include:

(i) Names of persons responsible for ensuring adherence to Environmental Protection Plan.

(ii) Names and qualifications of persons responsible for hazardous waste removal from Site.

(iii) Names and qualifications of persons responsible for training Site personnel.

(iv) Descriptions of environmental protection personnel training program.

(v) Fuel Handling and Storage Plan describing the Contractor's proposed procedure for refuelling of equipment. The plan shall include the location of the designated refuelling area, the provision of containment membranes underneath all equipment being refuelled, the provision of containment membranes underneath all stationary working equipment (e.g., membranes underneath all cranes to contain any leaks), the proposed procedure for refuelling large stationary equipment away from the designated refuelling area (e.g., refuelling of set-up cranes), proposed locations, types, and volumes of stored fuel, and any other details pertinent to refuelling on Site.

(vi) Storm Water Pollution Prevention Plan, if applicable, describing water quality protection measures including erosion and sediment controls, inspections, monitoring, and staff training. The plan shall also provide a schematic drawing indicating location and type of sediment protection measures.

(vii) Drawings showing locations of proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on-Site.

(viii) Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

(ix) Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.

(x) Spill Control Plan including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

(xi) Construction Waste Management Plan describing on-site waste management, disposal, reuse of materials, recycling, and staff training.

(xii) Hazardous Material Spill Management Plan describing management, reporting, emergency response and contact numbers, as well as staff training.

E14.4 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Workplace Hazardous Material Information System (Hazardous Product Act and Canada Labour Code);

(b) Canadian Environmental Protection Act;

(c) Canadian Environmental Assessment Act;

(d) Transportation of Dangerous Goods Act;

(e) Manitoba Environmental Act;

(f) The Manitoba Nuisance Act N120;

(g) The Public Health Act c.P210;

(h) Manitoba Dangerous Goods, Handling, and Transportation Act;

(i) The Workplace Safety and Health Act W210; and

(j) Current applicable associated regulations.

E14.5 The Contractor is advised that the following environmental protection measures apply to the Work.

E14.5.1 Material Handling and Storage

(a) Construction materials shall not be stored within 5 m of existing pipe centerlines.

E14.5.2 Fuel Handling

(a) The Contractor shall abide by the regulations of Manitoba Environment for handling and storage of fuel products.

(b) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.

(c) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.

(d) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.

(e) Products transferred from fuel storage area(s) to specific work sites shall not exceed the daily usage requirement.

(f) When servicing requires the drainage or pumping of fuels, lubricating oils, or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.

(g) The area around storage sites and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.

(h) A sufficient supply of materials such as absorbent material and plastic oil brooms, to clean-up minor spills shall be stored nearby on-Site. The Contractor shall ensure that additional material can be made available on short notice.

(i) Fuelling of stationary equipment shall be completed with portable tanks containing only enough fuel to fill equipment.

E14.5.3 Waste Handling and Disposal

(a) The construction area shall be kept clean and orderly at all times during and at completion of construction.

(b) At no time during construction shall personal or construction waste be permitted to accumulate for more than one (1) day at any location on the Site, other than at a dedicated storage area as may be approved by the Contract Administrator.

(c) Indiscriminate dumping, littering, or abandonment shall not take place.

(d) Equipment shall not be cleaned on Site unless at areas designated by the Contract Administrator.

E14.5.4 Dangerous Goods/Hazardous Waste Handling and Disposal

(a) Dangerous goods/hazardous waste are identified by, and shall be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.

(b) The Contractor shall be familiar with The Dangerous Goods Handling and Transportation Act and Regulations.

E14.5.5 Fires

(a) Fires and burning of rubbish on-Site shall not be permitted.

E14.5.6 Emergency Spill Response

(a) The Contractor shall ensure that due care and caution is taken to prevent spills.

(b) The Contractor shall report all major spills of petroleum products or other hazardous substances with the potential for impacting the environment and threat to human health and safety, including contamination of potable water, to the Contract Administrator and Manitoba Environment, immediately after occurrence of the environmental accident, by calling the twenty-four (24)-hour emergency telephone number 204-945-4888.

(c) The Contractor shall designate a qualified supervisor as the on-site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill.

(d) The following actions shall be taken by the person in charge of the spilled material or the first person(s) arriving at the scene of a hazardous material accident or the on-Site emergency response coordinator:

(i) Notify emergency-response coordinator of the accident:
- Identify exact location and time of accident
- Indicate injuries if any
- Request assistance as required by magnitude of accident (Manitoba Environment twenty-four (24)-hour Spill Response Line 204-945-4888, Winnipeg Police Service, Winnipeg Fire Paramedic Service, company backup)

(ii) Assess situation and gather information on the status of the situation noting:
- Personnel on-Site
- Cause and effect of spill
- Estimated extent of damage
- Amount and type of material involved
- Proximity to critical Reservoir infrastructure and other waterlines

(iii) If safe to do so, try to stop the dispersion or flow of spill materials:
- Approach from upwind
- Stop or reduce leak if safe to do so
- Dike spill material with dry, inert absorbent material or dry clay soil or sand
- Prevent spill material from entering Site infrastructure and utilities by diking
- Prevent spill material from entering drainage manholes and other openings by covering with rubber spill mats or diking

(iv) Resume any effective action to contain, clean-up, or stop the flow of the spilled product.

(e) The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to the Manitoba Environment according to The Dangerous Goods and Transportation Act Environmental Accident Report Regulation 439/87.

E14.5.7 Controlled Products

(a) Materials classified as “Controlled Products” under Regulation 52/88, “Workplace Hazardous Materials Information System”, including amendments, are prohibited inside the Site, unless the material will be directly employed in the Work.

E15. ADDITIONAL WORK

E15.1 Additional Work may be necessitated due to unforeseen circumstances that may arise during the course of the project due to:

(a) Additions to the scope of Work by the Contract Administrator, beyond that defined herein.

E15.2 A cash allowance has been included as Item No. 22 “Cash Allowance for Additional Work” on Form B: Prices.

E15.3 The City reserves the right to delete any or all of the Cash Allowance from the Contract if the Work intended to be covered by the Cash Allowance is not required, or if the Works intended are found to be more extensive than the provisional Cash Allowance.

E15.4 Cost of additional work shall be evaluated by the methods outlined in C7.4, and a Change Order prepared by the Contract Administrator. Cost of the Change Order will be paid on the Progress Estimate and deducted from the Cash Allowance. If the valuation of the authorized work exceeds the Value of the Cash Allowance, the Contract Value will be adjusted by the shortfall.

E15.5 Additional services and/or Work will not be initiated for:

(a) Reasons of lack of performance or errors in execution.

(b) Scheduling changes initiated by the City, where at least 24 hours notice is given prior to the Contractors schedule time to be on Site.

E15.6 Should it be determined that additional material or services are required, the Contract Administrator shall approve the Work, prior to commencement of the additional Work.

E15.7 Material Mark-Up Factors:

(a) The base cost is to be the wholesale cost of the material, regardless of the Contractor or Subcontractor supplying the material.

(b) In general, the party (Contractor or Subcontractor) supplying the material is the party that purchases the material from a supplier who does not perform any work on Site, unless otherwise determined by the Contract Administrator.

(c) Where the Contractor is supplying the material, the mark-up on the material is limited to fifteen percent (15%).

(d) Where a Subcontractor is supplying the material, the total mark-up on the material, including all Subcontractors and the Contractor is limited to twenty-five percent (25%), including the Contractor and all Subcontractors' mark-ups.

(e) Where the Contractor's immediate Subcontractor is supplying the material:

(i) The Subcontractor's mark-up on the material is limited to fifteen percent (15%);

(ii) The Contractor's mark-up on the material is limited to ten percent (10%).

(f) A Third-Level Subcontractor is a Subcontractor of a Subcontractor of the Contractor.

(i) No Third-Level Subcontractors on this project are approved for additional mark-up.

(ii) In the event that a Third-Level Subcontractor is utilized, that is not approved for additional mark-up, the Contractor is responsible for coordinating the split of the maximum approved mark-up between the Contractor and Subcontractors.

E15.8 Measurement and Payment

(a) Additional labour will be reimbursed at the rate specified in Item No. 24 "Additional Labour" on Form B: Prices. The rate will not be adjusted for Subcontractors or individuals with specialized skills, without specific approval of the Contract Administrator.

(b) Additional material will be reimbursed by the actual base cost of the material, multiplied by the approved mark-up factors.

PART F - SECURITY CLEARANCE

F1. SECURITY CLEARANCE

F1.1 Each individual proposed to perform Work under this Contract within facilities associated with the water supply, treatment and distribution system including the Shoal Lake Intake Facility, Shoal Lake Aqueduct, Deacon Reservoir, Water Treatment Plant, Regional Pumping Stations, and Booster Pumping Stations shall be required to obtain a Public Safety Verification Check **and** a Police Information Check as detailed below.

F1.1.1 The Public Safety Verification Check must be obtained through Sterling BackCheck.

(a) A Sterling BackCheck account must be setup seventy-two (72) hours prior to individual security clearances to allow sufficient time for activation of the contracting company's account. If the contracting company has an existing City of Winnipeg Sterling BackCheck vendor account, they may skip to (d) below.

(b) An authorized individual of the contracting company must complete the Sterling Backcheck Setup Form. There is no cost to the organization to set up the account. Click on the link below, complete the form, and hit submit. **(This form is to be completed by the company, not by the employee requiring the security clearances). https://forms.sterlingbackcheck.com/partners/platform2-en.php?&partner=winnipegcity

(c) Within forty-eight (48) hours of completing the Sterling BackCheck Setup Form, the authorized individual of the contracting company will receive a Username and Password for Sterling BackCheck. It will appear in their inbox as a "Welcome to Sterling BackCheck" email. Upon receipt, the authorized individual of the contracting company will be asked to login to the Sterling BackCheck website to set their security questions and password. Once completed, individual security clearance requests can be submitted.

(d) In order to run a Public Safety Verification Check and/or a Police Information Check, follow the steps below:

(i) Click on the sub-tab labelled "Order eConsent".

(ii) Fill out the required information about the employee proposed to perform Work under this Contract within City facilities (the person that requires the security clearances).

(iii) Select your location under the "Order Information" section and enter the organization's phone number, if required.

(iv) Select the required individual service(s) in the dropdown menu under the "Select Services" section. If both the Public Safety Verification Check and the Police Information Check are required, select the Sterling BackCheck Package One (with electronic identity verification). Once selected, both the Public Safety Verification Check and the Police Information Check should have a grey check mark beside them.

(v) Scroll down to the bottom and click the blue "Submit" button. The employee proposed to perform Work under this Contract within City facilities will be invited to complete their security clearance.

(vi) The employee will receive the invitation and must click on the link and complete their Public Safety Verification Check and/or Police Information Check.

(vii) The results of the Public Safety Verification Check and/or Police Information Check will go directly to the City of Winnipeg and to the authorized individual of the contracting company within twenty-four (24) hours.

(e) Any questions related to the Sterling BackCheck process can be directed to Linda Ferens at 204-999-0912 or by email at: linda.ferens@sterlingcheck.com OR managedsupport@sterlingcheck.com

F1.1.2 The Police Information Check must be obtained from one of the following:

(a) Sterling BackCheck;

(i) See F1.1.1(a) thru (e) for instructions on how to set up an account and submit individuals for security checks; or

(b) A police service having jurisdiction at his/her place of residence;

(i) The original Police Information Check (Form P–612) will be provided by the Winnipeg Police Service to the individual applicant. The original has a validation sticker from the Winnipeg Police Service in the top right hand corner.

(ii) The applicant shall provide the original Police Information Check (Form P–612) to the Contract Administrator; or

(c) Commissionaires (Manitoba Division);

(i) Forms to be completed can be found on the website at: https://www.commissionaires.ca/en/manitoba/home

(ii) The applicant shall provide the original Police Information Check to the Contract Administrator; or

(d) FASTCHECK Criminal Record & Fingerprint Specialists;

(i) Forms to be completed can be found on the website at: https://myfastcheck.com

(ii) The applicant shall provide the original Police Information Check to the Contract Administrator.

F1.2 Any individual for whom a Public Safety Verification Check and/or a Police Information Check is not provided will not be permitted to perform any Work.

F1.3 Individuals for whom a Public Safety Verification Check indicates “CLEAR” and a Police Information Check demonstrates no previous convictions or pending charges will be permitted to perform Work as specified in F1.1.

F1.4 Individuals for whom a Public Safety Verification Check does not indicate “CLEAR” and/or a Police Information Check demonstrates previous convictions or pending charges may not be permitted to perform any Work as specified in F1.1.

(a) Previous convictions or pending charges may be investigated and a determination will be made by the City as to whether the individual will be permitted to perform any Work.

(b) Convictions or pending charges that may preclude an individual from performing any Work include but are not limited to:

(i) convictions or pending charges related to property offences; and/or

(ii) convictions or pending charges related to crimes against another person.

(c) Where additional investigation related to a Public Safety Verification Check or a Police Information Check is required by the City, no extension to critical stages, Substantial Performance, or Total Performance, as applicable, will be provided.

(d) Additional investigation by the City may take upwards of six (6) weeks.

F1.5 Prior to the award of Contract, and during the term of the Contract, if additional or replacement individuals are proposed to perform Work within City facilities, the Contractor shall supply the Contract Administrator with a Public Safety Verification Check and a Police Information Check satisfactory to the City obtained not earlier than one (1) year prior to the Submission Deadline, or a certified true copy thereof, for each individual proposed to perform the Work.

F1.6 Any Public Safety Verification Check and Police Information Check determined to be satisfactory to the City will be deemed valid for the duration of the Contract subject to a repeated records search as hereinafter specified.

F1.7 Notwithstanding the foregoing, at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated Public Safety Verification Check and/or a Police Information Check. Any individual who fails to provide a Public Safety Verification Check and/or a Police Information Check satisfactory to the City as a result of a repeated records search will not be permitted to continue to perform any Work as specified in F1.1.

APPENDIX A

Geotechnical Soil Report

88003976

T.P.

SOIL MECHANICS INVESTIGATION,
PROPOSED RESERVOIR AND PUMPING STATION
WAVERLY STREET, WILKES AVENUE,
CITY OF WINNIPEG, MANITOBA :

A report prepared for

THE ENGINEERING DEPARTMENT OF THE

CITY OF WINNIPEG,

Manitoba

by

B A R A C O S A N D M A R A N T Z

Consulting Engineers

Winnipeg, Manitoba April 1958

SOIL MECHANICS INVESTIGATION
PROPOSED RESERVOIR AND PUMPING STATION
WAVERLY STREET, WILKES AVENUE
CITY OF WINNIPEG, MANITOBA

At the request of the Engineering Department of the City of Winnipeg, a soil mechanics investigation was made for the proposed reservoir and pumping station to be located at the property bounded by Waverly Street, Wilkes Avenue, Lottie Street and Edderton Avenue as shown in Drawing no. 1. The purposes of the investigation were to determine soil conditions at the site and to make recommendations as to bearing capacities, settlements, reservoir side slopes, and other factors related to soil conditions. It was understood that the reservoir would be of the open type. The investigation was commenced in December 1957.

PROCEDURE

Six test holes were advanced with a power auger 16 inch in diameter, at the locations shown in Drawing no 2. At regular intervals of depth of about 5 ft, undisturbed 2 or 3 inch soil samples were obtained by hydraulically advancing thin wall Shelby tubes into the soil. In addition moisture content and bulk soil samples were obtained at intermediate depths. The holes were advanced to depths of 36.5 to 40.5 ft where further penetration was stopped by a mixture of silt, rockflour, sand and gravel.

The samples were tested at the University of Manitoba Civil Engineering Soil Testing Laboratories. Unconfined compression, consolidation, and undisturbed density tests were performed on the undisturbed samples mainly from test holes 4 and 6. Because all six test holes showed very similar soil conditions, only moisture content and visual examination tests were performed for confirmation on the remaining undisturbed samples. On representative samples, plastic and liquid limit tests were performed. Representative samples were also tested for sulphate content detrimental to concrete employing ordinary cement. These latter tests were performed by the National Testing Laboratories of Winnipeg.

RESULTS OF TESTS

The results of the test holes and laboratory tests are given on the Test Hole Log Sheet, Drawing no. 2. Laboratory test results are further summarized in the appended reports from the University and National Testing Laboratories.

All the test holes showed a covering layer about a foot or less thick of black organic silty clay except for test hole 3 where the top 3 ft consisted of a stiff dark grey silty clay. In test holes 1 and 2, the organic soil was underlain by a thin layer of brown silty clay followed by a tan silt extending to about the 3 ft depth. In test holes 4 and 5, the organic soil was immediately underlain by the tan silt. Test holes 3 and 6 did not show the tan silt layer.

Below the soils mentioned above, a brown varved clay

was encountered. The varves are the result of many closely spaced, thin horizontal layers of silt found in the clay. This material extended to a depth of 20 to 25 ft. It contained a layer of about a foot thick of soft orange colored silt found at depths ranging from 5 to 7 ft. The brown varved clay was found to be stiff to medium stiff as indicated by unconfined compression strengths ranging from 1700 to 3180 lb per sq ft. One low value of 1285 lb per sq ft obtained on a sample from test hole 4, depth 10 ft, and probably reflects a weakness due to pockets of gypsum crystals. These pockets can appreciably affect the strength of a small sample, but because of their small size have no appreciable affect on bearing capacities.

The "nuggety" structure found to a depth of about 6 ft in the brown varved clay is due to numerous fissures attributed to past volume changes of the clay. These occur with seasonal changes in moisture content. That the clay is susceptible to excessive swelling on wetting, and shrinking on drying is confirmed by the very high liquid limit values of 72 to 85, and plastic limits of 23 to 27 associated with such soils, and by the results of the consolidation tests.

Below the brown varved clay, and extending to a depth of about 33 to 38 ft a grey clay was encountered. This material was quite similar to the overlying brown clay except for color and a noticeable softening with increased

depth. The unconfined strengths ranged from over 2000 lb per sq ft at the top to a low value of about 1000 lb per sq ft at the bottom of the layer. These lower strengths correspond to a higher silt content as indicated by somewhat lower plastic and liquid limits.

Below the grey clay a mixture of silt, rockflour, sand gravel and boulders was encountered in test holes 2, 3, 4 and 5. Test hole 1 showed a soft layer of about 3 ft thick of sandy silt with some gravel, and test hole 6 a layer about a foot thick of sandy clayey silt, occurring in both holes between the grey clay and the underlying mixture of silt, rockflour, sand and gravel.

The silt, rockflour, sand, gravel and boulder mixture is known to be a glacial deposit. The top 2 to 7 ft of this material was soft and had a "putty-like" consistency. At a depth ranging from 37 to 40.5 this glacial deposit was found to be too hard, or to contain sufficient coarse material to prevent further auger penetration. This hard material is locally described as "hardpan".

ANALYSIS AND RECOMMENDATIONS

The principal foundation design problems for the proposed water reservoir and pumping station are considered to be as follows:

(1) The determination of the safe side slopes to be used on the sides of the reservoir. For this purpose, Graph I was prepared showing the safety factor for various slopes. The 10 ft high dyke and the 23 ft total depth of the reservoir

are proposed values as given by the City Engineering Department. The safety factors were obtained using tables based on the sliding circle method of analysis for the worse case of the reservoir being empty. The shearing strength values used for the analysis were based on one half of the unconfined compression strengths applicable for saturated fine grain soils and in addition suitably reduced to take into account the effects of shrinkage cracks. (Practically all the soils encountered were saturated). Under this assumption a safety factor no less than about 1.5 as given by a slope of at least 3 horizontal to 1 vertical has been recommended.

(2) The type of lining to be used in the reservoir. Based on the consolidation tests, the clays encountered at the site are susceptible to large volume changes accompanying moisture changes. For example, an undisturbed sample from test hole 4, depth 5 ft, showed a 3.3% increase in height when water was added. It took 2800 lb per sq ft pressure to restore the sample to its original height. Similar but less intense swelling and swelling pressures were obtained on 3 other samples subjected to similar tests. Experience has shown that such changes in volume are by no means uniform and differential movements 2 to 3 or more inches are possible. More volume changes can occur at one location in the reservoir than in another. It is considered that a rigid lining as obtained by using a reinforced concrete slab will tend to prevent out-of-plane differential movements of the lining whereas a flexible lining would tend to warp. If

only a minimum of out-of-plane movement can be tolerated, the reinforced concrete lining is recommended.

It is further considered desirable that the lining be placed directly on the clay without the use of any gravel fill. The reason for this recommendation is that granular fill placed under the lining would tend to collect water. Should the reservoir be emptied at a time when the granular fill was saturated, high hydrostatic pressures could develop under the lining which could cause its movement. This will not occur if granular fill is not used. The clay supporting the lining is of very low permeability as indicated by the consolidation tests. Although the clays will probably be saturated, the moisture would be tightly held in the soil and not free to move. Should it be considered desirable to use granular fill under the upper portions of the reservoir, the granular fill should be under-drained to adequately permit the escape of any water that would tend to collect in the granular fill.

(3) The soft tan silt and the silty clay found in the upper two to three feet at the site are frost-heave susceptible. It is considered desirable that these soils not be used to support the lining of the reservoir in any location subject to frost penetration. In such locations it is recommended that these materials be removed and replaced with compacted clay, or under-drained granular fill to provide at least 6 ft of such non-frost susceptible material. The 6 ft

distance is to be measured perpendicular to any exposed surface subject to below freezing temperature. From experience the 6 ft is considered to be a reasonable estimate of frost penetration. Less than 6 ft of non frost susceptible material may be used if the exposed surface is only subject to freezing for short periods of time and if the depth of frost penetration can be accurately estimated. The removal of the organic top layer and any soft silt found immediately under this layer is also recommended to provide a more satisfactory base for any fill to be placed as a dyke around the reservoir.

It will be noted that a thin horizontal layer of soft orange colored silt was located just below the 5 foot depth. This material is also frost heave susceptible. Its removal is not considered necessary if it is not to be subjected to prolonged freezing. If it is subject to freezing, its removal or a means of under-draining this layer is recommended.

(5) For those portions of the reservoir consisting of earth fill, it is recommended that the silt excavated at the site be not used. This material cannot be satisfactorily compacted. If the predominantly clay soils are used, it is recommended that sheep foot compaction be employed, using lifts no greater than 6 inches. It is recommended that the fill be compacted to give 95 to 100% of Proctor Compaction maximum dry densities.

(6) Regarding the excavation for the reservoir, it is desirable to leave the final excavation to required grade until it is possible to immediately proceed with the placing of the reservoir lining. This is to avoid excessive shrinking or swelling of the soil that may accompany dry or wet weather and result in excessive movement of the lining when it is placed and moisture conditions again reach a condition of equilibrium.

(7) Regarding the foundations of the proposed pumping station, three foundation types are possible. If the pumping station can be supported on a single raft foundation, a net bearing value of 2000 lb per sq ft on the brown or grey clay will give a safety factor of about 3. Net bearing values are based on the dead and live loads on the structure including the weight of the foundation less the weight of soil displaced by the structure. The tests indicate that the weight of the soil may be taken as approximately 110 lb per cu ft.

The alternative to a raft foundation are augered cast-in-place concrete piles either as end-bearing on the "hardpan" at 15000 lb per sq ft or as friction piles at 300 lb per sq ft of pile, circumferential area. On the basis of the strength tests the 300 lb per sq ft "friction" value will assure a safety factor of about 3. The 15000 lb per sq ft end-bearing value is commonly used in the Winnipeg area. Experience with samples of the "hardpan" from other sites has shown that this end-bearing value assures a safety factor of at least three. No tests were performed on the "hardpan"

from the reservoir site as a diamond drill would have been required to obtain the necessary samples.

The piles are recommended in preference to the raft foundation if very little settlement or heave can be tolerated. Whether end-bearing or friction piles are employed depends on the pile lengths and diameters employed. If the pump station extends to considerable depth, the possible lengths of friction piles may be insufficient to develop an economical pile supporting value. It is recommended that both friction and end-bearing piles be considered and selection based on economy. If possible vertical movements of about one inch can be tolerated, the raft foundation will offer an economical alternative to the piles.

(8) The results of the sulphate content tests of the soil show contents as high as 586 ppm. This value and the occurrence of visible gypsum (calcium sulphate) pockets in the soil are considered sufficient evidence that the use of calicrete cement is warranted for all concrete in contact with the soil.

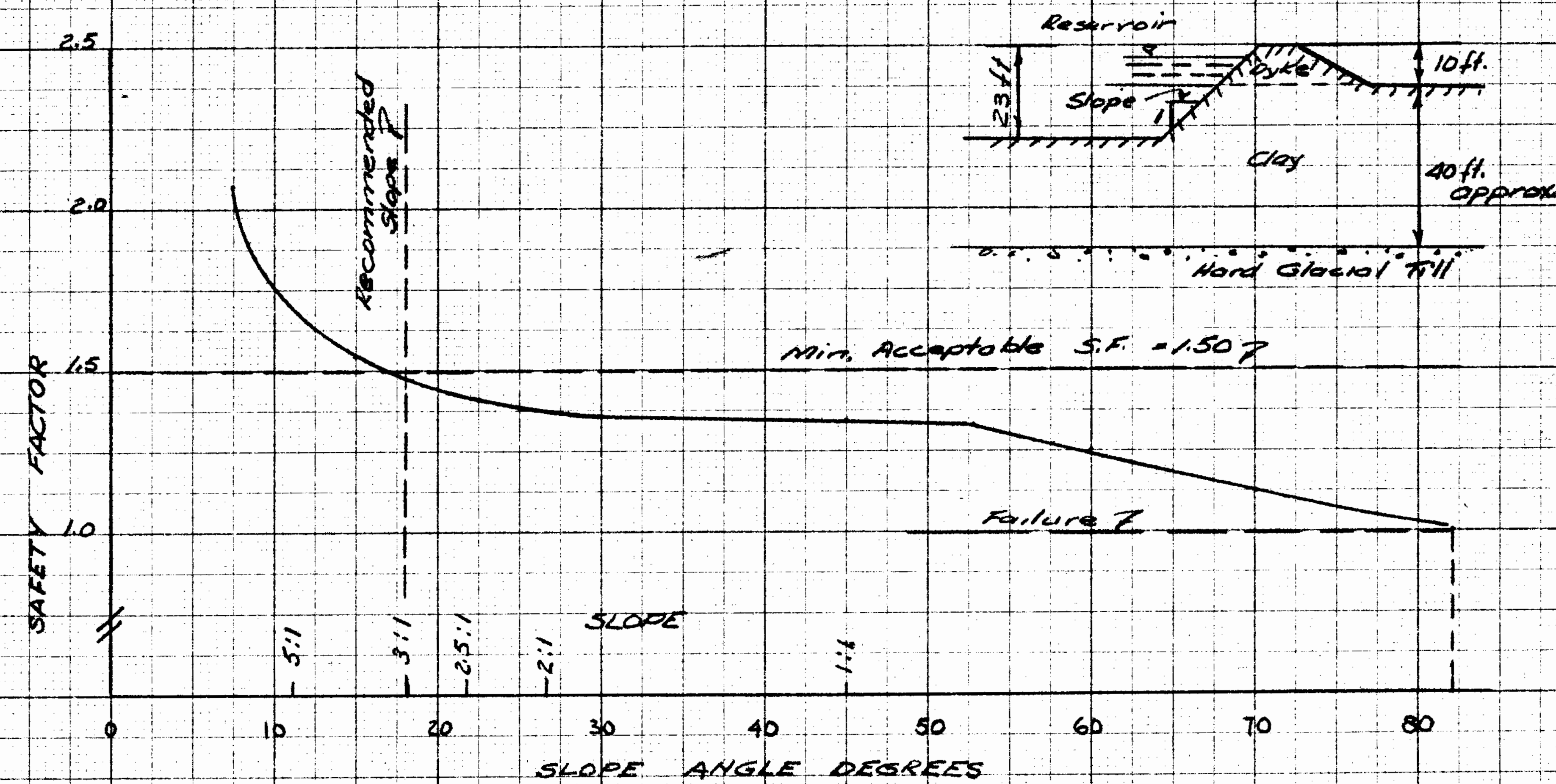
Submitted April 12, 1958.

A. Baracos

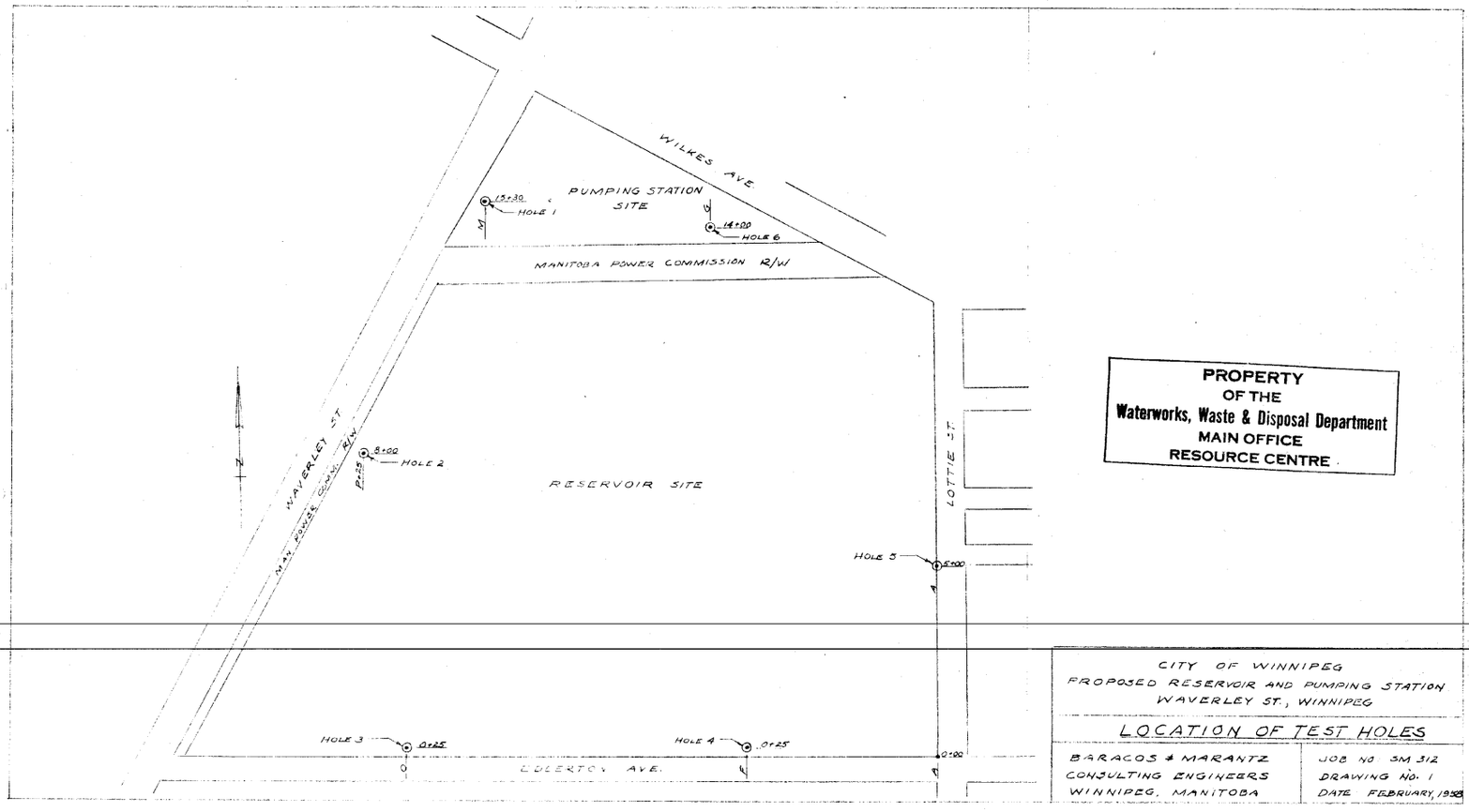
A. Baracos, P. Eng.
for BARACOS AND MARANTZ

GRAPH 7 – SAFETY FACTOR VS. SLOPE ANGLE.

PROPOSED WATER RESERVOIR
WAVERLY ST. WINNIPEG



GB. APRIL/58

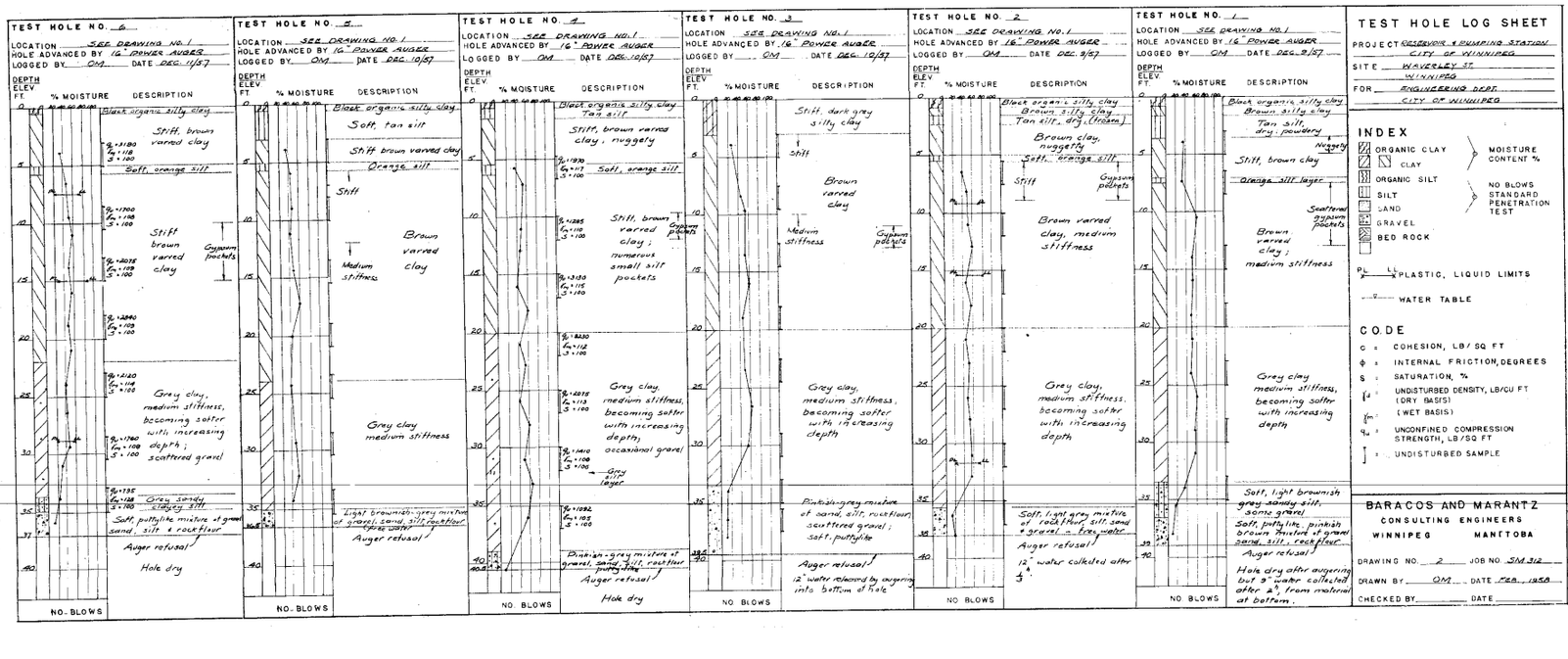


CITY OF WINNIPEG
PROPOSED RESERVOIR AND PUMPING STATION
WAVERLEY ST., WINNIPEG

LOCATION OF TEST HOLES

BARACOS & MARANTZ
CONSULTING ENGINEERS
WINNIPEG, MANITOBA

JOB NO. SM 312
DRAWING NO. 1
DATE FEBRUARY, 1958


TEST HOLE NO. 6
LOCATION SEE DRAWING NO. 1
HOLE ADVANCED BY 16" POWER AUGER
LOGGED BY OM DATE DEC. 11/57
DEPTH ELEV FT.
% MOISTURE
DESCRIPTION
Black organic silty clay
Stiff, brown varved clay
Soft, orange silt
Stiff brown varved clay
Gypsum pockets
Grey clay, medium stiffness, becoming softer with increasing depth; scattered gravel
Grey sandy clayey silt
Soft, puttylike mixture of gravel, sand, silt & rock flour
Auger refusal
Hole dry
NO. BLOWS
TEST HOLE NO. 5
LOCATION SEE DRAWING NO. 1
HOLE ADVANCED BY 16" POWER AUGER
LOGGED BY OM DATE DEC. 10/57
Black organic silty clay
Soft, tan silt
Stiff, brown varved clay
Orange silt
Stiff
Medium stiffness
Brown varved clay
Grey clay medium stiffness
Light brownish-grey mixture of gravel, sand, silt, rock flour
Auger refusal
NO. BLOWS
TEST HOLE NO. 4
LOCATION SEE DRAWING NO. 1
HOLE ADVANCED BY 16" POWER AUGER
LOGGED BY OM DATE DEC. 10/57
Black organic silty clay
Tan silt
Stiff, brown varved clay; nuggety
Soft, orange silt
Stiff, brown varved clay; numerous small silt pockets
Gypsum pockets
Grey clay, medium stiffness, becoming softer with increasing depth; occasional gravel
Grey layer
Brownish-grey mixture of gravel, sand, silt, rock flour, putty like
Auger refusal
Hole dry
NO. BLOWS
TEST HOLE NO. 3
LOCATION SEE DRAWING NO. 1
HOLE ADVANCED BY 16" POWER AUGER
LOGGED BY OM DATE DEC. 10/57
Stiff, dark grey silty clay
Stiff
Brown varved clay
Medium stiffness
Gypsum pockets
Grey clay, medium stiffness, becoming softer with increasing depth
Brownish-grey mixture of sand, silt, rock flour, scattered gravel; soft, puttylike
Auger refusal
12" water reboard by augering into bottom of hole
NO. BLOWS
TEST HOLE NO. 2
LOCATION SEE DRAWING NO. 1
HOLE ADVANCED BY 16" POWER AUGER
LOGGED BY OM DATE DEC. 9/57
Black organic silty clay
Brown silty clay
Tan silt, dry, (frozen)
Brown clay, nuggety
Soft, orange silt
Stiff
Gypsum pockets
Brown varved clay, medium stiffness
Grey clay, medium stiffness, becoming softer with increasing depth
Soft, light grey mixture of rock flour, silt, sand & gravel - trace water
Auger refusal
12" water collected after 4 hrs.
NO. BLOWS
TEST HOLE NO. 1
LOCATION SEE DRAWING NO. 1
HOLE ADVANCED BY 16" POWER AUGER
LOGGED BY OM DATE DEC. 9/57
Black organic silty clay
Brown silty clay
Tan silt, dry, powdery
Nuggety
Stiff, brown clay
Orange silt layer
Scattered gypsum pockets
Brown varved clay; medium stiffness
Grey clay medium stiffness, becoming softer with increasing depth
Soft, light brownish grey sandy silt, some gravel
Soft, puttylike, brownish grey mixture of gravel, sand, silt, rock flour
Auger refusal
Hole dry after augering but 9" water collected after 2 hrs. from material at bottom.
NO. BLOWS
TEST HOLE LOG SHEET
PROJECT RESERVOIR & PUMPING STATION CITY OF WINNIPEG
SITE WAVERLEY ST. WINNIPEG
FOR ENGINEERING DEPT. CITY OF WINNIPEG
INDEX
ORGANIC CLAY
CLAY
ORGANIC SILT
SILT
SAND
GRAVEL
BED ROCK
MOISTURE CONTENT %
NO BLOWS STANDARD PENETRATION TEST
PL LL PLASTIC, LIQUID LIMITS
WATER TABLE
CODE
C = COHESION, LB/SQ FT
Φ = INTERNAL FRICTION, DEGREES
S = SATURATION, %
γd = UNDISTURBED DENSITY, LB/CU FT (DRY BASIS)
γm = (WET BASIS)
qu = UNCONFINED COMPRESSION STRENGTH, LB/SQ FT
= UNDISTURBED SAMPLE
BARACOS AND MARANTZ
CONSULTING ENGINEERS
WINNIPEG MANITOBA
DRAWING NO. 2 JOB NO. SM 312
DRAWN BY OM DATE FEB. 1958
CHECKED BY DATE

File No. SM 312

LABORATORY TEST SUMMARY SHEET

Test Hole No.	Depth ft.	Sample No.	Moisture Content %	Degree of Saturation %	Specific Gravity	Moist Density lb/cu. ft.	Dry Density lb/cu. ft.	Strength Tests - Lateral Confining Pressure psi	Strength Tests - Deviator Stress at Failure psf	Strength Tests - Angle of Internal Friction Degrees	Strength Tests - Cohesion lb/sq. ft.	M.I.T. Grain size Distribution - Clay %	M.I.T. Grain size Distribution - Silt %	M.I.T. Grain size Distribution - Sand %	M.I.T. Grain size Distribution - Gravel %	Liquid Limit	Plastic Limit	Plasticity Index	Description / Comments
1	3		34.6																See Test Hole Log Sheet
	6.5		32.3																
	10.5		62.0																
	13		51.7																
	16		54.4																
	18		49.8																
	21		51.7																
	23		48.0																
	26		61.4																
	28		55.7																
	31		56.0																
	33		34.5																
	35.5		15.1																
	38		10.1																

Project RESERVOIR & PUMP STATION, WAVERLEY ST., WINNIPEG

Tests Requested by BARACOS & MARANTZ

Address 551 McNAUGHTON AVE. WINNIPEG

Date Submitted FEBRUARY, 1958 Checked by

SOIL MECHANICS LABORATORY
DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF MANITOBA
FORT GARRY MANITOBA

File No. SM 312

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2	5.5		38.6																See Test Hole Log Sheet
	5.5-12															72	25	47	
	8		49.0																
	10		51.8																
	12-20															79	26	53	
	13		60.0																
	15		45.7																
	18		56.0																
	20		44.7																
	23		51.4																
	25		48.4																
	28		53.2																
	28-35															71	22	49	
	30		55.3																
	33		54.6																
	35		12.6																
	38		18.6																

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3	3		26.9																See Test Hole Log Sheet
	7.5		46.2																
	9.5		53.6																
	12.5		52.0																
	16		59.8																
	18		46.7																
	22.5		51.3																
	26.5		62.9																
	29		54.7																
	33		13.0																
	35.5		11.0																
	38		11.4																

Project RESERVOIR & PUMP STATION, WAVERLEY ST. WINNIPEG

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SOIL MECHANICS LABORATORY
DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF MANITOBA
FORT GARRY MANITOBA

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Test Hole No.	Depth ft.	Sample No.	Moisture Content %	Degree of Saturation %	Specific gravity	Moist Density lb/cu. ft.	Dry Density lb/cu. ft.	Strength Tests - Lateral Confining Pressure psi	Strength Tests - Deviator Stress at Failure psf	Strength Tests - Angle of Internal Friction Degrees	Strength Tests - Cohesion lb/sq. ft.	M.I.T. Grain size Distribution - Clay %	Silt %	Sand %	Gravel %	Liquid Limit	Plastic Limit	Plasticity Index	Description Comments.
4	4.8		34.8	100		117	87	0	1970										See Test Hole Log Sheet
	7		51.7																
	10		48.3	100		110	74	0	1285										
	13		46.2																
	15		38.1	100		115	83	0	3130										
	18		59.6																
	20		42.6	100		112	79	0	3230										
	22.5		53.4																
	25		40.5	100		113	80	0	2075										
	28		60.4																
	30		50.4	100		108	72	0	1410										
	33		65.6																
	35		56.2	100		105	67	0	1092										
	40.5		11.2																

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5	3		34.5																See Test Hole Log Sheet
	6		46.3																
	8		48.3																
	11		43.2																
	13.5		49.3																
	17		61.0																
	19		45.4																
	23.5		41.0																
	28.5		47.8																
	32		54.0																
	35		41.8																

Project RESERVOIR & PUMP STATION, WAVERLEY ST. WINNIPEG

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6	3		33.8	100		118	88	0	3180										See Test Hole Log Sheet
	4-11															73	23	50	
	6.5		46.5																
	8.5		50.6	100		108	72	0	1700										
	11		58.3																
	11-18															85	27	58	
	13		50.4	100		109	72	0	2075										
	16		55.2																
	18		46.8	100		109	74	0	2840										
	21		52.7																
	23		41.4	100		114	99	0	2120										
	25-33															58	20	38	
	28.5		48.0	100		109	74	0	1760										
	26.5		44.4																
	31		30.0																
	33		24.5	100		128	103	0	795										
	36		11.9																

Project RESERVOIR & PUMP STATION, WAVERLEY ST., WINNIPEG

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SOIL MECHANICS LABORATORY
DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF MANITOBA
FORT GARRY MANITOBA

J. SILL, President

Phone WH 3-0061

THE NATIONAL TESTING LABORATORIES LIMITED

223 JAMES AVENUE

Winnipeg 2, Man.

Report ON 5 SAMPLES OF SOIL.

Received from BARACOS & MARANTZ

Laboratory No. M-977

For SOIL ALKALI.

Date JANUARY 7, 1958

Reported to BARACOS & MARANTZ, 545 MONTROSE ST., WINNIPEG, MAN.

SM 512 HOLE 6	SULPHATE CONTENT OF 10% AQUEOUS ACID EXTRACT
DEPTH 1/2 TO 4'	509 PPM
4 TO 11'	586 "
11 TO 18'	226 "
18 TO 24'	551 "
25 TO 33'	344 "

NOTE: SULPHATE CONTENTS IN EXCESS OF 350 PPM ARE INJURIOUS TO CONCRETE.

THE NATIONAL TESTING LABORATORIES LIMITED

Gordon C Sandilands

GCL/vsk

CONSOLIDATION TEST RESULTS

SM-312

Specific Gravity of Soil Solids G_s = 2.7 Height of Soil Solids H_s = .301

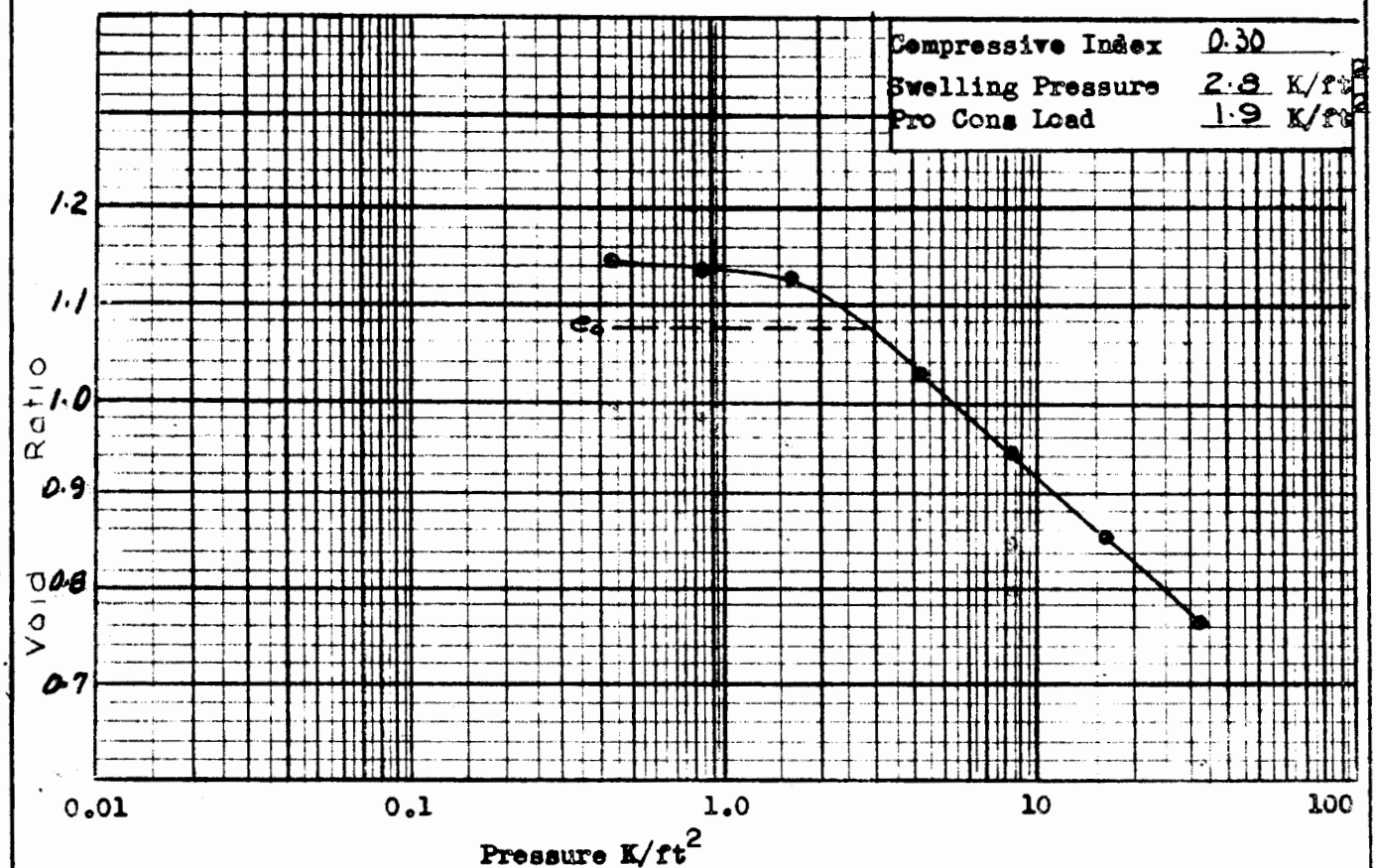
Void Ratio e (End) = .765

Void Ratio e(Start) = 1.074

Void Ratio e(Start Dimensions) = 1.075

e(End) = W%(End) x G_s $\quad H_s = \frac{\text{Wt. Soil}}{G_s \times \text{Area} \times 2.54}$ ins. $\quad$ e = previous e $\pm \frac{\text{Defl.}}{H_s}$

Time Interval	Load on Pan (lbs)	Corr Dial Reading (ins)	Deflection (ins)	Deflection / H_s	Void Ratio e	Pressure K/ft^2
0	0	.4000	.0929	.309	1.074	.0
47	½	.4209	.1138	.378	1.143	.44
48	1	.4176	.1105	.368	1.133	.85
24	2	.4086	.1015	.338	1.103	1.67
48	5	.3848	.0777	.258	1.023	4.15
24	10	.3613	.0542	.180	0.945	8.28
22	20	.3352	.0281	.094	0.859	16.50
45	40	.3071	.0000	.000	0.765	33.00



SOIL MECHANICS LABORATORY
The University of Manitoba
Dept. of Civil Engineering
Fort Garry Manitoba

Project WPG. WATER RESERVOIR
Site
Sample T-63 Hole 4 Depth 4.8
Location
Technician H.D. WIEBE Date JAN. 14. 58.

CONSOLIDATION TEST RESULTS

SM - 312

Specific Gravity of Soil Solids G_s = 2.72 Height of Soil Solids H_s = 2.54

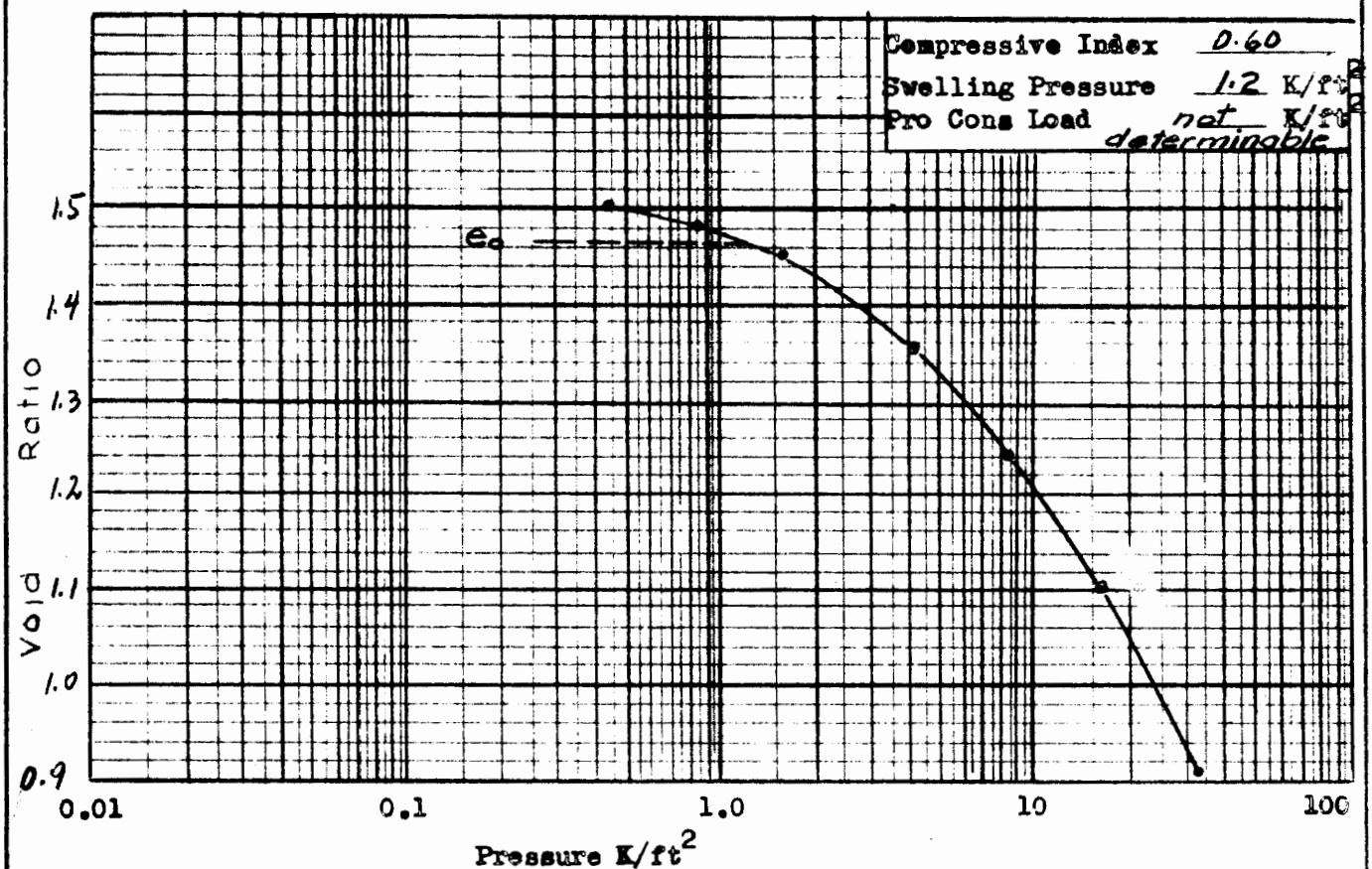
Void Ratio e (End) = .908

Void Ratio e(Start) = 1.462

Void Ratio e(Start Dimensions) = 1.450

e(End) = W%(End) x G_s $\quad H_s = \frac{\text{Wt. Soil}}{G \times \text{Area} \times 2.54}$ ins. $\quad$ e = previous e $\pm \frac{\text{Defl.}}{H_s}$

Time Interval	Load on Pan (lbs)	Corr Dial Reading (ins)	Deflection (ins)	Deflection / H_s	Void Ratio e	Pressure K/ft^2
0	0	.4000	.1405	.554	1.462	.0
46	1/4	.4099	.1504	.594	1.502	.44
48	1	.4058	.1463	.576	1.484	.85
24	2	.3979	.1384	.545	1.453	1.67
48	5	.3737	.1142	.450	1.358	4.15
24	10	.3469	.0874	.344	1.242	8.28
24	20	.3084	.0489	.193	1.101	16.50
45	40	.2595	.0000	.000	0.908	33.00



SOIL MECHANICS LABORATORY
The University of Manitoba
Dept. of Civil Engineering
Fort Garry Manitoba

Project WPG. WATER RESERVOIR
Site
Sample T-60 Hole 4 Depth 10'
Location
Technician H. D. WIEBE Date JAN. 14.58

CONSOLIDATION TEST RESULTS

S14 - 312

Specific Gravity of Soil Solids G_s = 2.7 Height of Soil Solids H_s = .265

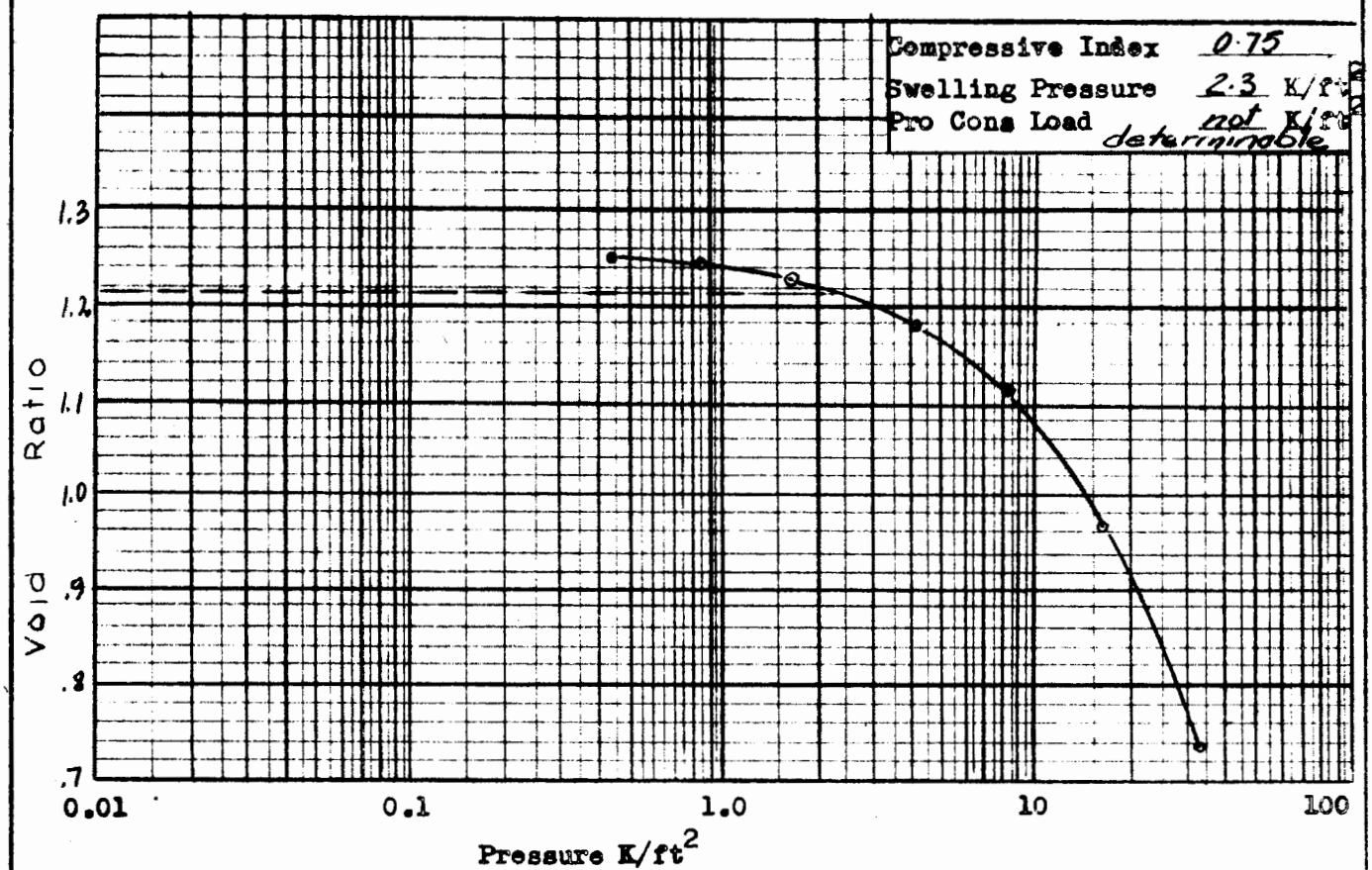
Void Ratio e (End) = .737

Void Ratio e(Start) = 1.214

Void Ratio e(Start Dimensions) = 1.350

e(End) = W%(End) x G_s $\quad H_s = \frac{\text{Wt. Soil}}{G_s \times \text{Area} \times 2.54}$ ins. $\quad$ e = previous e $\pm \frac{\text{Defl.}}{H_s}$

Time Interval	Load on Pan (lbs)	Corr Dial Reading (ins)	Deflection (ins)	Deflection / H_s	Void Ratio e	Pressure K/ft^2
0	0	.4000	.1262	.477	1.214	.0
44	½	.4099	.1361	.514	1.251	.44
48	1	.4079	.1341	.507	1.244	.85
24	2	.4037	.1299	.490	1.227	1.67
48	5	.3909	.1171	.442	1.179	4.15
24	10	.3737	.0999	.377	1.114	8.28
22	20	.3348	.0610	.230	0.967	16.50
45	40	.2738	.0000	.000	0.737	33.00



SOIL MECHANICS LABORATORY
The University of Manitoba
Dept. of Civil Engineering
Fort Garry Manitoba

Project WPG. WATER RESERVOIR
Site
Sample T-108 Hole 4 Depth 15'
Location
Technician H.D. WIEBE Date JAN. 14.58

CONSOLIDATION TEST RESULTS

SM-312

Specific Gravity of Soil Solids G_s = 2.7 Height of Soil Solids H_s = .298

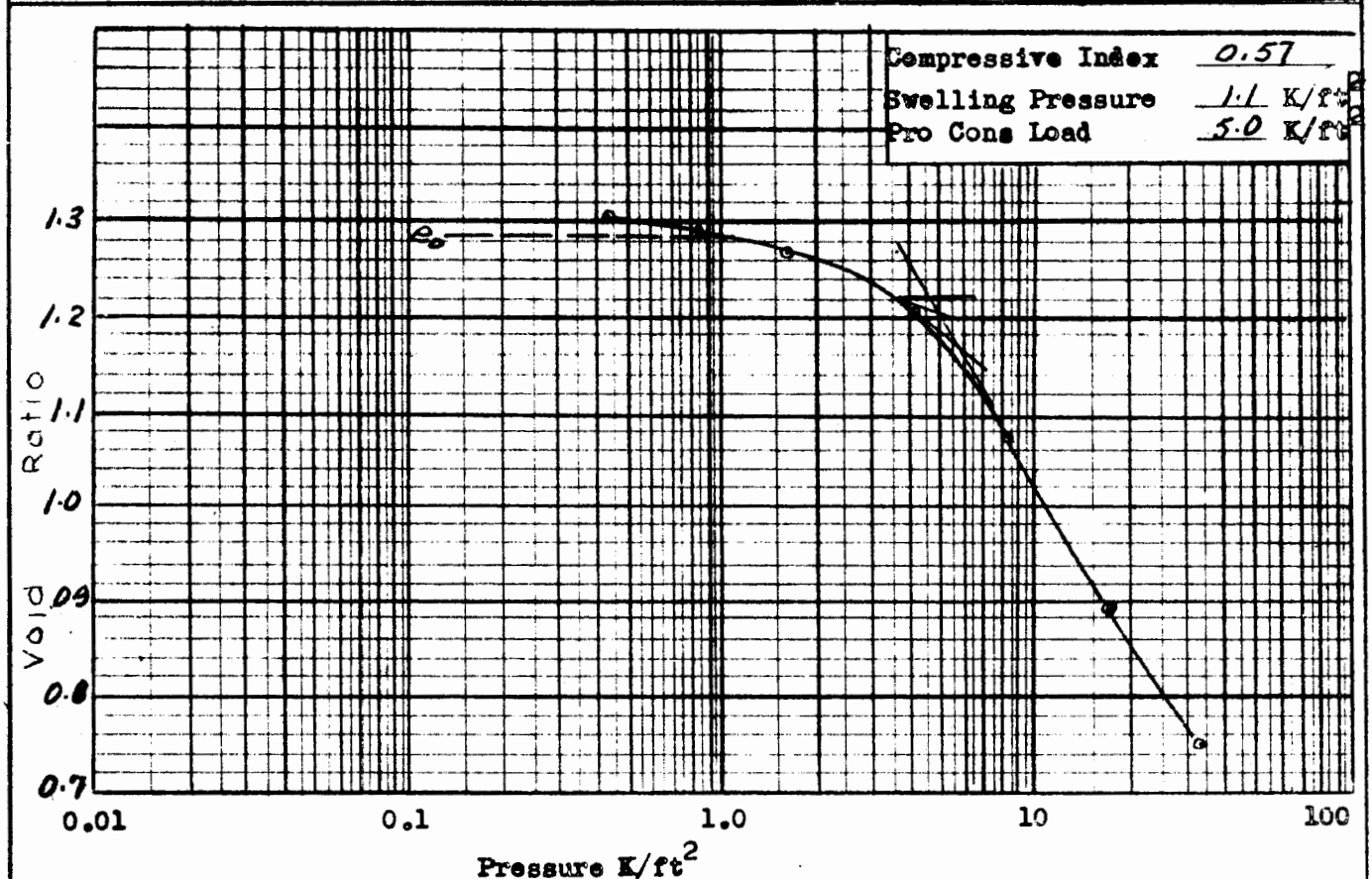
Void Ratio e (End) = .75

Void Ratio e(Start) = 1.282

Void Ratio e(Start Dimensions) = 1.08

e(End) = W%(End) x G_s $\quad H_s = \frac{\text{Wt. Soil}}{G_s \times \text{Area} \times 2.54}$ ins. $\quad$ e = previous e $\pm \frac{\text{Defl.}}{H_s}$

Time Interval	Load on Pan (lbs)	Corr Dial Reading (ins)	Deflection (ins)	Deflection / H_s	Void Ratio e	Pressure K/ft^2
0	0	.4000	.1582	.532	1.282	00
43	½	.4069	.1651	.554	1.304	.44
48	1	.4039	.1621	.544	1.294	.85
24	2	.3967	.1549	.520	1.270	1.67
32	5	.3773	.1355	.454	1.204	4.15
24	10	.3388	.0970	.325	1.075	8.28
22	20	.2848	.0430	.144	0.894	16.50
45	40	.2418	.0000	.000	0.750	33 00



SOIL MECHANICS LABORATORY
The University of Manitoba
Dept. of Civil Engineering
Fort Garry Manitoba

Project WPG. WATER RESERVOIR
Site
Sample T-85 Hole 4 Depth 25'
Location
Technician H. D. WIEBE Date JAN. 14 58

May 20/58 GB

(2.) 3rd para

Pumps at GWWD booster station will deliver 50 Mgd not 42 Mgd. Until booster station is built flow is 28.0 Mgd or 29.1 Mgd.

42 Mgd required for 60 pg supplied thru 2 pressure lines.

42
28
70

(3) 3rd para "should have a storage capacity" should be "would have a storage capacity"

Page 7 - Connecting Reservoirs

Piping between reservoirs for 60 Mgd (ave) = 50 Mgd from pump + 20%

Page 8 - Check losses thru pipes it looks as if entrance loss is 0.27 + Exit loss 0.17

Suggest that on p. 29 3 - that some mention be made of ice on Phelps St reservoirs, its thickness + its effect, + if open water occurs.

APPENDIX B

Hazardous Material Assessments

Client : City of Winnipeg Water and Waste Dept **Site:** W.D. Hurst Pumping Station

Building Number(s):

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 1 **Location Name: Main Building - Vestibule** **Floor: Main-Main Building** **Room #:** **Square ft: 96**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
190	Floor	All	Adhesive/mastic	Surface	N/A	B	N	100	(7)					%	V9500	Presumed Asbestos	Non-Friable
189	Floor	All	Plaster	Edge	Ceramic Tiles	A	Y	100	(5)					%	V9500	[Presumed Asbestos]	Friable

Note: Floor tiles are presumed asbestos containing. KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action				Access		Condition		Sample Number	
(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris	A	Accessible to all building occupants	Good	No visible damage or deterioration.	S####	Sample collected
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition	B	Accessible to maintenance and operations staff without a ladder	Fair	Minor, repairable damage, cracking or deterioration.	V####	Material is visually identified to be identical to S###
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair	C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas	Poor	Irreparable damage or deterioration with exposed and missing material	V0000	Known non-asbestos material
(7)	Management program and surveillance			D	Not normally accessible or without demolition	NOTE: See report for full definitions of action, access and condition		V9000	Material is visually identified to contain asbestos
								V9500	Material is presumed to contain asbestos
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual								Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Date: 13/05/20 16:31:17

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 4 **Location Name: Main Building - Walkway** **Floor: Main-Main Building** **Room #:** **Square ft: 1500**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
195	Floor	All	Adhesive/mastic	Surface	Ceramic Tiles	B	N	100	(7)					%	V9500	Presumed Asbestos	Non-Friable
194	Floor	All	Plaster	Surface	Ceramic Tiles	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
27	Ceiling		Transite	Surface	N/A	C	Y	1497	(7)	1	[6]			SF	V9000	Confirmed Asbestos	Non-Friable

Note: Floor tiles are presumed asbestos containing. Damaged transite cement ceiling finish present. KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 5 **Location Name: Main Building - Landing/Loading Area** **Floor: Main-Main Building** **Room #:** **Square ft: 750**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
36	Ceiling		Transite	Surface	N/A	C	Y	746	(7)	4	[6]			SF	V9000	Confirmed Asbestos	Non-Friable
38	Wall		Transite	Surface	N/A	C	Y	99	(7)	1	[6]			SF	V9000	Confirmed Asbestos	Non-Friable
39	Wall		Transite	Surface	N/A	C	Y	55	(7)					SF	V9000	Confirmed Asbestos	Non-Friable
220	Other	All	Transite	Debris	N/A	A	Y					8	(3)	SF	V9000	Confirmed Asbestos	Non-Friable

Note: July 2019 - 8 asbestos cement ceiling tiles have been placed on the floor. Damaged transite cement wall and ceiling finish present KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 6 **Location Name: Main Building - Walkway** **Floor: Main-Main Building** **Room #:** **Square ft: 120**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
200	Floor	All	Adhesive/mastic	Surface	Ceramic Tiles	A	N	100	(7)					%	V9500	Presumed Asbestos	Non-Friable
199	Floor	All	Plaster	Surface	Ceramic Tiles	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
47	Ceiling		Transite	Surface	N/A	C	Y	117	(7)	3	[6]			SF	V9000	Confirmed Asbestos	Non-Friable

Note: 3 SF of damaged transite ceiling finish present KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action				Access		Condition		Sample Number	
(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris	A	Accessible to all building occupants	Good	No visible damage or deterioration.	S####	Sample collected
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition	B	Accessible to maintenance and operations staff without a ladder	Fair	Minor, repairable damage, cracking or deterioration.	V####	Material is visually identified to be identical to S###
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair	C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas	Poor	Irreparable damage or deterioration with exposed and missing material	V0000	Known non-asbestos material
(7)	Management program and surveillance			D	Not normally accessible or without demolition	NOTE: See report for full definitions of action, access and condition		V9000	Material is visually identified to contain asbestos
								V9500	Material is presumed to contain asbestos
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual								Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**

Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**

Location #: 10 **Location Name: Main Building - Pump Room** **Floor: Basement-Main Building** **Room #:** **Square ft: 7700**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
207	Floor	All	Adhesive/mastic	Surface	Ceramic Tiles	A	N	100	(7)					%	V9500	Presumed Asbestos	Non-Friable
206	Floor	All	Plaster	Surface	Ceramic Tiles	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
80	Ceiling		Transite	Surface	N/A	C	Y	5328	(7)	2	[6]			SF	S0006	Confirmed Asbestos	Non-Friable
83	Wall		Transite	Surface	N/A	B	Y	16	(7)					SF	V0006	Confirmed Asbestos	Non-Friable
87	Duct	Generator Exhaust	Metal Over Mag Block	System		C	Y	30						LF	S0003	[Presumed Asbestos]	Non-Friable

Note: O = Phone Booth July 2019 - 2 SF of damaged transite ceiling finish present Magnesia Block on generator exhaust duct is pressumed asbestos containing still until 3 samples had been completed. KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 11 **Location Name: Main Building - Custodian Closet** **Floor: Basement-Main Building** **Room #:** **Square ft: 32**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
210	Floor	All	Adhesive/mastic	Surface	Ceramic Tiles	A	N	100	(7)					%	V9500	Presumed Asbestos	Non-Friable
209	Floor	All	Plaster	Surface	Ceramic Tiles	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
102	Ceiling		Transite	Surface	N/A	C	Y	20	(7)			1	[3]	SF	V9000	Confirmed Asbestos	Non-Friable

Note: Floor tiles are presumed asbestos containing. July 2019 - 1 SF of damaged transite ceiling finish present KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 12 **Location Name: Main Building - Washroom** **Floor: Basement-Main Building** **Room #:** **Square ft: 32**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
214	Floor	All	Adhesive/mastic	Surface	Ceramic Tiles	A	N	100	(7)					%	V9500	Presumed Asbestos	Non-Friable
213	Floor	All	Plaster	Surface	Ceramic Tiles	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
110	Ceiling		Transite	Surface	N/A	C	Y	32	(7)					SF	V9000	Confirmed Asbestos	Non-Friable

Note: KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar was also sampled and determined to be non ACM.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 17 **Location Name: North Resevoir Building** **Floor: Main-North Resevoir Building** **Room #:** **Square ft: 300**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
217	Wall	All	Plaster	Surface	Preformed Block	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
180	Wall		Vermiculite	Insulation	Masonry	B	N	100	(7)					%	V9500	Presumed Asbestos	Friable

Note: Masonry walls suspect to contain asbestos containing vermiculite insulation Grout (masonry mortar/cement/plaster) on cinder block walls is presumed asbestos containing. Roof sections needs to be tested prior to any renovation or demolition activities.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 18 **Location Name: B Pit Building** **Floor: Main-B Pit Building** **Room #:** **Square ft: 150**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
218	Wall	All	Plaster	Surface	Preformed Block	A	Y	100	(5)					%	V9500	Presumed Asbestos	Friable
181	Wall		Vermiculite	Insulation	Masonry	B	N	100	(7)					%	V9500	Presumed Asbestos	Friable

Note: Masonry walls suspect to contain asbestos containing vermiculite insulation Grout (masonry mortar/cement/plaster) on cinder block walls is presumed asbestos containing. Roof sections needs to be tested prior to any renovation or demolition activities.

Legend:

Action

(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair
(7)	Management program and surveillance		
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual			

Access

A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible or without demolition

Condition

Good	No visible damage or deterioration.
Fair	Minor, repairable damage, cracking or deterioration.
Poor	Irreparable damage or deterioration with exposed and missing material
NOTE: See report for full definitions of action, access and condition	

Sample Number

S####	Sample collected
V####	Material is visually identified to be identical to S###
V0000	Known non-asbestos material
V9000	Material is visually identified to contain asbestos
V9500	Material is presumed to contain asbestos
Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

Confirmed Asbestos and Presumed Asbestos Report

Building #: **Building Name: W.D. Hurst Pumping Station** **Surveyor: Jason Combes** **Survey Date: 2006-05-03**
Reassessment Date:2019-07-02 **Reassessment Surveyor: Lambert Cruz**
Location #: 19 **Location Name: Hurst Pump Station Main Building Exterior** **Floor: NA** **Room #:** **Square ft:**

Observ. #	System	Component	Material	Item	Covering	Access	Visible	Condition, Quantity & Action						Units	Sample	Hazard	Friability
								Good		Fair		Poor					
187	Wall	Window Liner	Caulking	Exterior	N/A	A	Y	100	(7)					%	S0010	Confirmed Asbestos	Non-Friable

Note: KGS Group determined the walls do not contain vermiculite as per their report dated October 29, 2019. Brick mortar and roofing materials were also sampled and determined to be non ACM. Grout (masonry mortar/cement/plaster) on cinder block walls is presumed asbestos containing. Grout (masonry mortar/cement/plaster) on cinder block walls is presumed asbestos containing. Roof sections needs to be tested prior to any renovation or demolition activities.

Legend:

Action				Access		Condition		Sample Number	
(1)	Clean Up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris	A	Accessible to all building occupants	Good	No visible damage or deterioration.	S####	Sample collected
(3)	ACM removal	(4)	Precautions for Work Which may Disturb ACM in Poor Condition	B	Accessible to maintenance and operations staff without a ladder	Fair	Minor, repairable damage, cracking or deterioration.	V####	Material is visually identified to be identical to S###
(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair	C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas	Poor	Irreparable damage or deterioration with exposed and missing material	V0000	Known non-asbestos material
(7)	Management program and surveillance			D	Not normally accessible or without demolition	NOTE: See report for full definitions of action, access and condition		V9000	Material is visually identified to contain asbestos
								V9500	Material is presumed to contain asbestos
NOTE: Actions in round brackets ( ) are auto-calculated. Actions in square brackets [ ] are manual								Note: Presumed various materials identified in the report are ACM if not sampled.	

Units SF - Square feet LF - Linear feet EA - Each % - Percentage

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October 29, 2019

City of Winnipeg
110-1199 Pacific Avenue
Winnipeg, Manitoba R3E 3S8

Attention: Ms. Alison Weiss, P.Eng.
Senior Project Engineer

Re: Hurst Pumping Station Structural Repairs and Drainage Building Upgrades - Hazardous Materials Assessment

Dear Ms. Weiss:

This report summarizes the results of the Hazardous Materials Assessment conducted at the City of Winnipeg's Hurst Pumping Station and Drainage Building by KGS Group on August 30, 2019, including recommendations for the management of identified hazardous building materials. Building materials assessed relate to materials that may be affected by the current Hurst Pumping Station Structural Repairs and Drainage Building Upgrades project (the Project). Results of the assessment are summarized in Tables 1 and 2. A site photographic log is included in Appendix A and the laboratory Certificates of Analyses are included in Appendix B.

1.0 OBJECTIVE

The objectives of the Hazardous Materials Assessment included the following:

- Determine the presence (or absence) of specific hazardous building materials within building components at the main Pumping Station Building and the Drainage Facility Building that may be affected by the Project;
- Conduct the survey in accordance with the requirements of The Canada Labour Code Part II – Canada Health and Safety Regulations and Manitoba Workplace Safety and Health Regulation 217/2006 (MB Reg. 217/2006);
- Assess for the following hazardous substances/materials that may be affected by the Project:
  - Asbestos; and
  - Lead, mercury arsenic, polychlorinated biphenyls (PCBs), and leachable lead, mercury and arsenic in paint.
  - Provide professional advice and recommendations as to how to deal with the identified substances, notably with respect to the health and safety of workers and others, and waste disposal.

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2.0 SCOPE OF WORK

In order to meet the project objectives, KGS Group completed the following tasks:

- Completion of a Hazardous Materials Assessment, including sampling and laboratory analyses; and
- Preparation of a report summarizing the findings and recommendations of the Hazardous Materials Assessment.

3.0 METHODOLOGY

KGS Group supplied all required labour, materials and equipment to conduct the Hazardous Materials Assessment at the pumping station. Proper sampling techniques and protocols (asbestos and paint) including chain of custody, decontamination and QA/QC procedures followed applicable federal and provincial standards and regulations, including the Manitoba Regulation 217/2006 Workplace Safety and Health Regulation and the Manitoba Guideline for Working with Asbestos (March 2008). All bulk samples for asbestos analysis and paint samples were submitted to Bureau Veritas Laboratory (BV Labs; formerly known as Maxxam Analytics) in Winnipeg, Manitoba, a Standards Council of Canada (SCC) certified testing laboratory and accredited to ISO/IEC 170925:2005. The criteria and guidelines used for assessment of analytical data were clearly established with the laboratory to ensure appropriate detection limits were used.

The methodologies used to identify various hazardous materials at the building are described in the following sections.

3.1 Asbestos-Containing Materials

Building materials in structures constructed prior to the 1990s may contain asbestos containing materials. Asbestos was typically added to insulating materials due to its non-combustibility and flame-retardant properties and was also used as a reinforcing agent due to its strength and flexibility. Materials containing asbestos present a potential exposure risk if the asbestos fibres are released and inhaled.

Based on the age of these buildings, the potential exists for asbestos containing materials. Types and locations of all materials potentially containing asbestos that may require abatement prior to renovation of the buildings were identified using field observations and professional judgment. Three bulk samples per material, per building, were collected, as per the applicable guidelines. Bulk samples were collected at random locations and were representative of the materials sampled. Representative samples of selected building materials suspected of potentially containing asbestos were collected by cutting through all layers of the material to the substrate using appropriate hand tools.

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All samples were stored in appropriately labeled sample bags and were submitted to BV Labs for laboratory analysis of bulk asbestos content. All bulk samples were analyzed using Polarized Light Microscopy (PLM) via the US Environmental Protection Agency (EPA) 600/R-93/116 methodology. The analytical methodologies for PLM are described in detail in the Laboratory Certificate of Analysis (Appendix B). Where the laboratory identified additional layers in a sample, they were separated and analyzed separately.

According to the Manitoba Regulation 217/2006 Workplace Safety and Health Regulation and the Manitoba Guideline for Working with Asbestos (March 2008), asbestos-containing materials are defined as: (a) “a friable material containing 0.1% or greater asbestos”; and (b) “a non-friable material containing 1.0% or greater asbestos by weight.” Laboratory analytical methods used sufficient detection limits to ensure compliance with this guideline. Asbestos waste in Manitoba can only be accepted by authorized Waste Disposal Grounds. Specific disposal criteria, including handling, labeling, and transport applies to asbestos waste (Manitoba Guideline for Asbestos Management, May 2017). Approval for the disposal of asbestos waste at a disposal site must be obtained from the municipal authority before a disposal site is used.

3.2 Paint

Representative paint samples were obtained from each colour of paint observed inside the buildings which may be affected by the renovation. All paint samples were stored in appropriately labeled sample bags and submitted to BV Labs in Winnipeg, Manitoba for laboratory analysis. Each paint sample was analyzed for total lead, mercury, arsenic and PCBs. One paint sample was also analyzed for leachable lead, mercury and arsenic content as it will be disposed of as part of the renovation.

Paint samples were assessed using the federal Surface Coatings Materials Regulations (SOR/2005-109; amended 2011) of the Canada Consumer Product Safety Act (CCPSA; replaces Part 1 and Schedule 1 of the Hazardous Products Act), and The Dangerous Goods and Handling Transportation Act (MR 282/87). According to the federal Surface Coatings Materials Regulations under the CCPSA, the amounts of total lead and mercury in surface coating materials, which include consumer paints, is restricted to 90 mg/kg and 10 mg/kg, respectively. Paints with lead or mercury concentrations greater are considered lead-based and/or mercury-based paints, and should be managed accordingly.

Paints with leachable concentrations of lead, arsenic and mercury above 5 mg/L, 2.5 mg/L and 0.1 mg/L, respectively, are considered “hazardous leachable waste” as outlined in Schedule C of The Hazardous Waste Regulation (MR 195/2015) of The Dangerous Goods Handling and Transportation Act. Hazardous leachable waste, including paint or painted materials are managed in Manitoba in accordance with The Dangerous Goods Handling and Transportation Act (MR 195/2015).

PCB concentrations in paint are limited to 50 mg/kg. Paints with total PCB concentrations greater than 50 mg/kg are considered hazardous waste according to the federal PCB Regulations (SOR/2008-273) and must be managed accordingly.

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4.0 RESULTS AND DISCUSSION

4.1 Asbestos-Containing Materials

A total of six types of materials potentially containing asbestos were identified, including the following materials:

Drainage Facility Building:

- Brick mortar – exterior walls

Pumping Station Building:

- Asphalt roofing membrane – roof
- Red duct mastic – roof ducts
- Black duct mastic – roof ducts
- Roofing tar – roof ducts
- Mortar – interior concrete block wall

Three samples of each material were collected and submitted for laboratory analysis of bulk asbestos content, for a total of 18 samples. Additionally, the laboratory identified multiple layers of several samples which were analysed separately. Laboratory results are summarized in Table 1. Photos of each sample location are included in Appendix A. A copy of the laboratory certificate of analysis is provided in Appendix B.

No asbestos was detected in any of the materials sampled. Laboratory results for asbestos analyses are summarized in Table 1.

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TABLE 1: SUMMARY OF MATERIALS SAMPLED FOR ASBESTOS AT THE HURST PUMPING STATION AND DRAINAGE BUILDING

Building	Sample ID	Sample Description	Sample Location	Asbestos %	Condition
Drainage Facility Building	DF-ACM-01A	Brick Mortar	Exterior Wall - South Side	ND	Good
	DF-ACM-01B		Exterior Wall - NW Corner	ND	Good
	DF-ACM-01C		Exterior Wall - South Side	ND	Good
Pumping Station Building	PS-ACM-01A	Asphalt Roof Membrane	Roof - Centre	ND	Good
	PS-ACM-01B		Roof - Centre	ND	Good
	PS-ACM-01C		Roof - Centre	ND	Good
	PS-ACM-02A	Duct Mastic - Black	Duct Mastic - Red	ND	Fair
		Duct Mastic - Red		ND	
	PS-ACM-02B	Duct Mastic - Black	Roof Duct - West Side	ND	Fair
		Duct Mastic - Red		ND	
		Duct Mastic - Grey		ND	
	PS-ACM-02C	Duct Mastic - Black	Roof Duct - South Side	ND	Fair
		Duct Mastic - Red		ND	
	PS-ACM-03A	Duct Mastic - Black	Roof Duct - East Side	ND	Fair
	PS-ACM-03B		Roof Duct - East Side	ND	Fair
	PS-ACM-03C		Roof Duct - East Side	ND	Fair
	PS-ACM-04A	Roof Tar - Black	Roof - North Side	ND	Good
	PS-ACM-04B		Roof - North Side	ND	Good
	PS-ACM-04C		Roof - North Side	ND	Good
	PS-ACM-05A	Grey Mortar	Interior Wall - South Side	ND	Good
	PS-ACM-05B		Interior Wall - South Side	ND	Good
	PS-ACM-05C		Interior Wall - South Side	ND	Good

Notes:

ND = Not detected. No asbestos fibres were observed.

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Each building was also assessed for the potential presence of vermiculite within concrete block wall cavities. At the Drainage Facility Building it was determined that concrete block walls were not present. At the Pumping Station Building a hole was drilled from the interior on the south side of the building, in the "chlorine storage room". The cavity inspected was empty. The drill hole was repaired following the inspection.

4.2 Paint

A total of three paint samples were collected, as follows:

Drainage Facility Building:

- Brown with blue beneath – fascia

Pumping Station Building:

- Brown with blue beneath – roof ducts
- White – interior walls

All paint samples were analyzed for total lead, arsenic, mercury and PCBs. One sample was additionally analyzed for leachable lead, arsenic and mercury in order to confirm appropriate disposal procedures. Laboratory results for metals in paint are summarized in Table 2.

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TABLE 2: SUMMARY OF PAINTS SAMPLED AT THE HURST PUMPING STATION AND DRAINAGE BUILDING

Sample ID	Description	Location	Total Metals (mg/kg)			Total PCBs (mg/kg)	Leachable Metals (mg/L)		
			Lead L	Arsenic	Mercury		Lead	Arsenic	Mercury
RDL			1.0	2.0	0.10	0.2	0.5	0.5	0.020
DF-LP-01	Brown with blue beneath	Drainage Facility Building - Fascia	**190**	<2.0	**28**	<0.2	-	-	-
PS-LP-01	Brown with blue beneath	Pumping Station Building – Roof Duct	**420**	<2.0	0.3	<0.2	2.2	<0.5	<0.020
PS-LP-02	White	Pumping Station Building – Interior Walls	62	20	9	4.4	-	-	-
The Dangerous Goods and Handling Transportation Act (MR 195/2015)			-	-	-	-	5.0	2.5	0.1
Federal Surface Coating Materials Regulations (SOR/2016-193)			90	-	10	-	-	-	-
Federal *PCB Regulation*			-	-	-	50	-	-	-

4.2.1 Total Metals in Paint

Two of the three paint samples had lead concentrations that exceeded 90 mg/kg, the allowable concentration of lead in paint as per the federal Surface Coatings Materials Regulation (DF-LP-01; PS-LP-01). One of these paints also had a total mercury concentration that exceeded 10 mg/L (DF-LP-01), the allowable concentration of mercury in paint as per the federal Surface Coatings Materials Regulation. The remaining paint sample had metal concentrations that were below the allowable concentrations in paint as per the federal Surface Coatings Materials Regulation.

Confirmed lead-and mercury-based paints were in poor condition (peeling and flaking) and may pose a human health risk primarily from exposure to lead and mercury dust during renovation activities. Proper health and

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safety guidelines and applicable regulations for working with lead and mercury must be followed to reduce exposure to lead and mercury dust, and ensure the safe handling, transportation and disposal of all lead-based and mercury-based materials.

4.2.2 Leachable Metals in Paint

One paint sample was analyzed for leachable metal concentrations, as this was the only paint which may require disposal (PS-LP-01). Leachable lead, arsenic and mercury concentrations were all below The Dangerous Goods and Handling Transportation Act (MR 195/2015) limits of 5.0 mg/L, 2.5 mg/L and 0.1 mg/L, respectively, therefore the paint does not constitute hazardous leachable waste.

4.2.3 PCBS in Paint

All three paint samples were also analyzed for PCB concentrations. None of the paint samples had PCB concentrations above 50 mg/kg, the allowable concentration as per the federal *PCB Regulations*.

5.0 SUMMARY OF HAZARDOUS MATERIALS

Based on the 2019 field and laboratory results, the following hazardous materials were identified within building materials to be affected by the Project at the City of Winnipeg Hurst Pumping Station:

- Lead-based and mercury-based paint (total lead >90 mg/kg, total mercury >10 mg/kg) was identified on the exterior of the Drainage Facility Building (brown with blue beneath). The paint was in poor condition.
- Non-leachable lead-based paint (total lead >90 mg/kg and leachable lead <5 mg/L) was identified on ducts on the roof of the Pumping Station Building (brown with blue beneath). The paint was in poor condition.

6.0 RECOMMENDATIONS

Prior to the commencement of renovation activities at the Hurst Pumping Station, hazardous building materials must be managed according to applicable legislation and guidelines. More specifically, KGS Group makes the following recommendations related to the management of hazardous materials identified at the Hurst Pumping Station:

- Materials coated with non-leachable lead-based and mercury-based paints (>90 mg/kg total lead, >10 mg/kg total mercury) can be disposed of at any regular landfill as construction waste.
- Proper precautions must be taken to protect worker health and safety while working with lead-based and mercury-based paints.

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Prepared By:

(for) Dan Leitch, M.Sc.
Environmental Scientist

DL/jkb
Attached

Approved By:

Gord Siebert, B.Sc., P.Eng.
Senior Project Manager

APPENDIX A

Photographic Log

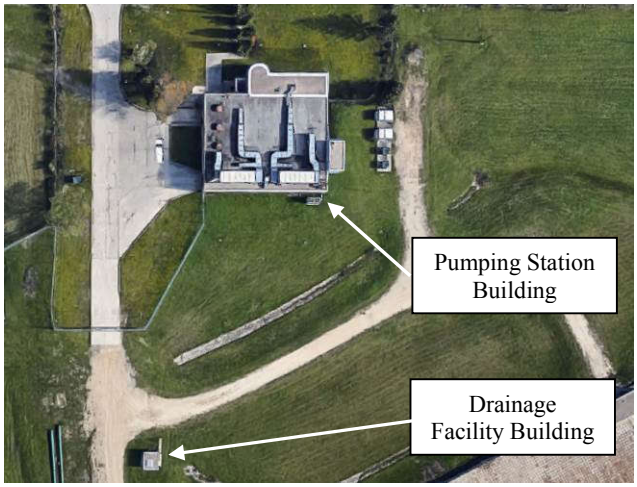


Photo 1. Building locations.

Photo 2. Drainage Facility Building.

Photo 3. Sample location DF-ACM-01A, mortar sample, south exterior wall of Drainage Facility Building.

Photo 4. Sample location DF-ACM-01B, mortar sample, north-west corner of exterior wall of Drainage Facility Building.

Photo 5. Sample location DF-ACM-01C, mortar sample, south exterior wall of Drainage Facility Building.

Photo 6. Sample location PS-ACM-01A/B/C, asphalt roof membrane, roof of Pumping Station Building.

Photo 7. Sample location PS-ACM-02A, red duct mastic (also with black layer), roof of Pumping Station Building.

Photo 8. Sample location PS-ACM-02B, red duct mastic (also with black and grey layers), roof of Pumping Station Building.

Photo 9. Sample location PS-ACM-02C, red duct mastic (also with black layer), roof of Pumping Station Building.

Photo 10. Sample location PS-ACM-03A, black duct mastic, roof of Pumping Station Building.

Photo 11. Sample location PS-ACM-03B, black duct mastic, roof of Pumping Station Building.

Photo 12. Sample location PS-ACM-03C, black duct mastic, roof of Pumping Station Building.

Photo 13. Sample location PS-ACM-04A/B/C, roofing tar, roof of Pumping Station Building.

Photo 14. Sample location PS-ACM-05A, grey mortar, interior wall of “choline storage room” in Pumping Station Building.

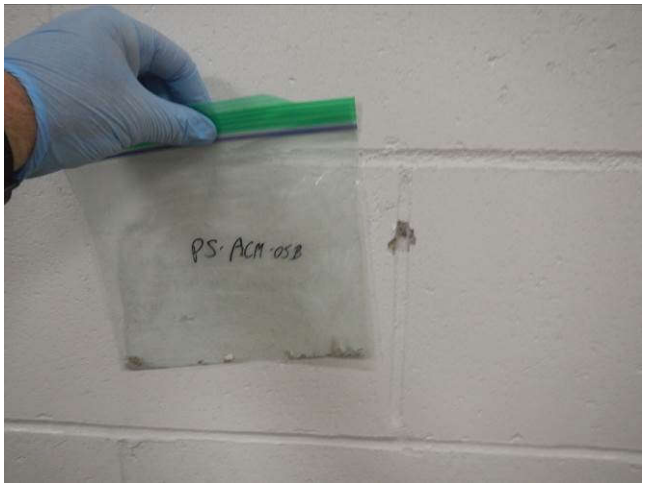


Photo 15. Sample location PS-ACM-05B, grey mortar, interior wall of “choline storage room” in Pumping Station Building.

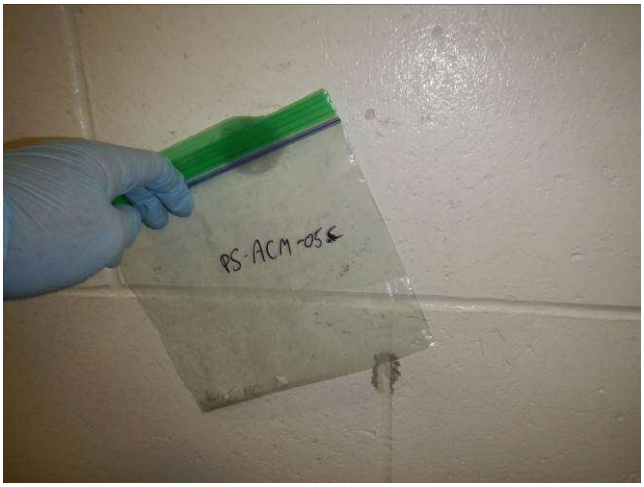


Photo 16. Sample location PS-ACM-05C, grey mortar, interior wall of “choline storage room” in Pumping Station Building.

Photo 17. Hole drilled in concrete block wall in “chlorine storage room” in Pumping Station Building. Cavity was empty.

Photo 18. Repair of hole drilled in in “chlorine storage room” in Pumping Station Building.

Photo 19. Paint sample DF-LP-01, brown with blue beneath, sampled from fascia on south side of Drainage Facility Building.

Photo 20. Paint sample PS-LP-01, brown with blue beneath, sampled from duct on roof of Pumping Station Building.

Photo 21. Paint sample PS-LP-02, white, sampled from interior wall on main floor of Pumping Station Building.

APPENDIX B

Laboratory Certificate Analyses

Your Project #: 19-0107-005
Site Location: HURST PS
Your C.O.C. #: 08472938

Attention: DAN LEITCH

KGS Group
3rd Floor
865 Waverly St
Winnipeg, MB
Canada R3T 5T4

Report Date: 2019/09/23
Report #: R2785091
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B976202
Received: 2019/09/10, 08:00

Sample Matrix: Bulk
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Asbestos by PLM - 1.0 RDL (1)	18	N/A	2019/09/19	COR3SOP-00002	EPA 600R-93/116

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Bureau Veritas Laboratories' Asbestos Laboratory is accredited by NVLAP for bulk asbestos analysis by polarized light microscopy, NVLAP Code 600163-0.

This report may not be reproduced, except in full, without the written approval of Bureau Veritas Laboratories. This report may not be used by the client to claim product endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Bureau Veritas Laboratories' scope of accreditation includes EPA-600/M4-82-020: "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" and EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk Building Materials".

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) The Asbestos Analysis is based on NIOSH 9002 method and EPA/600R-93/116 Method.

Your Project #: 19-0107-005
Site Location: HURST PS
Your C.O.C. #: 08472938

Attention: DAN LEITCH

KGS Group
3rd Floor
865 Waverly St
Winnipeg, MB
Canada R3T 5T4

Report Date: 2019/09/23
Report #: R2785091
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B976202
Received: 2019/09/10, 08:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Janelle Kochan, B.Sc., Senior Customer Service Representative
Email: Janelle.KOCHAN@bvlabs.com
Phone# (204)259-0231
==========
This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: B976202
Report Date: 2019/09/23

KGS Group
Client Project #: 19-0107-005
Site Location: HURST PS

Asbestos Analytical Results

The Asbestos Analysis is based on NIOSH 9002 method and EPA/600R-93/116 Method. P.O.B. - Percent of Bulk Percent of Bulk

DF-ACM-01A

BV Labs ID: WL8022 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous light grey mortar	Not Detected		Non-Fibrous

DF-ACM-01B

BV Labs ID: WL8023 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous light grey mortar	Not Detected		Non-Fibrous

DF-ACM-01C

BV Labs ID: WL8024 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous light grey mortar	Not Detected		Non-Fibrous

PS-ACM-01A

BV Labs ID: WL8025 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous black asphalt membrane	Not Detected	Synthetic Fibres 15%	Non-Fibrous

The limit of quantitation is 1%, although asbestos may be qualitatively detected at concentrations less than 1%. Samples for which asbestos is detected at <1% are reported as trace, "<1%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
Date Format : yyyy/mm/dd

BV Labs Job #: B976202
Report Date: 2019/09/23

KGS Group
Client Project #: 19-0107-005
Site Location: HURST PS

Asbestos Analytical Results

The Asbestos Analysis is based on NIOSH 9002 method and EPA/600R-93/116 Method. P.O.B. - Percent of Bulk Percent of Bulk

PS-ACM-01B

BV Labs ID: WL8026 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	100	Homogeneous black asphalt membrane	Not Detected	Synthetic Fibres	15%	Non-Fibrous

PS-ACM-01C

BV Labs ID: WL8027 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	100	Homogeneous black asphalt membrane	Not Detected	Synthetic Fibres	15%	Non-Fibrous

PS-ACM-02A

BV Labs ID: WL8028 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	70	Homogeneous black mastic	Not Detected	Cellulose	3%	Non-Fibrous
Layer 2	30	Homogeneous red mastic	Not Detected	Wollastonite	5%	Non-Fibrous

The limit of quantitation is 1%, although asbestos may be qualitatively detected at concentrations less than 1%. Samples for which asbestos is detected at <1% are reported as trace, "<1%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
Date Format : yyyy/mm/dd

BV Labs Job #: B976202
Report Date: 2019/09/23

KGS Group
Client Project #: 19-0107-005
Site Location: HURST PS

Asbestos Analytical Results

The Asbestos Analysis is based on NIOSH 9002 method and EPA/600R-93/116 Method. P.O.B. - Percent of Bulk Percent of Bulk

PS-ACM-02B

BV Labs ID: WL8029 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	45	Homogeneous black mastic	Not Detected	Cellulose	3%	Non-Fibrous
Layer 2	30	Homogeneous red mastic	Not Detected	Wollastonite	5%	Non-Fibrous
Layer 3	25	Homogeneous grey mastic	Not Detected			Non-Fibrous

PS-ACM-02C

BV Labs ID: WL8030 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	70	Homogeneous black mastic	Not Detected	Cellulose	3%	Non-Fibrous
Layer 2	30	Homogeneous red mastic	Not Detected	Wollastonite	5%	Non-Fibrous

PS-ACM-03A

BV Labs ID: WL8031 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	100	Homogeneous black mastic	Not Detected	Cellulose	3%	Non-Fibrous

The limit of quantitation is 1%, although asbestos may be qualitatively detected at concentrations less than 1%. Samples for which asbestos is detected at <1% are reported as trace, "<1%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
Date Format : yyyy/mm/dd

BV Labs Job #: B976202
Report Date: 2019/09/23

KGS Group
Client Project #: 19-0107-005
Site Location: HURST PS

Asbestos Analytical Results

The Asbestos Analysis is based on NIOSH 9002 method and EPA/600R-93/116 Method. P.O.B. - Percent of Bulk Percent of Bulk

PS-ACM-03B

BV Labs ID: WL8032 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	100	Homogeneous black mastic	Not Detected	Cellulose	3%	Non-Fibrous

PS-ACM-03C

BV Labs ID: WL8033 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres		Particulate
Layer 1	100	Homogeneous black mastic	Not Detected	Cellulose	3%	Non-Fibrous

PS-ACM-04A

BV Labs ID: WL8034 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous black roof tar	Not Detected		Tar Non-Fibrous

PS-ACM-04B

BV Labs ID: WL8035 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous black roof tar	Not Detected		Tar Non-Fibrous

The limit of quantitation is 1%, although asbestos may be qualitatively detected at concentrations less than 1%. Samples for which asbestos is detected at <1% are reported as trace, "<1%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
Date Format : yyyy/mm/dd

BV Labs Job #: B976202
Report Date: 2019/09/23

KGS Group
Client Project #: 19-0107-005
Site Location: HURST PS

Asbestos Analytical Results

The Asbestos Analysis is based on NIOSH 9002 method and EPA/600R-93/116 Method. P.O.B. - Percent of Bulk Percent of Bulk

PS-ACM-04C

BV Labs ID: WL8036 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous black roof tar	Not Detected		Tar
					Non-Fibrous

PS-ACM-05A

BV Labs ID: WL8037 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous light grey mortar	Not Detected		Non-Fibrous

PS-ACM-05B

BV Labs ID: WL8038 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous light grey mortar	Not Detected		Non-Fibrous

PS-ACM-05C

BV Labs ID: WL8039 Date Analyzed: 2019/09/19

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous light grey mortar	Not Detected		Non-Fibrous

The limit of quantitation is 1%, although asbestos may be qualitatively detected at concentrations less than 1%. Samples for which asbestos is detected at <1% are reported as trace, “<1%”. “Not Detected” indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
Date Format : yyyy/mm/dd

GENERAL COMMENTS

Results relate only to the items tested.

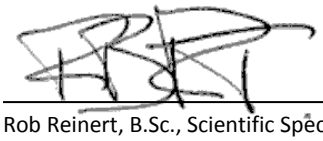
Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BV Labs Job #: B976202
Report Date: 2019/09/23

KGS Group
Client Project #: 19-0107-005
Site Location: HURST PS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rob Reinert, B.Sc., Scientific Specialist

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For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Laboratories Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

BUREAU VERITAS 1828

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4606 Canada Way
Burnaby, BC V5G 1K5
Phone: 604-734-7276
Toll Free: 800-665-8566

Atlanta Lab
3380 Chastain Meadows Pky, Ste 300
Kennesaw, GA 30144
Phone: 770-499-7500
Toll Free: 800-806-5887

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08472938

ASBESTOS & FIBRE CHAIN OF CUSTODY RECORD

Page 1 of 1

Invoice Information	
Company Name:	KGS Group
Contact Name:	Dan Leitch / Ken Dyck
Address:	3rd Floor - 865 Waverley St.
	Winnipeg, MB, R3T 5P4
Phone:	204-896-1209
Fax:	
Email:	dleitch@kgsgroup.com; kdyck@kgsgroup.com

Report Information (if differs from invoice)	
Company Name:	
Contact Name:	
Address:	
Phone:	
Fax:	
Email:	

Project Information (where applicable)	
Quotation #:	
P.O. #/ AFE#:	
Project #:	19-0107-005
Site Location:	Hurst PS
Sampled By:	DL

Turnaround Time (TAT) Required

Regular TAT (Most analyses)

☐ 5-DAYS ☒ 10-DAYS

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)

☐ 4-HR ☐ SAME DAY ☐ 1-DAY ☐ 2-DAYS ☐ 3-DAYS

Date Required:

Rush Confirmation #:

SPECIAL INSTRUCTIONS

ASBESTOS ANALYSIS

PROVINCIAL REGULATORY GUIDELINE

☐ Alberta ☐ Nfld & Labrador ☐ Nunavut ☐ Quebec
☐ BC ☐ NWT ☐ Ontario ☐ Saskatchewan
☒ Manitoba ☐ Nova Scotia ☐ PEI ☐ Yukon
☐ New Brunswick

Analysis Requested: PLM ANALYSIS - BULK (EPA 600/R-93/116; NIOSH 9002; EPA GRAVIMETRIC; 200-POINT COUNT; 400-POINT COUNT; 1000-POINT COUNT; NYELAP 198.6 (NOB); CINCINNATI PLM EPA 600/R-04/004); PCM - AIR (NIOSH 7400 A RULES; NIOSH 7400 B RULES); TEM (VERMICULITE CINCINNATI EPA 600/R-04/004; AIR NIOSH 7402; SEMI QUANTITATION (DL 1%); FULL QUANTITATION (DL 0.1%); NYELAP 198.4 (NOB)); POSITIVE STOP; HOLD - DO NOT ANALYZE

SAMPLE NUMBER - DESCRIPTION	DATE SAMPLED (YYYY/MM/DD)	SAMPLE TYPE	AIR VOLUME (L) (If applicable)	EPA 600/R-93/116	POSITIVE STOP	COMMENTS
DF-ACM-01A/B/C	2019/08/30	Brick mortar		X	X	
PS-ACM-01 A/B/C	2019/08/30	Asphalt Membrane		X	X	
PS-ACM-02 A/B/C	2019/08/30	Duct Mastic		X	X	
PS-ACM-03 A/B/C	2019/08/30	Duct Mastic		X	X	
PS-ACM-04 A/B/C	2019/08/30	Roof tar		X	X	
PS-ACM-05 A/B/C	2019/08/30	Concrete Mortar		X	X	

B976202_COC

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
[signature] GENE SENIOR	2019/09/09	17:34	[signature] Tegan Harwell	2019/09/10	08:00

404 ADEJUMOKE A 2019/09/11 10:50 CS:YES COR FCD-00345/4

Your C.O.C. #: 1 of 1

Attention: DAN LEITCH

KGS Group
3rd Floor
865 Waverly St
Winnipeg, MB
Canada R3T 5T4

Report Date: 2019/09/17
Report #: R2782355
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B976053
Received: 2019/09/10, 08:00

Sample Matrix: Paint
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ICPMS Metals on TCLP Leachate (1, 2)	1	2019/09/12	2019/09/13	AB SOP-00043	EPA 6020b R2 m
Elements by ICPMS - Soils (1)	3	2019/09/13	2019/09/13	AB SOP-00001 / AB SOP-00043	EPA 6020b R2 m
Non Routine/Non Validated Matrix Tested (1, 3)	3	N/A	2019/09/12		
PCB with Silica Gel Clean-up (1)	2	2019/09/13	2019/09/13	CAL SOP-00149	EPA 8082A R1 m
PCB with Silica Gel Clean-up (1)	1	2019/09/13	2019/09/14	CAL SOP-00149	EPA 8082A R1 m
Total PCB with SG cleanup in Soil (1, 4)	3	N/A	2019/09/14		Auto Calc
TCLP pH Measurements (1)	1	2019/09/12	2019/09/13	AB SOP-00006	SM 23 4500 H+B m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by BV Labs Calgary Environmental
(2) Samples were extracted as per EPA 1311 unless otherwise noted in the report.
(3) Sample(s) analyzed using methodologies that have not been subjected to Bureau Veritas Laboratories' standard validation process for the submitted matrix and is not an accredited method. Analysis performed with client consent, however results should be viewed with discretion.
(4) Total PCB in Soil, BC Reg. 375/96 - Calculated parameter, including Arochlor mixtures 1242, 1248, 1254 and 1260.

Your C.O.C. #: 1 of 1

Attention: DAN LEITCH

KGS Group
3rd Floor
865 Waverly St
Winnipeg, MB
Canada R3T 5T4

Report Date: 2019/09/17
Report #: R2782355
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B976053
Received: 2019/09/10, 08:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Janelle Kochan, B.Sc., Senior Customer Service Representative
Email: Janelle.KOCHAN@bvlabs.com
Phone# (204)259-0231
==========
This report has been generated and distributed using a secure automated process.
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Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B976053
Report Date: 2019/09/17

KGS Group
Sampler Initials: DL

RESULTS OF CHEMICAL ANALYSES OF PAINT

BV Labs ID		WL7175	WL7176	WL7177	
Sampling Date		2019/08/30	2019/08/30	2019/08/30	
COC Number		1 of 1	1 of 1	1 of 1	
	UNITS	**DF-LP-01**	**PS-LP-01**	**PS-LP-02**	**QC Batch**
Misc. Inorganics					
Leachable Final pH of Leachate	pH	N/A	5.17	N/A	9586261
MISCELLANEOUS					
Sample Matrix	N/A	PAINT	PAINT	PAINT	ONSITE

N/A = Not Applicable

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B976053
Report Date: 2019/09/17

KGS Group
Sampler Initials: DL

POLYCHLORINATED BIPHENYLS BY GC-ECD (PAINT)

BV Labs ID		WL7175	WL7176	WL7176		WL7177		
Sampling Date		2019/08/30	2019/08/30	2019/08/30		2019/08/30		
COC Number		1 of 1	1 of 1	1 of 1		1 of 1		
	UNITS	DF-LP-01	PS-LP-01	PS-LP-01 Lab-Dup	RDL	PS-LP-02	RDL	QC Batch
Polychlorinated Biphenyls								
Silica Gel Aroclor 1016	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1221	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1232	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1242	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1248	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1254	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1260	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Aroclor 1262	mg/kg	<0.20	<0.20	<0.20	0.20	4.4	2.0	9586539
Silica Gel Aroclor 1268	mg/kg	<0.20	<0.20	<0.20	0.20	<2.0	2.0	9586539
Silica Gel Total PCB	mg/kg	<0.20	<0.20	N/A	0.20	4.4	2.0	9585711
Surrogate Recovery (%)								
Silica Gel NONACHLOROBIPHENYL (sur.)	%	80	67	73	N/A	112	N/A	9586539

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B976053
Report Date: 2019/09/17

KGS Group
Sampler Initials: DL

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

BV Labs ID		WL7175	WL7176	WL7177		
Sampling Date		2019/08/30	2019/08/30	2019/08/30		
COC Number		1 of 1	1 of 1	1 of 1		
	UNITS	DF-LP-01	PS-LP-01	PS-LP-02	RDL	QC Batch
Elements						
Leachable Arsenic (As)	mg/L	N/A	<0.50	N/A	0.50	9586365
Leachable Lead (Pb)	mg/L	N/A	2.2	N/A	0.50	9586365
Leachable Mercury (Hg)	mg/L	N/A	<0.020	N/A	0.020	9586365
Total Arsenic (As)	mg/kg	<2.0	<2.0	20	2.0	9586946
Total Lead (Pb)	mg/kg	190	420	62	1.0	9586946
Total Mercury (Hg)	mg/kg	28	0.30	9.0	0.10	9586946

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	19.8°C

Sample WL7176 [PS-LP-01] : The minimum weight of 100g, or the ability to sieve through 1mm or 9.5mm for the standard TCLP extraction, as per Reference Method EPA 1311 R1992, could not be achieved due to insufficient sample or sample matrix. Client consent has been received to proceed using the modified TCLP method. The uncertainty of the analysis may be increased, and the reported results may not be suitable for compliance purposes.

POLYCHLORINATED BIPHENYLS BY GC-ECD (PAINT) Comments

Sample WL7175 [DF-LP-01] PCB with Silica Gel Clean-up: Detection limits raised due to sample matrix.
Sample WL7176 [PS-LP-01] PCB with Silica Gel Clean-up: Detection limits raised due to sample matrix.
Sample WL7177 [PS-LP-02] PCB with Silica Gel Clean-up: Detection limits raised due to sample matrix and dilution to bring analyte within the calibrated range.

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT) Comments

Sample WL7175 [DF-LP-01] Elements by ICPMS - Soils: Detection limits raised based on sample weight used for analysis.
Sample WL7176 [PS-LP-01] Elements by ICPMS - Soils: Detection limits raised based on sample weight used for analysis.
Sample WL7177 [PS-LP-02] Elements by ICPMS - Soils: Detection limits raised based on sample weight used for analysis.

Results relate only to the items tested.

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B976053
Report Date: 2019/09/17

QUALITY ASSURANCE REPORT

KGS Group
Sampler Initials: DL

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
9586539	Silica Gel NONACHLOROBIPHENYL (sur.)	2019/09/13	63	50 - 130	91	50 - 130	85	%				
9586261	Leachable Final pH of Leachate	2019/09/13			100	97 - 103			0.38	N/A		
9586261	Leachable Initial pH of Sample	2019/09/13							4.0	N/A		
9586261	Leachable pH after HCl	2019/09/13							2.8	N/A		
9586365	Leachable Arsenic (As)	2019/09/13	103	75 - 125	104	80 - 120	<0.50	mg/L	NC	35		
9586365	Leachable Lead (Pb)	2019/09/13	106	75 - 125	106	80 - 120	<0.50	mg/L	NC	35		
9586365	Leachable Mercury (Hg)	2019/09/13	110	75 - 125	102	80 - 120	<0.020	mg/L	NC	35		
9586539	Silica Gel Aroclor 1016	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1221	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1232	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1242	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1248	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1254	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1260	2019/09/13	59	50 - 130	83	50 - 130	<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1262	2019/09/13					<0.010	mg/kg	NC	50		
9586539	Silica Gel Aroclor 1268	2019/09/13					<0.010	mg/kg	NC	50		
9586946	Total Arsenic (As)	2019/09/13	84	75 - 125	93	80 - 120	<1.0	mg/kg	0.45	30	95	53 - 147
9586946	Total Lead (Pb)	2019/09/13	89	75 - 125	97	80 - 120	<0.50	mg/kg	0.34	35	101	79 - 121
9586946	Total Mercury (Hg)	2019/09/13	87	75 - 125	86	80 - 120	<0.050	mg/kg	17	35		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

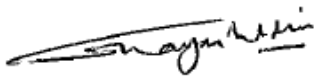
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

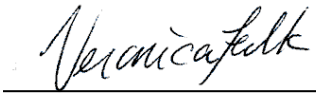
Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics



Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

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For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

292

Winnipeg: D-675 Berry Street, Winnipeg, MB R3H 1A7 Ph: (204) 772-7276 Fax: (204) 772-2386, Toll Free: (800) 665-8566

CHAIN OF CUSTODY RECORD

Click here to get the COC number

BV Job #: COC #: Page: 1 of 1

Invoice To: Require Report? Yes ☐ No ☐

Company Name: KGS Group
Contact Name: Dan Leitch / Ken Dyck
Address: 3rd Floor - 865 Waverley St.
Winnipeg, MB PC: R3T 5P4
Phone / Fax#: Ph: 204-896-1209 Fax: 204-896-0754
E-mail: dleitch@kgsgroup.com, kdyck@kgsgroup.com

Report To:

Company Name: KGS Group
Contact Name: Dan Leitch / Ken Dyck
Address: 3rd Floor - 865 Waverley St.
Winnipeg, MB PC: R3T 5P4
Phone / Fax#: Ph: 204-896-1209 Fax: 204-896-0754
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PO #:	
Quotation #:	
Project # :	
Proj. Name:	
Location:	
Sampled by: DL	

REGULATORY REQUIREMENTS:

☐ CSR
☐ CCME
☐ BC Water Quality
☐ Other
☐ DRINKING WATER

SERVICE REQUESTED:

◉ Regular Turn Around Time (TAT)
(5 days for most tests)
RUSH (Please contact the lab)
○ 1 Day ○ 2 Day ○ 3 Day
Date Required:

SPECIAL INSTRUCTIONS:

Return Cooler ☐ Ship Sample Bottles (please specify) ☐

Limited sample volumes. If insufficient for all analyses, please contact to determine priorities.

ANALYSIS REQUESTED

Lab Use Only

	Sample Identification	Lab Identification	Sample Type	Date/Time(24hr) Sampled	Field Filtered? Y☐N☐	Field Acidified? Y☐N☐	Field Acidified? Y☐N☐	Dissolved Metals (DM)	Total Metals	Total lead, mercury, arsenic	Leachable lead, mercury, arsenic	PCBs	Number of Containers
1	DF-LP-01		Paint	2019/08/30						X		X	1
2	PS-LP-01		Paint	2019/08/30						X	X	X	1
3	PS-LP-02		Paint	2019/08/30						X		X	1
4													
5													
6													
7													
8													
9													
10													
11													
12													

10-Sep-19 08:00
Janelle Kochan
B976053
SBZ INS-0207

Print name and sign

*Relinquished By:	Date (yy/mm/dd):	Time (24hr):	Received by :	Date (yy/mm/dd):	Time (24 hr):	Time Sensitive
[signature]	2019/09/09	1734	Ethrell Tegan Hamill	2019/09/10	08:00	☐
[signature]			TINA WHITE	2019/09/11	08:30	

Laboratory Use Only

Temperature on Receipt (°C)						Custody Seal	Yes	No
A)	19.6	B)	19.8	C)	19.9	Present?	☐	☐
Just sampled & rec'd on ice: ☐						Intact?	☐	☐

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORDS. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS. Unless otherwise agreed to in wirting, work submitted on this Chain of Custody is subject to Bureau Veritas Laboratories' standard terms and conditions. Signing of this Chain of Custody document is acknowledgment and acceptance or our terms and conditions which are available for viewing at http://www.bvlabs.com/terms-and-conditions

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WIN FCD-00219/2 page 1 of 1

APPENDIX C

Pipe Loading Assessment

Memorandum

To:	Alison Weiss, P.Eng.	**Date:**	June 19, 2020
		Project No.:	19-0107-005
From:	Ray Offman, P.Eng. Arash Kiayee, P.Eng.	**Cc:**	Ron Sorokowski, P.Eng. Colin Siepman, P.Eng. Lunide Milius-Alphonse, P.Eng.
Re:	Hurst Pumping Station Structural Repairs & Drainage Building Upgrades Pipe Loading Assessment – Final		

1.0 INTRODUCTION AND PROJECT BACKGROUND

The City of Winnipeg (City) retained KGS Group to carry out a loading assessment of buried infrastructure during the Hurst Pumping Station Structural Repairs and Drainage Building Upgrade.

Part of the project includes replacement of the existing roofs of the Hurst Pumping Station (PS) which necessitates removal and re-installation of existing air handling units (AHU). The project also includes mitigation of sloughing soils and water infiltration into the crawl space south of the Hurst PS.

This technical memorandum presents KGS Group's evaluation of the potential impacts of the proposed construction activities on the pipes and valve chambers within the project site and provides areas of concern where the anticipated loads could have negative impacts on the buried infrastructure. We have also identified the assumed equipment required to undertake the work and we have presented the equipment restrictions that address our equipment loading and construction methodology. Nonetheless, we recommend the Contractor submit their means and methods to KGS Group before undertaking the construction activities based on the availability of the equipment and their previous experience.

2.0 IMPACTED BURIED INFRASTRUCTURE

The project site plan including the existing buried infrastructure and the site access is shown on Drawing 1-0650A-C0003-001. Two access routes to the site were considered, one from Hurst Way at the northwest of the site, and one from Willson Place at the southwest of the site. The selection of the site access is important as it determines which pipes could be impacted by the construction activities. The access from Willson Place was previously developed for the Wilkes Reservoir North Cell Rehabilitation Project (2015). The distance from the access gate to the Hurst PS is approximately 440 m and the route includes an enclosed laydown area pad and a gravel road until it ends at the paved road in the vicinity of the pumping

station. The access from the Hurst Way is shorter (40 m) and only includes the paved road to access the pump station. In consultation with the City, the access from Hurst Way was deemed to be preferred due to the shorter length and ease of use during construction.

Based on the selected site access, the below underground pipes are anticipated to require construction equipment to pass over them during the construction activities (as presented on Drawing 1-0650A-C0003-001).

- Charleswood Feedermain, 750 mm Reinforced Concrete Water Pipe – Steel Cylinder Type, Not Prestressed, installed on the boulevard / sidewalk between the property line and back of the curb, and crossing the entrance driveway.
- Wilkes Avenue Feedermain, 900 mm Prestressed Concrete Pressure (PSC) Pipe installed on the boulevard and crossing the entrance driveway.
- Wilkes Avenue Reservoir Drainage Building Outlet Pipe, 600 mm Asbestos Cement (AC) Class II Sewer Pipe installed on the west of Hurst Pumping Station Building connecting the Drainage Lift Station to the City 1350 mm Concrete LDS.
- Wilkes Avenue Reservoir By-pass Piping, 1350 mm PSC Suction Pipe installed on the south side of the station crossing the driveway under the yard entrance gate.
- 900 mm PSC Suction Pipe on the south side of the pumping station supplying water from Wilkes Avenue Reservoir North Cell (Wilkes Avenue Reservoir No. 2) to the station crossing the gravel road.
- 900 mm PSC Interconnecting Suction Pipe running diagonally on the south side of the station.
- Two 1350 mm Steel Pipe in Concrete Suction Lines on the southwest & southeast of Hurst Pumping Station.

The City of Winnipeg provided pertinent available historical information to assist in our performance of the loading assessment. The data included record / as-built drawings, contract documents (including special provisions and general conditions), manufacturer's notes, and applicable standards at the time of various underground infrastructure construction works at the site.

To determine the pipe depths at the proposed pathway locations, the ground and invert elevations were established from survey data obtained by KGS (2019) and the City's drawings, respectively.

The reference documents that were used to assess the pipes are described in Table 1. It should be noted that where available, we used the standards and specifications that were in effect at the time of pipe installation. If no data was available, we used the first available pertinent document before or after the pipe installation.

TABLE 1: LIST OF AVAILABLE PIPE RECORDS

Asset	Year Installed	Reference Drawing	Reference Document	Applicable Standard	Cover (m)	Design Criteria
Charleswood Feedermain, 750 mm Reinforced Concrete Water Pipe – Steel Cylinder Type, Not Prestressed	1960	– Dwg. WA-18749 – 30" & 24" WM from Wilkes Ave. PS to Edgeland Blvd., Sta. 0+00 to 16+00, 1960	Specification C.E.D. 77-59, General Conditions & Special Provisions, Supply and Delivery of 30", 24" and 16" Water Pipe	– Alternate (3): AWWA C300-57, Reinforced-Concrete Water Pipe-Steel Cylinder Type, Not Prestressed	2.1 @ site access driveway	– Pipe to safely withstand the full dead load of the backfill plus maximum live load equivalent to **H-20 loading** when the pipe is subjected to the internal design pressure of 150 psi, as per requirements of AWWA C-300. Depth of cover over the top of the pipe will vary from a minimum of **5 ft to 9 ft** – Unit weight of backfill = 120 lb/ft^3
Wilkes Avenue Feedermain, 900 mm Reinforced Concrete Water Pipe – Steel Cylinder Type, Prestressed (PSC)	1966	– Dwg. D-1027, Wilkes Ave. Feedermain III, As Constructed, 1967	Specification W 11-66 - 1966, General Conditions, Installation of Wilkes Avenue Feedermain III – Specification W 9-66, Contract No. 213, Specifications for Supply & Delivery of Concrete Water Pipe for Feedermains, Prestressed Concrete Pressure Pipe, 1966	AWWA C-301-58	2.1 @ site access driveway	– Width of trench at 1 ft above the top of pipe to be between 12" to 24" + Pipe O.D. – Soil Weight of 110 lb/ft^3 – Trench bedding factor of 1.5 – Min. earth cover of 9 ft – K_u = 0.130 in Marston's Formula – Live load **H-20 loading** – All pipe & fittings to withstand 100 psi working

Asset	Year Installed	Reference Drawing	Reference Document	Applicable Standard	Cover (m)	Design Criteria
			– Design & Transient-Capacity Curves for 900 mm PSC with Cubic Parabola Design Method as per AWWA C-301-64 Appendix A			pressure plus 50 psi for water hammer
Wilkes Avenue Reservoir Drainage Building Outlet, 600 mm Asbestos Cement (AC)	1959	– WH5621-4, Wilkes Ave. Reservoir N0. 1 & 2, Drainage Sewer Details, 1958 – WH5621-6, Wilkes Ave. Reservoir N0. 1 & 2, Lift Station Details, 1958 – WIL- 35, Wilkes Ave. Reservoir Reconstruction, Floor Drain Piping, Misc. Details, 1980	Specification C.E.D. 6-59, Wilkes Avenue Reservoirs No. 1 & 2	Standard 34-GP-9M for: Pipe Asbestos Cement Sewer, Canadian General Standards Board - 1975	2.4 @ Drainage Lift Station, 2.8 m at Gravel Road, 3.0 @ paved access driveway in front of AHUs	– Max. clear width of trench not to be more than 2 ft greater than pipe diameter – Slope = 2.0%
Wilkes Avenue Reservoir By-pass Piping, 1350 mm PSC	1979	– Dwg. D-1411, By-pass Piping, 1982	– Special Provisions of Tender No. PD 79-178 to Construct By-pass Piping & Valve Chambers at W.D. Hurst PS & Associated Works, 1979 – Addendum # 1, Tender No. PD 79-162 to Supply & Deliver to the City PSC Pipe, Complete with	AWWA C301-79 – Prestressed Concrete Pressure Pipe, Steel Cylinder Type, For Water & Other Liquids	4.8	– All pipe & fittings to withstand 0.7 MPa (100 psi) test pressure & 0.35 MPa (50 psi) working pressure internally – Trench width equal to O.D. + 0.6 m – Soil Weight of 1925 kg/m^3 (120 lb/ft^3) – Trench bedding factor of 1.5

Asset	Year Installed	Reference Drawing	Reference Document	Applicable Standard	Cover (m)	Design Criteria
			Fittings, for By-pass Piping at W.D. Hurst PS – Pipe Design Calculations for Wilkes Reservoir Reconstruction, Canron Inc. - Pipe Division, 1980 – Specification CW 2115, Specification for Installation of Prestressed Concrete Pressure Pipe Feedermains, 1979			– Min. earth cover of 2.75 m – K_u = 0.110 in Marston's Formula – Live load **H-20 loading**
Wilkes Avenue Reservoir North Cell (No. 2) Suction Line, 900 mm PSC (prestressed concrete embedded cylinder pipe w/rubber & steel joint)	1959	– Dwg. WH5621-25, Wilkes Ave. Reservoirs No. 1 & 2, Pipe Details for Design, 1959 – Dwg. B-571, Yard Piping, 1982 – Dwg. WH5621-19, Details of Valve Pit "C", 1959	– Specification C.E.D. 6-59, Wilkes Avenue Reservoirs No. 1 & 2 – Pipe Manufacturer's Notes for Design of Yard Piping – Manufacturer's Pipe Summaries for Yard Piping – Pipe manufacturer's Laying Schedules for Yard Piping	AWWA C301-55T– Reinforced Concrete Water Pipe-Steel Cylinder Type, Prestressed	5.1	– Section XV of Dwg. WH5621-25 – Live load **H-15 loading** – Total Pressure incl. Water Hammer = 100 psi – Depth of Cover over Top of Pipe = 18.5 ft (5.6 m) of Earth
900 mm PSC Interconnecting Suction Line (prestressed concrete embedded cylinder pipe w/rubber & steel joint)	1959	– Dwg. WH5621-25, Wilkes Ave. Reservoirs No. 1 & 2, Pipe Details for Design, 1959 – Dwg. D-1412, Valve Chamber No. 1, Mechanical, 1980			4.9	– Section XV of Dwg. WH5621-25 (assumed) – Live load **H-15 loading** – Total Pressure incl. Water Hammer = 100 psi – Depth of Cover over Top of Pipe = 16.5 ft (5.0 m) of Earth

Asset	Year Installed	Reference Drawing	Reference Document	Applicable Standard	Cover (m)	Design Criteria
1350 mm Steel Pipe in Concrete, Suction Lines on the Southwest & Southeast of Hurst Pumping Station	~ 1960	– Dwg. WH5622-18, Wilkes Ave. Pumping Station, Site Plan Showing Pipe Layout, 1960 – Dwg. WH5621-25, Wilkes Ave. Reservoirs No. 1 & 2, Pipe Details for Design, 1959 Shop Drawings, Manitoba Bridge & Engineering Works Limited, 1958	Specification C.E.D. 74-59, General Conditions and Special Provisions for Supply and Construction of Wilkes Avenue Pumping Station and Reservoir Building Superstructure, 1959	AWWA C201	4.5 @ 54”×54”×54”×36” Cross on Southwest & 4.4 @ Southwest of Building 4.8 @ 54”×54”×36” Tee on Southeast & 4.5 @ Southeast of Building	– Working Pressure including Water Hammer = 75 psi – Wall Thickness = 0.375” – The use of trenching machinery or hand methods shall be acceptable except that all excavations within six (6) feet of an existing utility must be done as hand work unless written permission has been obtained from the Engineer.

3.0 PROPOSED CONSTRUCTION ACTIVITIES

The construction activities at the site require using heavy machinery that could impact the existing pipes and valve chambers within the site. They include:

- Removal and re-installation of existing Air Handling Units to implement upgrades on the roof of the pump station building.
- Crawl space modification including excavation and temporary shoring on the south side to facilitate installation of new grade beams.

The size of the equipment has been selected in such a way that the load on each pipe does not exceed its allowable load, where possible. We contacted Able Crane Services Limited and Subterranean (Manitoba) Limited to obtain information on the size of equipment that could be used for lifting the air handling units and temporary shoring, respectively. List of anticipated equipment that could be used during construction to implement the above activities is provided in Table 2. The list is by no means exhaustive and the Contractor is required to submit their equipment to perform the work for approval. Details as to how this information is incorporated into our analysis will be discussed in the following sections. It should be noted that only certain pipes will be impacted by each construction activity based on the strategy adopted and the equipment used.

TABLE 2: EQUIPMENT USED DURING CONSTRUCTION

Equipment	Model	Max. Weight (Operating + Load) *(kg)*	No. of Axles	Axle / Track Load (kg)
Skid Steer Loader	CAT 262D	5,000	2	2,500
Hydraulic Excavator	Komatsu PC55MR-5	6,000	2 Tracks	3,000
Rotary Drill Rig	Sub-Tec 06-04	7,000	2 Tracks	3,500
Articulated Boom Lift	Genie Z-34/22 IC	5,000	2	2,500
Concrete Pump Truck	N/A	11,000	3	3,667
Concrete Mixer Truck (6 m^3)	N/A	27,000	3	9,000
Crane	AC 140	49,940	5	9,988
Crane + Counterweight	AC 140 + 86 KIP Counterweight	49,940 + 39,000 = 92,940	N/A	N/A

3.1 Removal and Re-installation of Air Handling Units

There are two air handling units on the Hurst PS building roof which are to be removed by a crane before replacement of the roof. The units will be stored at the designated location shown on the drawings (as stipulated by the City) adjacent to the PRV Chamber and will be re-installed on the roof upon completion of the roofing. KGS consulted Able Crane Services Limited to submit a lifting plan and size a crane to perform the task. The factors that affected the size of the crane were as follows:

- Weight of the AHUs: each unit weighs 3.5 tonnes.
- Height of the Hurst PS building: 5 m.
- Position of the crane: To maintain maximum feasible clearance from the building to protect existing underground pipes.

The selected crane and the conditions under which the crane will hoist the AHUs are described in Table 3 and Table 4.

TABLE 3: CRANE INFORMATION

Crane Manufacturer	TEREX | DEMAG
Crane Model	AC 140 | All Terrain Crane – 170 t Lifting Capacity
Main Boom Length	47.2 m (154.9 ‘)
Main Boom Angle	28.7°
Position of Outriggers	Full Extension (100%)
Outrigger Length	8.2 m
Outrigger Width	7.5 m
Outrigger Pads	Steel, 1.2 m x 2.4 m x 0.13 m (4’ x 8’ x 5”)
Counterweight	86 kip (86,000 lb)
Lift Radius at 360°	40 m (131’)
Crane Capacity at 40 m (131’) Lift Radius	5,400 kg (11,900 lb)
Axle Load with 8,000 kg (17,650 lb) Counterweight	12,000 kg (26,500 lb)
Axles	5 × 12,000 kg (26,500 lb)

TABLE 4: CRANE WEIGHTS

Carrier	25,100 kg	55,336 lb
Superstructure	9,200 kg	20,283 lb
HA Boom (Foot Weight)	9,790 kg	21,583 lb
HA Boom (Head Weight)	5,850 kg	12,897 lb
Counterweight	39,000 kg	85,980 lb
Net Load Weight (including AHU & Rigging)	4,000 kg	8,817 lb
Total Weight	**92,940 kg**	**204,896 lb**

Able Crane provided the ground bearing pressure at 90° swing angle as well as 47° critical angle, as shown below on Figure 1. The lifting plan supplied by Able Crane is provided in Appendix B.

Pipes that will be traversed by this work include the Charleswood Feedermain (750 mm RC), the Wilkes Avenue Feedermain (900 mm PSC), and the Wilkes Avenue Reservoir Drainage Building Outlet sewer (600 mm AC). Traveling of the crane over or adjacent to the pipes is not expected to cause the feedermains to be subjected to load concentrations in excess of their original design loads (H-20 Highway Loading) as the crane axle load is less than the design axle load of 32,000 lb as per the American Association of State Highway Officials (AASHTO) H-20 loading criteria.

The situation that causes concern is when the crane hoists the AHU from the roof and moves it to the designated area for storage. To minimize the impacts of crane load on the underground pipes, its sitting position will be restricted to a 20 m by 9 m area, maintaining 3 m clearance from outside wall of the 600 mm asbestos-cement pipe (as shown on the Drawing 1-0650A-C0003-001). We identified the existing loads (see section 4.3.3) and provided recommendation for their protection during design. A complete loading assessment was undertaken for the anticipated loads on the 600 mm Class II AC drainage pipe.

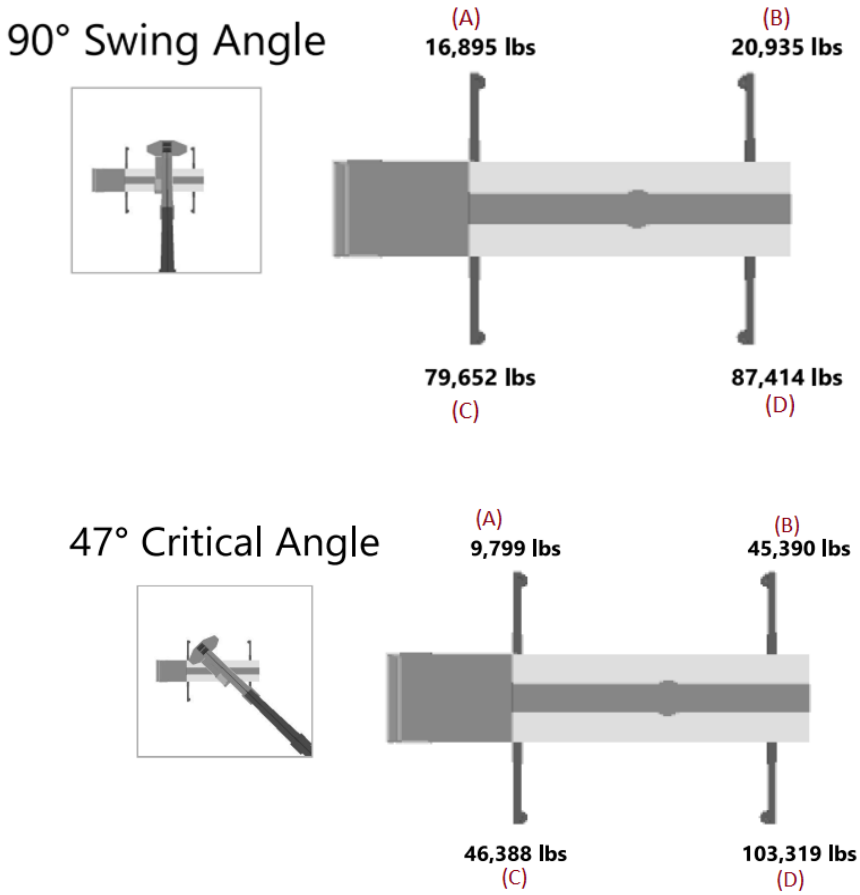


FIGURE 1: GROUND BEARING PRESSURES UNDER OUTRIGGERS

3.2 Crawl Space Modifications

To prevent soils sloughing and water infiltration into the crawl space along the south side of the pumping station building, modifications to the crawl space will be required. The construction activities include excavating a 2.5 m wide trench adjacent to the south side of the building. In the areas in proximity to the existing cooling tower, temporary shoring will be required to protect the infrastructure. In addition, a concrete mixer truck and a concrete pump truck will be required to supply material for the concrete works. To increase the safety of the underground infrastructure, the concrete mixer truck and the concrete pump truck are required to be parked on the designated area west of the pumping station building. The Rotary Drill Rig will then be the heaviest equipment with the highest surface stress entering the fenced area (yard) and has the governing load for the loading assessment.

The pipes for which the loading assessment were carried out are as follows:

- Wilkes Avenue Reservoir By-pass Piping (1350 mm PSC) at the yard entrance gate.
- Wilkes Avenue Reservoir Drainage Building Outlet pipe (600 mm AC) at the gravel road crossing.
- Wilkes Avenue Reservoir North Cell (No. 2) suction line (900 mm PSC) at the gravel road crossing.
- Interconnecting suction line (900 mm PSC) under the grassed area south of the pumping station building.
- 1350 mm Steel Pipe in Concrete Suction Lines on the southwest & southeast of Hurst Pumping Station.

4.0 PIPE LOADING ASSESSMENT

4.1 Methodology

Two different methods were used for loading assessment of the pipes based on the availability of their design live loads (as a threshold) at the time of installation.

- For pipes with available design live loads, we first calculated the proposed live loads imposed from the new equipment on the pipes. Then, we compared the two numbers to determine if the proposed live load exceeds the original design live load. All water pipes at the site fell into this category. The 750 mm RC Charleswood Feedermain, 900 mm PSC Wilkes Avenue Feedermain, and the 1350 mm PSC Wilkes Avenue Reservoir By-pass were designed to withstand the maximum live loads equivalent to AASHTO H-20 loading. The water pipes installed in the yard including 900 mm PSC Wilkes Avenue Reservoir North Cell and the 900 mm PSC interconnecting suction lines were designed to withstand the maximum live loads equivalent to AASHTO H-15 loading. Additionally, the pipes for which the combined internal-external loading analysis was available were double-checked using their current internal and external loads (i.e. Wilkes Ave. FM & Wilkes Ave. By-pass). The external loads on the pipe included backfill loads (calculated using Marston Load Calculations in Trench Condition) and the proposed live loads.

- For the pipe with unknown design live load – i.e. 600 mm Asbestos-Cement Pipe, we calculated the external loads using the same approach. Then, we compared the external load with the crushing strength of the pipe to determine if it could withstand the proposed loads.

4.2 Assumptions

To estimate the live load from the equipment, the following assumptions were made.

- For wheeled machines, tire loads were assumed to be effective as point loads and the total loads were equally distributed on all tires.
- For tracked machines, loads were assumed to be effective as strip load equally distributed on two tracks.
- Boussinesq's Equation was used to determine stresses at any point P at a depth z because of a surface point load.
- A Factor of Safety of 1.14 was applied to the mass of all equipment.

4.3 Pipe Loading Assessment

4.3.1 PIPE IMPACTED BY REMOVAL AND RE-INSTALLATION OF AIR HANDLING UNITS

The critical condition for each pipe under which it could be impacted the most by the live load is based on the equipment weight and the load distribution on its axles / tracks. The Charleswood and Wilkes feedermains will be impacted by the equipment traversing them. The two heaviest pieces of equipment imposing stress on these pipes are the crane and 6 m^3 concrete mixer truck. Due to the shorter distance between the rear axles of the concrete mixer truck compared to the crane (1 m vs. 1.65 m), it will impose a higher stress on the feedermains and therefore will be used for the loading assessment. We also assumed that the required counterweight will be delivered to the site using flatbed trucks in two parts, therefore, its weight will not exceed that of the concrete mixer truck or the crane.

The additional load from the AC 140 Crane and the 6 m^3 concrete mixer truck while passing the feedermains is provided in Table 5. For comparison, the feedermains were originally designed based on the H-20 design highway loading of 32,000 lb on the rear axle, corresponding to the uniform lane loading of 640 lb/ft of lane load.

TABLE 5: ADDITIONAL LOAD (STRESS) FROM CONCRETE MIXER TRUCK & CRANE ON CHARLESWOOD & WILKES AVE. FEEDERMAINS

Description	Unit	Charleswood Feedermain 750 mm RC, 2.1 m Cover	Wilkes Ave. Feedermain 900 mm PSC, 2.1 m Cover
AC 140 Crane	kPa	9.9	9.9
	lb/ft^2	206	206
	lb/ft	508	609
6 m^3 Concrete Mixer Truck	kPa	10.0	10.0
	lb/ft^2	208	208
	lb/ft	**513**	**616**
Design Uniform Lane Load	lb/ft	***640***	***640***

As the original design combined internal-external loading analysis was available for the Wilkes Avenue Feedermain, we also double-checked its load capacity using the current dead and proposed live loads. The load analysis of the pipes is provided in Table 6. Because applying the proposed live load from the Concrete Mixer Truck does not exceed the pipe maximum allowable load ratio ($(W_D + W_L) / (W_{.001} \times L_F)$ = 0.47 < Max. 0.88), the pipe is expected to withstand the load.

TABLE 6: LOAD ANALYSIS OF WILKES AVENUE FEEDERMAIN IMPACTED BY REMOVAL & RE-INSTALLATION OF AIR HANDLING UNITS

Parameter	Desc.	Unit	Wilkes Ave. Feedermain, 900 mm PSC, 2.1 m Cover	Comment
Design Data				
P_0	Internal Pressure required to overcome all compression in the core concrete, exclusive of the effect of external load	psi	160	
$W_{.001}$	Three-edge bearing load producing incipient cracking in the core, with no internal pressure	lb/ft	6800	W_0/0.9
P_W	Working Pressure	psi	100	
P_{WH}	Max Surge Pressure Allowance	psi	50	
I.D.	Inside Diameter	inch	36	
O.D.	Outside Diameter	inch	44	
B_D	Trench Width	ft	5.7	O.D. Pipe + 2 ft
w	Unit Weight of Backfill	lb/ft^3	120	

Parameter	Desc.	Unit	Wilkes Ave. Feedermain, 900 mm PSC, 2.1 m Cover	Comment
L_F	Load Factor for Bedding	N/A	1.5	
Design Live Load	Category		H-20	
	Uniform Lane Load	lb/ft	640	
H	Depth of Fill	ft	6.9	
K_u (or K_μ)	Soil Properties	N/A	0.11	$K_\mu = K_{\mu'}$
External Load Calculations				
C_D	Load Coefficient	N/A	1.06	$C_D = (1-e^{-2K\mu'(H/BD)})/2K_{\mu'}$
W_D	Dead Load	lb/ft	4133	$W_D = C_D \times w \times B_D^2$
W_L	Live Load	lb/ft	616	
Combined Analysis				
P_W/P_0		N/A	0.63	
$W_D/ (W_{.001} \times L_F)$		N/A	0.41 Max 0.64	See Appendix C
$(P_W+P_{WH}) / P_0$		N/A	0.94	
$W_D/ (W_{.001} \times L_F)$		N/A	0.41 Max 0.74	See Appendix C
P_W/P_0		N/A	0.63	
$(W_D + W_L) / (W_{.001} \times L_F)$		N/A	0.47 Max 0.88	See Appendix C

The 600 mm Class II (2400) sewer pipe will be impacted by the weight of the crane plus counterweight sitting on the four outriggers parallel to the pipe. The additional (live) loads from the two critical ground bearing pressures under outriggers at 90° swing angle and 47° critical angle (see Figure 1) are provided in Table 7.

TABLE 7: ADDITIONAL LOAD (STRESS) FROM CRANE OUTRIGGERS

Condition	Unit	Wilkes Avenue Reservoir Drainage Building Outlet, 600 mm AC Class II (2400) Sewer, 3 m Cover
47° Critical Angle	kPa	3.0
	lb/ft^2	63
	lb/ft	**125**
90° Swing Angle	kPa	2.6
	lb/ft^2	54
	lb/ft	107

Since the crane under 47° Critical Angle imposes more stress to the pipe, the higher load of 125 lb/ft was used in the loading assessment. The pipe loading assessment calculations are summarized in Table 8.

TABLE 8: LOAD ANALYSIS OF WILKES AVENUE RESERVOIR DRAINAGE BUILDING OUTLET IMPACTED BY REMOVAL & RE-INSTALLATION OF AIR HANDLING UNITS

Parameter	Desc.	Unit	Wilkes Avenue Reservoir Drainage Building Outlet, 600 mm AC Class II (2400) Sewer, 3 m Cover	Comment
Design Data				
I.D.	Inside Diameter	inch	24.05	
O.D.	Outside Diameter	inch	25.67	
Crushing Strength	Per ASTM Three-Edge Bearing Method	lb/ft	2400	
B_D	Trench Width	ft	4.14	O.D. Pipe + 2 ft
w	Unit Weight of Backfill	lb/ft^3	120	
L_F	Load Factor for Bedding	N/A	1.5	
H	Depth of Fill	ft	9.8	
K_u (or K_μ)	Soil Properties	N/A	0.11	$K_\mu = K_{\mu'}$
External Load Calculations				
C_D	Load Coefficient	N/A	1.85	$C_D = (1-e^{-2K\mu'(H/BD)})/2K_{\mu'}$
W_D	Dead Load	lb/ft	3805	$C_D \times w \times B_D^2$
W_L	Live Load	lb/ft	125	See Table 7
$(W_D+W_L)/1.5$		lb/ft	**2620**	
$W_D/1.5$		lb/ft	2537	
W_L/W_D	Proposed Live Load / Existing Dead Load	%	3	

As the estimated external load of 2,620 lb/ft (resulting from the total soil pressure on top of the pipe and the crane live loads) exceeds the pipe crushing strength of 2,400 lb/ft, the pipe would be susceptible to damage. The proposed live load may exceed the total load on the pipe by 3%.

To mitigate the risks associated with this pipe, we have included the following measures into the construction tender as follows.

- Multiple inspection of the sewer to be conducted during construction to look for potential impacts on the pipe. Inspections include once prior to and once after the removal of Air Handling Units, and once prior to the substantial performance of the project.
- Localized sewer repair pricing should impact be identified during construction.
- A working area for the crane, concrete mixer truck and the concrete pump truck with 3 m separation from outside of the pipe was designated.

4.3.2 PIPES IMPACTED BY CRAWL SPACE MODIFICATION WORK

The weight of the Sub-Tec 06-04 Rotary Drill Rig for installation of the temporary shoring wall to protect the cooling tower during construction is estimated at 7,000 kg (approximately 15,400 lb) imposed on two tracks. The additional load from this machine while passing the yard piping impacted by the construction activities is provided in Table 9. For comparison, all yard piping was originally designed based on the H-15 design highway loading of 24,000 lb on the rear axle, corresponding to the uniform lane loading 480 lb/ft of lane load. The Wilkes Avenue Reservoir By-pass Piping was also designed based on the H-20 design highway loading of 32,000 lb on the rear axle, corresponding to the uniform lane loading of 640 lb/ft of lane load.

TABLE 9: ADDITIONAL LOAD (STRESS) FROM ROTARY DRILL RIG ON YARD PIPING

Description	Unit	Wilkes Ave. Reservoir By-pass Piping, 1350 mm PSC, 4.8 m Cover	Wilkes Ave. Reservoir Drainage Building Outlet, 600 mm AC, 2.8 m Cover	Wilkes Ave. Reservoir North Cell (No. 2) Suction Line, 900 mm PSC, 5.1 m Cover	Interconnecting Suction Line, 900 mm PSC, 4.9 m Cover
Rotary Drill Rig	kPa	4.6	7.2	4.4	4.5
	lb/ft^2	97	151	91	95
	lb/ft	**427**	**298**	**270**	**280**
Design Uniform Lane Load	lb/ft	***640***	***N/A***	***480***	***480***

As the original design combined internal-external loading analysis was available for the Wilkes Avenue Reservoir By-pass piping, we also double-checked its load capacity using the current dead and proposed live loads. The load analysis of the pipes is provided in Table 10. Because applying the proposed live load from the Rotary Drill Rig does not exceed the pipe maximum allowable load ratio ($(W_D + W_L) / (W_{.001} \times L_F)$ = 0.73 < Max. 0.87), the pipe is expected to withstand the applied load from the drill rig.

TABLE 10: LOAD ANALYSIS OF WILKES AVENUE BY-PASS PIPING IMPACTED BY CRAWL SPACE MODIFICATION WORK

Parameter	Desc.	Unit	Wilkes Ave. Reservoir By-pass Piping, 1350 mm PSC, 4.8 m Cover	Comment
Design Data				
P_0	Internal Pressure required to overcome all compression in the core concrete, exclusive of the effect of external load	psi	150	
W_0	0.9 of the three-edge bearing load producing incipient cracking in the core, with no internal pressure	lb/ft	10395	
P_T	Test Pressure	psi	100	
P_W	Working Pressure	psi	50	
P_{WH}	Max Surge Pressure Allowance	psi	20	
B_D	Trench Width	ft	7.2	O.D. Pipe + 2 ft
w	Unit Weight of Backfill	lb/ft^3	120	
L_F	Load Factor for Bedding	N/A	1.5	
Design Live Load	Category		H-20 - S16	
	Uniform Load	lb/ft	640	
H	Depth of Fill	ft	15.7	
K_u (or K_μ)	Soil Properties	N/A	0.11	$K_\mu = K_{\mu'}$
External Load Calculations				
C_D	Load Coefficient	N/A	1.73	$C_D = (1-e^{-2K\mu'(H/BD)})/2K_{\mu'}$
W_D	Dead Load	lb/ft	10762	$W_D = C_D \times w \times B_D^2$
W_L	Live Load	lb/ft	640	See Table 5
Combined Analysis				
P_W/P_0		N/A	0.33	
$W_D/ (W_0 \times L_F)$		N/A	0.69 Max 0.87	See Appendix C
$(P_W+P_{WH})/P_0$		N/A	0.47	
$W_D/ (W_0 \times L_F)$		N/A	0.69 Max 1.02	See Appendix C

Parameter	Desc.	Unit	Wilkes Ave. Reservoir By-pass Piping, 1350 mm PSC, 4.8 m Cover	Comment
P_W/P_0		N/A	0.33	
$(W_D + W_L)/ (W_0 \times L_F)$		N/A	0.73 Max 0.87	
W_L/W_D	Proposed Live Load / Existing Dead Load	%	6	

The impact of the Sub-Tec 06-04 Rotary Drill Rig crossing the Wilkes Avenue Reservoir Drainage Building Outlet as well as the existing dead load on the pipe is provided in Table 11.

TABLE 11: LOAD ANALYSIS OF WILKES AVENUE RESERVOIR DRAINAGE BUILDING OUTLET IMPACTED BY CRAWL SPACE MODIFICATION WORK

Parameter	Desc.	Unit	600 mm AC Class II (2400) Sewer	Comment
Design Data				
I.D.	Inside Diameter	inch	24.05	
O.D.	Outside Diameter	inch	25.67	
Crushing Strength	Per ASTM Three-Edge Bearing Method	lb/ft	2400	
B_D	Trench Width	ft	4.14	O.D. Pipe + 2 ft
w	Unit Weight of Backfill	lb/ft^3	120	
L_F	Load Factor for Bedding	N/A	1.5	
H	Depth of Fill	ft	9.2	
K_u (or K_μ)	Soil Properties	N/A	0.11	$K_\mu = K_{\mu'}$
External Load Calculations				
C_D	Load Coefficient	N/A	1.76	$C_D = (1-e^{-2K\mu'(H/BD)})/2K_{\mu'}$
W_D	Dead Load	lb/ft	3620	$C_D \times w \times B_D^2$
W_L	Live Load	lb/ft	298	See Table 5
$(W_D+W_L)/1.5$		lb/ft	**2612**	
$W_D/1.5$		lb/ft	2413	
W_L/W_D	Proposed Live Load / Existing Dead Load	%	8	

As the estimated external load of 2,612 lb/ft (resulting from the total soil pressure on top of the pipe and the drill rig traversing the pipe) exceeds the pipe crushing strength of 2,400 lb/ft, the pipe would be susceptible to damage. The proposed live load may exceed the total load on the pipe by 8%.

We also analyzed the impact of the proposed live load on the pipe if two steel road plates were to be used under the rotary drill rig tracks. Each steel road plate was assumed to be 5'×10'×1" with a mass of 2,042 pounds. The stress imposed on the 600 AC pipe at the gravel road while the rotary drill rig crossing the steel road plates (one under each track) was estimated at 255 lb/ft Comparing the live loads on the pipe with and without using the steel road plates shows that using the steel road plate to distribute the load does not noticeably improve the situation as the pipe is already overloaded by its dead load.

To mitigate the risks associated with this pipe, we have included the following measures into the construction tender as follows.

- Multiple inspection of the sewer to be conducted during construction to look for potential impacts on the pipe.
- Localized sewer repair pricing should impact be identified during construction.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Several findings have resulted from this study. They include the following:

- All assessed water pipes including the Charleswood Feedermain 750 mm RC), the Wilkes Avenue Feedermain (900 mm PSC), the Wilkes Avenue Reservoir By-pass Piping (1350 mm PSC), the Wilkes Avenue Reservoir North Cell (No. 2) Suction Line (900 mm PSC) and the Interconnecting Suction Line (900 mm PSC) can withstand the live loads resulting from the construction activities providing the selected equipment is similar to the allowable equipment identified in this report.
- The Wilkes Avenue Reservoir Drainage Building Outlet pipe (600 mm AC Class II Sewer) could be impacted by the construction activities as the pipe is overloaded based on its classification. However, the risk will be mitigated by conducting inspections and performing point repairs as required.
- During the crane operation at the site, it is critical to maintain a minimum 3 m offset from the edge of the Wilkes Avenue Reservoir Drainage Building Outlet pipe to mitigate the risk of overloading the pipe. Steel plates shall be used under the outriggers.
- Protection of valve chambers by installation of temporary snow fences is recommended. The contractor is advised to adhere to the area restrictions shown on the Drawing 1-0650A-C0003-001.
- No vehicle is permitted within 2 m of the two 1350 Steel Pipes in Concrete Suction Lines on the southwest & southeast of Hurst Pumping Station.
- All excavations within two (2.0) meters of an existing utility must be done as hand work.
- The equipment to undertake the work was selected based on KGS previous experience of similar projects and after consultation with contractors. However, each Contractor may choose to use alternate means and methods based on the availability of the equipment and their previous experience. The Contractor shall submit their means and methods of undertaking the work to the Contract Administrator for approval before commencement of each activity.

- The Contractor shall select each piece of equipment to undertake the work in such a way that they meet the design loading criteria stated in Table 1. The Contractor shall also verify that the equipment will not impose more stress on the piping than the loading thresholds. If the load of a selected piece of equipment exceeds the loading threshold, the Contractor shall provide their specific means and methods validating the piping will not be impacted.

Prepared By:	Approved By:
Arash Kiayee, P.Eng. Municipal Engineer	Ray Offman, P.Eng. Municipal Department Head

STATEMENT OF LIMITATIONS AND CONDITIONS

Limitations

This memorandum has been prepared for the City of Winnipeg in accordance with the agreement between KGS Group and the City of Winnipeg (the "Agreement"). This memorandum represents KGS Group's professional judgment and exercising due care consistent with the preparation of similar documents. The information, data, recommendations, and conclusions in this memorandum are subject to the constraints and limitations in the Agreement and the qualifications in this memorandum. This memorandum must be read as a whole, and sections or parts should not be read out of context.

This memorandum is based on information made available to KGS Group by the City of Winnipeg. Unless stated otherwise, KGS Group has not verified the accuracy, completeness, or validity of such information, makes no representation regarding its accuracy, and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this memorandum apply only as they existed at the time of KGS Group's work.

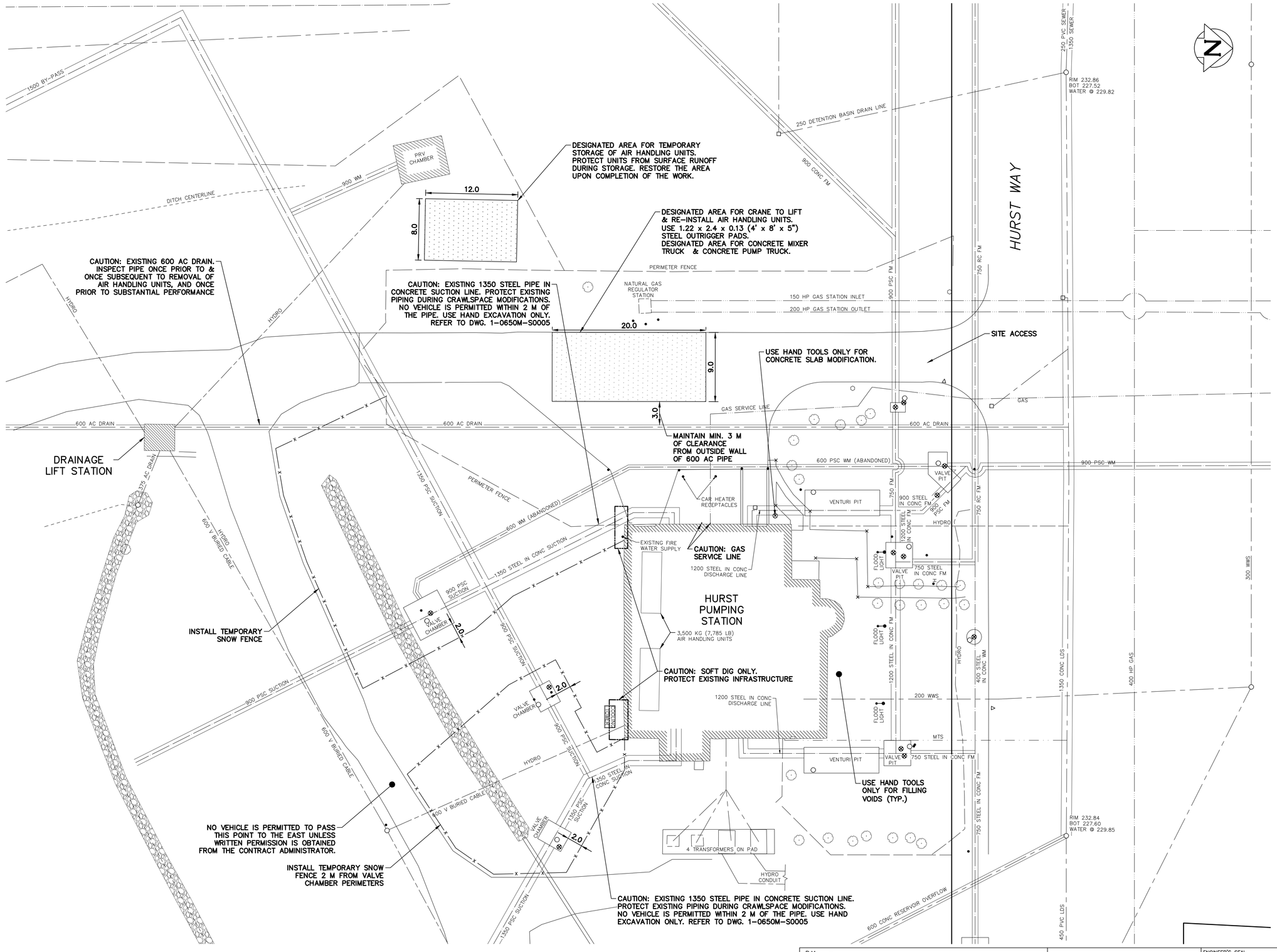
Third Party Use of Memorandum

Any use a third party makes of this memorandum or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this memorandum.

APPENDIX A

Drawings

A1 SIZE – 594mm x 841mm



NOTES:

1. ALL WORK TO BE DONE IN ACCORDANCE WITH THE LATEST VERSION OF THE CITY OF WINNIPEG CONSTRUCTION SPECIFICATIONS.
2. LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.
3. RESTORE ALL DISTURBED SURFACES IMPACTED BY CONSTRUCTION ACTIVITIES TO THE ORIGINAL, DOCUMENTED CONDITIONS PRIOR TO CONSTRUCTION, WITH THE EXCEPTION OF MODIFICATIONS / UPGRADES INDICATED ON THE CONTRACT DRAWINGS.
4. CONTRACTOR TO DOUBLE-CHECK WEIGHT OF AIR HANDLING UNITS AND SUBMIT A LIFTING PLAN TO THE CONTRACT ADMINISTRATOR BEFORE LIFTING THE UNITS.
5. REFER TO PIPE LOADING ASSESSMENT REPORT BEFORE COMMENCEMENT OF CONSTRUCTION.
6. CONTRACTOR SHALL SUBMIT THEIR MEANS AND METHODS OF UNDERTAKING THE WORK TO THE CONTRACT ADMINISTRATOR FOR APPROVAL BEFORE COMMENCEMENT OF EACH ACTIVITY.
7. THE CONTRACTOR SHALL SELECT EACH PIECE OF EQUIPMENT TO UNDERTAKE THE WORK IN SUCH A WAY THAT THEY MEET THE DESIGN LOADING CRITERIA STATED IN THE PIPE LOADING ASSESSMENT REPORT. THE CONTRACTOR SHALL ALSO VERIFY THAT THE EQUIPMENT WILL NOT IMPOSE MORE STRESS ON THE PIPING THAN THE LOADING THRESHOLDS. IF THE LOAD OF A SELECTED PIECE OF EQUIPMENT EXCEEDS THE LOADING THRESHOLD, THE CONTRACTOR SHALL PROVIDE THEIR SPECIFIC MEANS AND METHODS VALIDATING THE PIPING WILL NOT BE IMPACTED.
8. ALL EXCAVATIONS WITHIN 2.0 M OF AN EXISTING UTILITY MUST BE DONE AS HAND WORK.

DRAWING NUMBER	REFERENCE DRAWINGS
1-0650M-S0005-001	STRUCTURAL – PUMP STATION CRAWLSPACE MODIFICATIONS – PARTIAL PLAN & SECTION
1-0650A-D0001-001	COVER SHEET

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

B.M. –
ELEV. –

NO.	REVISIONS	DATE	DESIGN	CHECK
0	ISSUED FOR CONSTRUCTION	2020/06/18		

KGS GROUP

DESIGNED BY: A. KIAYEE	CHECKED BY: R. OFFMAN
DRAWN BY: G. LOEWEN	APPROVED BY: R. OFFMAN
SCALE: 1:250	ISSUED FOR CONSTRUCTION BY:
DATE: 2019/07/05	DATE:
CONSULTANT NO.: 19-0107-005_C03	

ENGINEER'S SEAL

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

HURST PUMPING STATION
STRUCTURAL REPAIRS AND DRAINAGE BUILDING UPGRADES
MUNICIPAL
SENSITIVE INFRASTRUCTURE PROTECTION PLAN

CITY DRAWING NUMBER	SHEET	REV.	SIZE
1-0650A-C0003	001	0	A1

APPENDIX B

Able Crane Lifting Plan

KGS GROUP

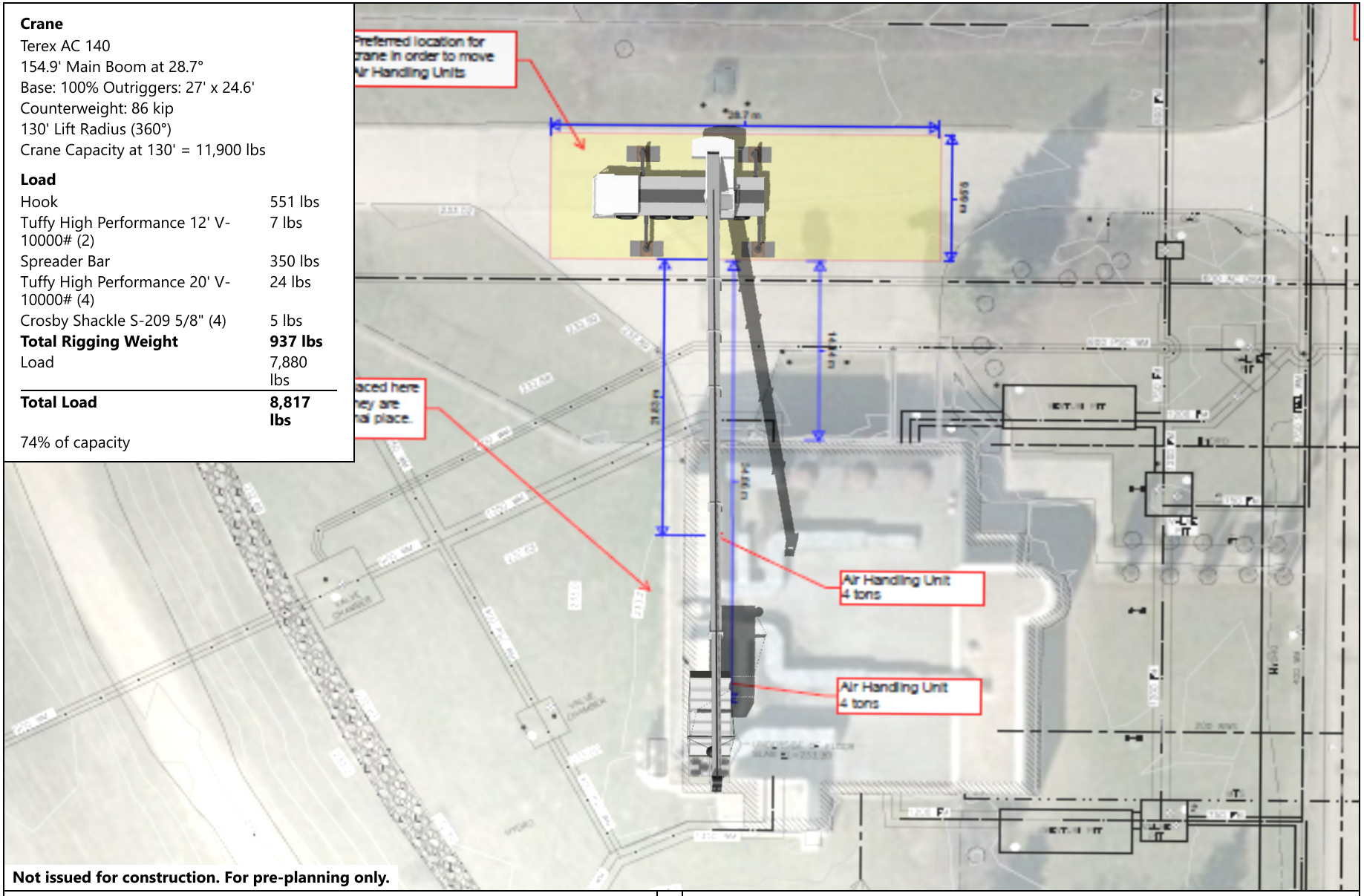
Crane

Terex AC 140
154.9' Main Boom at 28.7°
Base: 100% Outriggers: 27' x 24.6'
Counterweight: 86 kip
130' Lift Radius (360°)
Crane Capacity at 130' = 11,900 lbs

Load

Hook	551 lbs
Tuffy High Performance 12' V-10000# (2)	7 lbs
Spreader Bar	350 lbs
Tuffy High Performance 20' V-10000# (4)	24 lbs
Crosby Shackle S-209 5/8" (4)	5 lbs
Total Rigging Weight	**937 lbs**
Load	7,880 lbs
Total Load	**8,817 lbs**

74% of capacity



Not issued for construction. For pre-planning only.

Title	Lift Plan
Project	R KGS 4TON UNITS JUNE 2019
Customer	KGS Consulting Engineers
Description	Hoist AHU's
Drawn By	Rick Moquin 6/20/2019

Crane

Terex AC 140
154.9' Main Boom at 28.7°
Base: 100% Outriggers: 27' x 24.6'
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Total Rigging Weight	**937 lbs**
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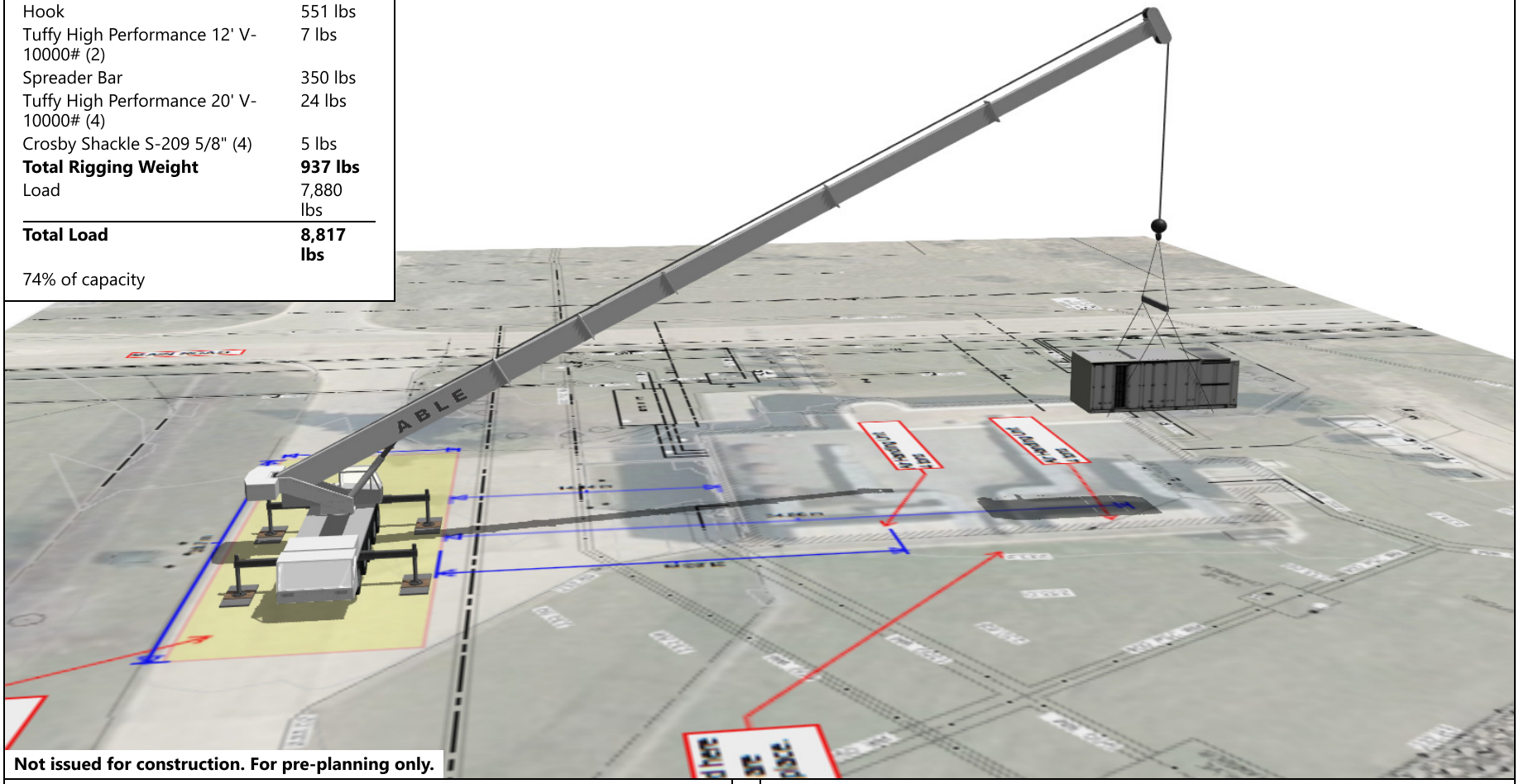
74% of capacity



Not issued for construction. For pre-planning only.

Title	Lift Plan
Project	R KGS 4TON UNITS JUNE 2019
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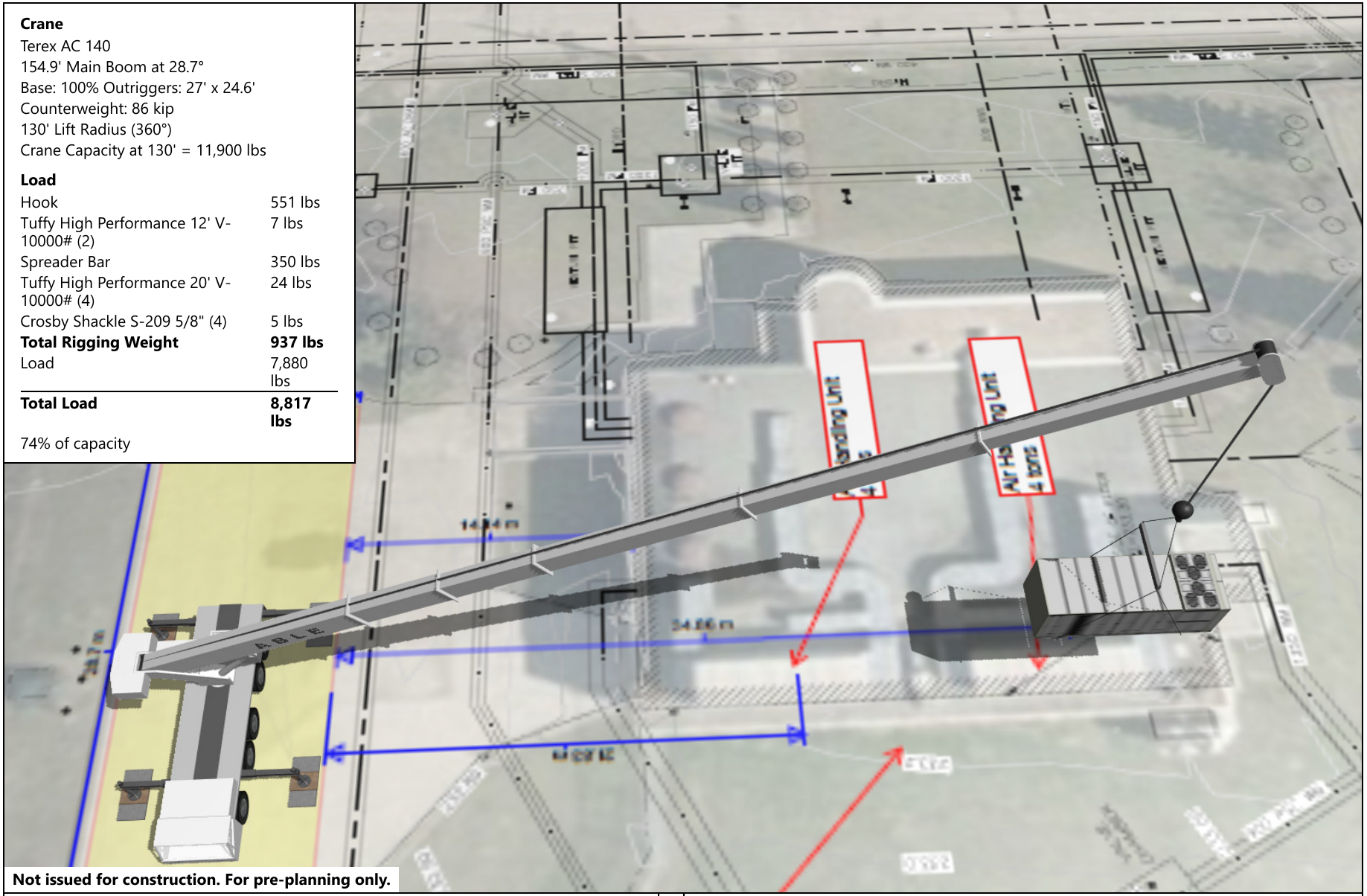
74% of capacity



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Project	R KGS 4TON UNITS JUNE 2019
Customer	KGS Consulting Engineers
Description	Hoist AHU's
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Total Rigging Weight	**937 lbs**
Load	7,880 lbs
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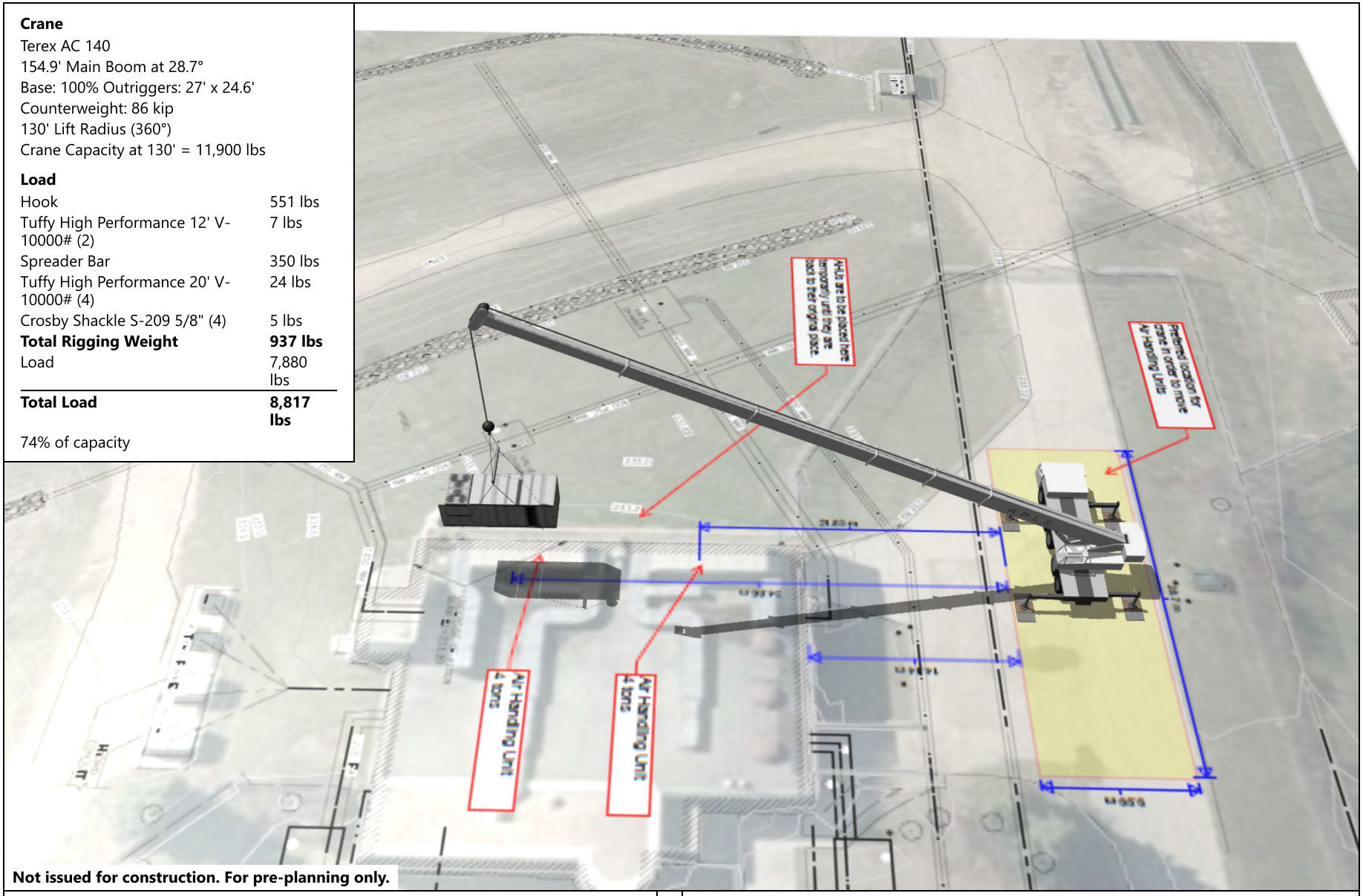
74% of capacity



Not issued for construction. For pre-planning only.

Title	Lift Plan
Project	R KGS 4TON UNITS JUNE 2019
Customer	KGS Consulting Engineers
Description	Hoist AHU's
Drawn By	Rick Moquin 6/20/2019

Outrigger Loads

Job Information

Project	R KGS 4TON UNITS JUNE 2019
Customer	KGS Consulting Engineers
Description	Hoist AHU's
Drawn By	Rick Moquin
Date	6/20/2019

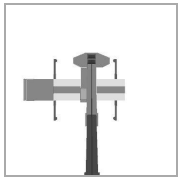
Crane Information

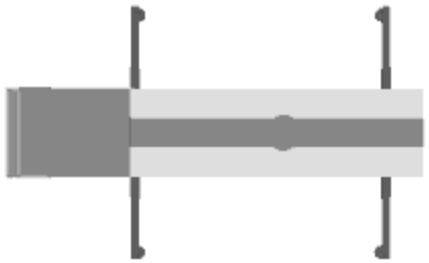
Terex AC140
154.9' Main Boom at 28.7°
100% Outriggers: 27' x 24.6'
Cwt: 86 kip
130' Lift Radius

Crane Weights

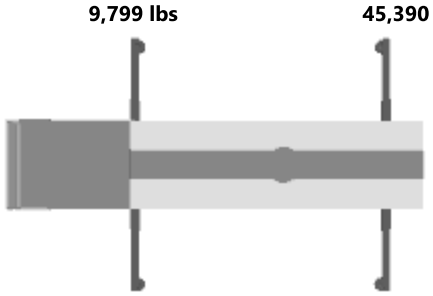
carrier	55,336 lbs
superstructure	20,282.5 lbs
counterweight	85,980.3 lbs
HA Boom (Foot Weight)	21,583.3 lbs
HA Boom (Head Weight)	12,897 lbs
Net Load Weight	8,817.22 lbs
Total Weight	**204,896.3 lbs**

90° Swing Angle





47° Critical Angle



Not for construction use. For pre-planning only.

AC140

Capacities on Main Boom

HA

Capacity (kip) = Load + Hook Block

Slew Range	0-360 °
Outrigger Length	27 ft
Outrigger Width	24,6 ft
Counterweight	86 kip

Main Boom Length (ft)	154,9	154,9	165,4	168	169	180,1	182,1	196,9
Radius (ft)								
29,5	41,4	39	27,1					
32,8	40,6	37,7	26	35,9	31,3	24		
39,4	36,4	34	24	34,2	30	22,5	26,9	20,5
45,9	32,6	30,6	21,8	31,5	28,2	20,9	26	20,3
52,5	29,5	28	20,1	28,9	26,5	19,4	25,1	19,4
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105	14,8	14,8	9,7	13,7	13,4	10,1	13,2	11,2
111,5	13,7	13,9	8,8	12,6	12,8	9,5	11,9	10,6
118,1	12,6	13	8,2	11,7	11,9	8,8	11,2	9,7
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131,2	10,8	11,9	6,8	9,9	10,4	7,7	9,7	8,4
137,8	9,7	11	6,4	8,6	9,7	7,1	8,8	7,7
144,4			6	7,5	9,3	6,6	8,2	7,1
150,9			5,5	6,6	8,4	6,2	7,5	6,6
157,5						5,7	6,6	6
164						5,5	5,7	5,5
177,2								4,2
single hook block	3	3	2	3	2	2	2	2
LK-Code	48	49	51	52	53	54	55	56
Tele 1 (%)	45	45	0	90	45	45	90	100
Tele 2 (%)	90	45	100	90	90	100	90	100
Tele 3 (%)	90	90	100	90	90	100	90	100
Tele 4 (%)	90	90	100	90	90	100	90	100
Tele 5 (%)	45	90	100	45	90	100	90	100

APPENDIX C

Combined Internal External Loading Analysis

KGS GROUP

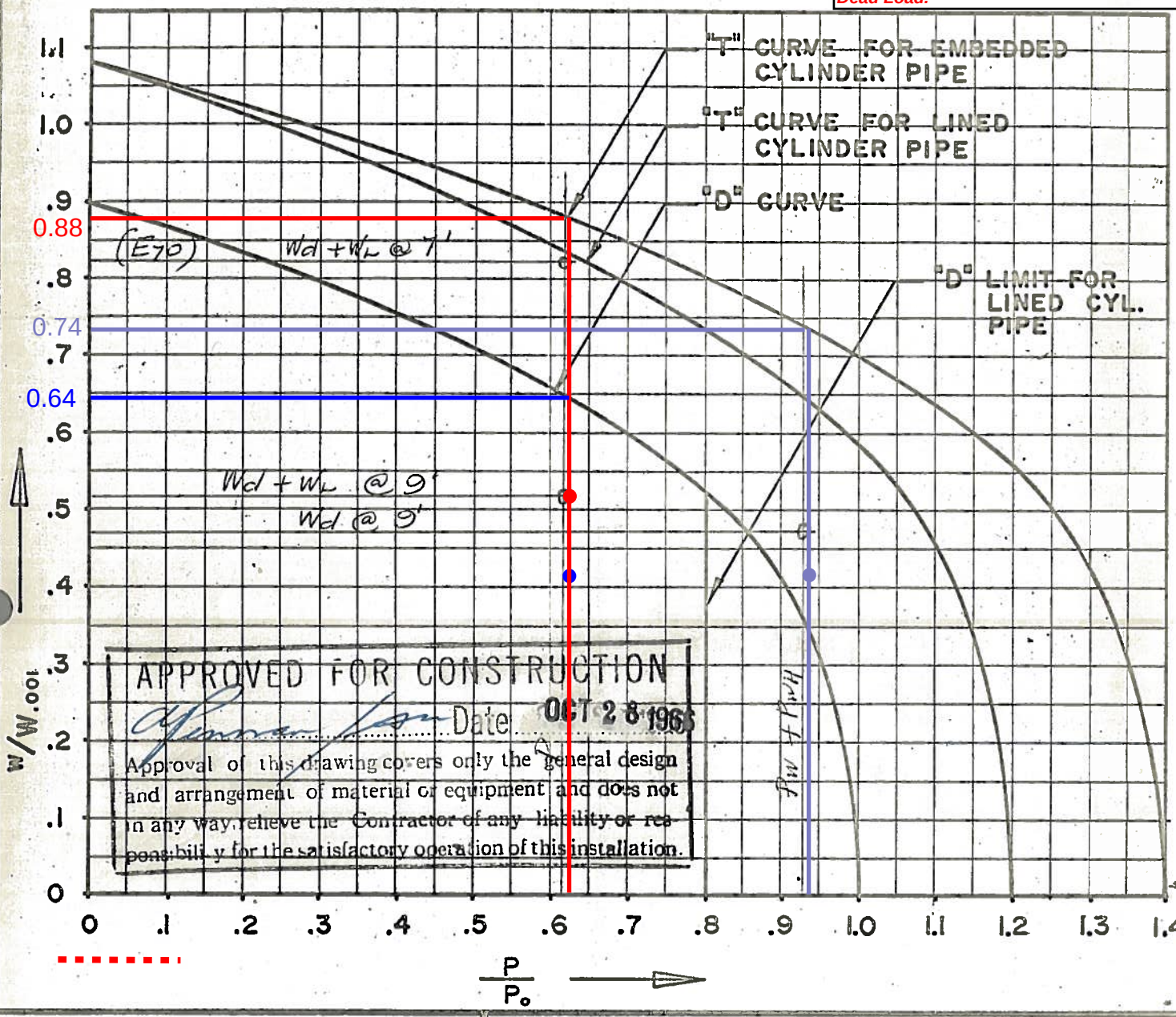
COMBINED INTERNAL - EXTERNAL LOADING ANALYSIS

A.W.W.A. C-301-64 APPENDIX "A"

Graph used for Loading Assessment of Wilkes Ave. Feedermain (900 mm PSC)

$$\frac{W}{W_{.001}} = .9\sqrt[3]{1-\frac{P}{P_o}}$$

Disregard ALL Original Calculations & Numbers.
Blue denotes Combined Analysis of Dead Loads.
Pink denotes Combined Analysis of Dead Loads + Surge Pressure.
Red denotes Combined Analysis of Live Load + Dead Load.

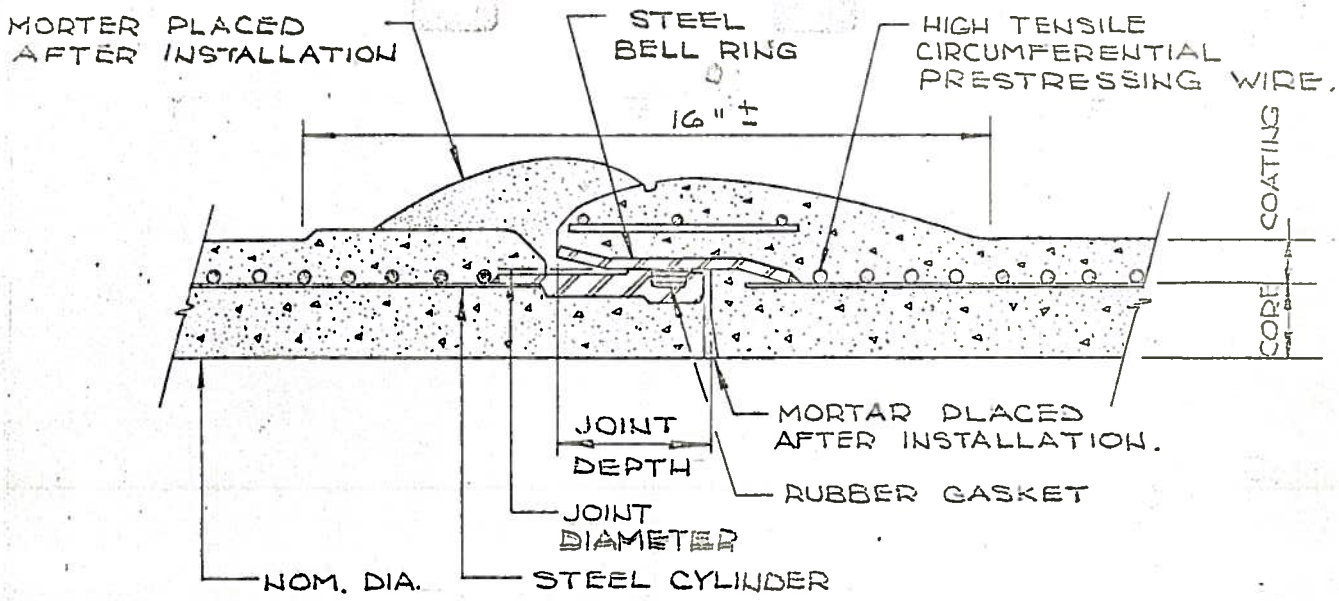


APPROVED FOR CONSTRUCTION
Date OCT 28 1965
Approval of this drawing covers only the general design and arrangement of material or equipment and does not in any way relieve the Contractor of any liability or responsibility for the satisfactory operation of this installation.

PIPE DESIGN		COMBINATION LOADING			@ 7'	@ 9'
SPECIFICATION	C-301-78	UNDER "D" CURVE	$\frac{P_w}{P_o}$ = .62 ✓	$\frac{W_d}{W_{.001} \times B.F.}$ =		.47 ✓
PIPE DIAMETER inches	36" ✓					
WIRE AREA in.²/ft.	.381 ✓	UNDER "T" CURVE	$\frac{P_w + P_{WH}}{P_o}$ = .93 ✓	$\frac{W_d}{W_{.001} \times B.F.}$ =		.47 ✓
P_o p.s.i.	160 ✓					
$W_{.001}$ lbs./foot	6800 ✓	UNDER "T" CURVE	$\frac{P_w}{P_o}$ = .62 ✓	$\frac{W_d + W_l}{W_{.001} \times B.F.}$ =	.82 ✓	.52 ✓
cr p.s.i.	1220 ✓					
W_d lbs./foot	4800 @ 9' ✓ 3900 @ 7'	LOCATION - Metro Winnipeg				
W_l lbs./foot	H_{20} = 560 @ 9' ✓ E_{70} = 4500 @ 7'	CUSTOMER - Metro Winnipeg				

CANADA IRON FOUNDRIES PIPE DIVISION | APPROVED BY - ...on.....

Wilkes Ave. Feedermain (900 mm PSC)



USE KALICRETE TYPE V FOR WINNIPEG

NOMINAL PIPE DIA - IN.	36"
CYLINDER GAGE - (A.S.T.M.) A-245-57T GRADE B	16 USG
CYLINDER AREA SQ. IN. / FT.	.718
CYLINDER TEST PRESSURE (25,000 P.S.I.) P.S.I.	74
WIRE SIZE - (A.S.T.M. A227-47)	#6 MBU
WIRE SPACING - IN. c/c	.89
WIRE AREA - SQ. IN./FT.	.381
GROSS WRAPPING STRESS - P.S.I.	140 000
DYNAMOMETER (1 WIRE) - LBS.	4060
MIN. COMPRESSIVE STGTH OF CONCRETE AT TIME OF WRAPPING	3500
CORE THICKNESS (INCLUDING CYLINDER) IN.	2¼
COATING THICKNESS - IN.	1
SPIGOT RING - SECTION	6 x 6
BELL RING - SECTION	7.5 x 6
JOINT DEPTH - IN.	3 3/16
JOINT DIA. - IN.	
O.D. PIPE AT BELL - IN.	45
MANUFACTURED LENGTH. - FT.	16 or 20

APPROVED FOR CONSTRUCTION
Date OCT 28 1966
Approval of this drawing covers only the general design and arrangement of material or equipment and does not in any way relieve the Contractor of any liability or responsibility for the satisfactory operation of the installation.

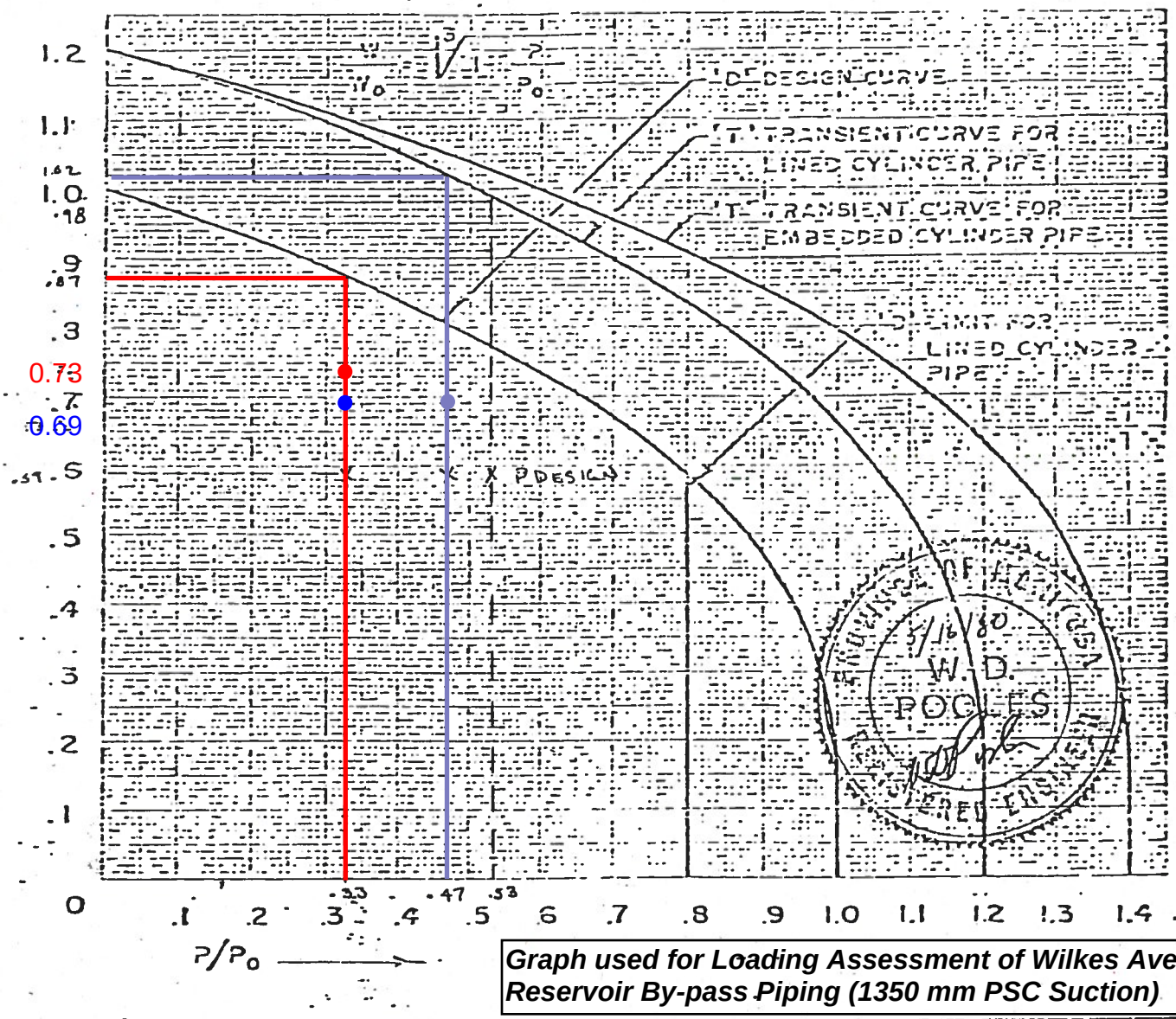
CANADA IRON FOUNDRIES LTD. – Pipe Division

"HYPRESCON"
PRESTRESSED CONCRETE CYLINDER PIPE
WITH R & S EXPANSION JOINT
SPECIFICATION A.W.W.A. C-301

36" NOM. DIA. PIPE. CLASS — P.S.I. J.O. 445

PREP'D BY	CR
APP'D BY	
DATE	Jan. 31/66
SPECIFICATION Nº	C-301-78
Sheet — of —	

COMBINED INTERNAL-EXTERNAL LOADING ANALYSIS



Graph used for Loading Assessment of Wilkes Ave. Reservoir By-pass Piping (1350 mm PSC Suction)

DATA			COMBINATION LOADING		
WIRE AREA in.²/ft.					
P_o	p.s.i.	150 psi	UNDER 'D' CURVE	$\frac{P_w}{P_o} = .33$	$\frac{W_d/L.F.}{W_o} = 0.59 < 0.87$
W_o	lbs/ft.	10395 LB/FT			
P_w	p.s.i.	50 psi	UNDER 'T' CURVE	$\frac{P_w + P_{wh}}{P_o} = .47$	$\frac{W_d/L.F.}{W_o} = 0.59 < 1.02$
P_{wh}	p.s.i.	20 psi			
W_d	lbs/ft.	9244 LB/FT	UNDER 'T' CURVE	$\frac{P_w}{P_o} = .33$	$\frac{W_d/L.F. + W_i/1.5}{W_o} = 0.59 < 0.8$
W_i	lbs/ft.	0			
L.F.					

COM. PIPE DIAMETER – 54 inches

CLASS – C301(L)

JOB ORDER NO. –

REVISION –

SPECIFICATION: A.W.W.A. C-301-72 APPENDIX 'A'

PREP. BY W.D.P. DATE: MAY 11/80 DWG. NO

APPROVED BY

ENAMEL LIMITED

PIPE DIVISION

36" PRESTRESSED CONCRETE EMBEDDED CYLINDER PIPE W/RUBBER & STEEL JOINT (SP-12)

WINNIPEG, MANITOBA

OUR JOB NO. CAR-LJ 59-2

PIPE SUMMARY SP-59-17

Marks	Description	Average L.L.	Units	Total L.L.
	Section XII			
Win	Straights	16.03	6	96.18
	Short: (12'-0-1/8"O.A.)	9.76	1	9.76
	Short: (14'-11-1/8"O.A.)	14.68	1	14.68
	Adapter - Wall Fitting - LJ Spigot x Steel Pipe (1'-6-5/8"O.A.)	1.30	1	1.30
	Adapter - LJ Bell x Victaulic (2'-6"O.A.)	2.50	1	2.50
	Adapter - LJSpigot x Victaulic (2'-9"O.A.)	2.50	1	2.50
Win	Eccentric Reducer - 48" LJ Spigot x 36" LJ Bell (4'-7-1/4"O.A.)	4.31	1	4.31
SB	Eccentric - 54" LJ Bell x 48" LJ Spigot (5'-2"O.A.)	4.88	1	4.88
	Wye:			
SB	54" x 54" x 42" (56°-38°) LJS x LJB x LJS (8'-11-3/4"O.A.)	8.67	1	8.67
Win	48" x 48" x 48" (33°-22°) - LJB x LJB x LJB (12'-9-1/2"O.A.)	12.55	1	12.55
		Total		157.33
	Section XIV			
Win	Straights	16.03	7	112.21
Win	Short (4'-11-5/8"O.A.)	4.72	1	4.72
Win	Adapter - Wall Fitting - LJ Spigot x Steel Pipe (1'-6-5/8"O.A.)	1.30	1	1.30
		Total		118.23
	Section XV			
Win	Straights	16.03	10	160.30
Win	Adapter - CI Spigot x LJ Bell (2'-4-1/4"O.A.)	2.35	1	2.35
Win	Adapter - LJBell x Victaulic (1'-3-1/2"O.A.)	1.29	1	1.29
SB	Std Reducer - 54" LJB x 36" LJS (6'-7"O.A.)	6.33	1	6.33
SB	Cross - 54" x 54" x 54" x 36" - LJS x LJB x LJB LJB (8'-11-3/4"O.A.)	8.67	1	8.67
Win	Closure	11.42	1	11.42
		Total		190.36

APPROVED FOR CONSTRUCTION

DATE July 29/59

Approval of this drawing covers only the design and arrangement of material or equipment and does not in any way relieve the Contractor of any liability or responsibility.

LOCK JOINT PIPE COMPANY
EAST ORANGE, NEW JERSEY

PIPE LAYING SCHEDULE

WINNIPEG, MANITOBA
36" PRESTRESSED CONCRETE EMBEDDED CYLINDER PIPE WITH RUBBER AND STEEL JOINT (SP-12)
OUR JOB NO. CANLJ 59-2

DATE: 6-30-59
BY: DJL:lal

SHEET NO. 8

REV.	DATE	BY	SHEETS

NOTE: ALL LAYING INSTRUCTIONS GIVEN LOOKING IN THE DIRECTION OF LAYING. THIS SCHEDULE SUPPLIED ONLY AS A GUIDE FOR DISTRIBUTING & INSTALLING PIPE & FITTINGS. ADJUSTMENTS TO MEET FIELD CONDITIONS MUST BE MADE AS REQUIRED.

POS.	DESCRIPTION	AVERAGE L. L.	SLOPE CORR.	HORIZ. L. L.	STATION	ANGLE	TANGENT	ELEV. CHANGE	INVERT ELEV.
	This Layout is for Section XV & XIV								
	Beginning on the West Corner of Reservoir No. 2 at the 36" CI Spigot Adapter and Laying Southeast Towards the Reservoir Bells Ahead				0+00 SE				17.25
1	CI Spigot x LJ Bell - Adapter (2'-4-1/4"O.A.)	2.35			0+02.35 SE	0°-15'	.0042		
~~3~~ 3	Straights, Open Joints for proper slope	~~64.12~~			~~0+66.47 SE~~				
~~7~~ 7	Straights	~~96.18~~							
					1+62.65 SE				
1	Short (4'-11-5/8"O.A.)	4.72			1+67.37 SE				
1	Straight	16.03			1+83.40 SE				
1	LJ Spigot x Steel Pipe Adapter - Wall Fitting (1'-6-5/8"O.A.)	1.30			1+84.70 SE			-.78	16.47
	This Layout is for Section XII								
	Beginning at the run of the 48" Wye and Laying East Toward Reservoir No. 2 Bells Ahead				0+00 E				16.47
	Run of 48" Wye (Adjacent to Branch) B	9.84			0+09.84 E	0°-52'	.0150		
1	48" x 36" Eccentric Reducer - LJS x LJB (4'-7-1/4"O.A.)	4.31			0+14.15 E				
1	Short (12'-0-1/8"O.A.) Open Joint for Proper Slope	9.76			0+23.91 E				
1	LJ Spigot x Victaulic Adapter (2'-9"O.A.)	2.50			0+26.41 E				
	Valve (By Others)	-							16.87
1	LJ Bell x Victaulic Adapter (2'-6"O.A.)	2.50				0°-12'	.0035		
5	Straights, Open Joints for Proper Slope	80.15			0+28.91 E				
1	Short (14'-11-1/8"O.A.)	14.68			1+09.06 E				
					1+23.74 E				
1	Straight	16.03			1+39.77 E				
1	LJ Spigot x Steel Pipe Adapter - Wall Fitting (1'-6-5/8"O.A.)	1.30			1+41.07 E			-.40	16.47

APPROVED FOR CONSTRUCTION
WITH CHANGES AS NOTED IN RED
DATE July 9/59
Approval of this drawing covers only the design and arrangement of material or equipment and does not in any way relieve the Contractor of any liability or responsibility

EXC-1

LOCK JOINT PIPE COMPANY
EAST ORANGE, NEW JERSEY

PIPE LAYING SCHEDULE
WINNIPEG, MANITOBA
36" & 54" PRESTRESSED CONCRETE CYLINDER PIPE WITH RUBBER &STEEL JOINT (SP-12)
OUR JOB NO. CHNLJ-59-2

DATE: 7-17-59
BY: DJL:lal

SHEET NO. 10

REV.	DATE	BY	SHEETS

NOTE: ALL LAYING DISTANCES GIVEN LOOKING IN THE DIRECTION OF LAYING. THIS SCHEDULE SUPPLIED ONLY AS A GUIDE FOR DISTRIBUTING & INSTALLING PIPE & FITTINGS. ADJUSTMENTS TO MEET FIELD CONDITIONS MUST BE MADE AS REQUIRED.

PCS.	DESCRIPTION			AVERAGE L. L.	SLOPE CORR.	HORIZ. L. L.	STATION	ANGLE	TANGENT	ELEV. CHANGE	INVERT ELEV.
	This Layout is for Parts of Sections XIII & XV										
	Beginning at 36" Victaulic Adapter At Northwest Corner of Reservoir No. 2 Laying Away From Reservoir Bell Ahead										
							0+00 NW				17.25
1	Adapter - LJ Bell x Victaulic (1°-3-1/2"O.A.)			1.29	-						
							0+01.29 NW				
1	Straight, Field Weld to Reducer			16.03							
							0+17.32				
1	54" x 36" Std Reducer - LJB x LJS (6°-7"O.A.) Field Weld to Straight and Cross			6.33							
							0+23.65 NW				
1	54" x 54" x 54" x 36" Cross - LJS - LJB x LJB x LJB w/Spigot Plugs at 54" LJB Run & Branch. Field Weld All Joints (8°-11-3/4"O.A.)		S	4.23							
							0+27.88 NW				16.64
	Laying off 36" Branch	BR.	B	3.44							
							0+31.32 NE				
3	Straights, Field Weld 1st Straight to Cross			48.09							
							0+79.41 NE				
	Beginning at 54" x 48" Eccentric Reducer Laying Away From Reservoir Bells Ahead										
							0+00				
1	54" x 48" Eccentric Reducer - LJB x Victaulic (5°-2-1/2"O.A.)			5.21							
							0+05.21 W				
1	Straight, Field Weld to Elbow			16.03							
							0+21.24 W				
1	33°-22' Elbow Right w/1°-2-1/8" Extension on Spigot End, Field Weld Both Ends		S	2.76							
							0+24.00 W				
			B	1.79							
							0+25.79 NW				
1	Short (5°-3-1/2"O.A.) Field Weld Both Ends			4.98							
							0+30.77 NW				
1	54" x 54" x 36" Tee - LJS x LJB x LJB w/Spigot Plug at 54" Bell End of Run, Field Weld All Joints (6°-11-3/4"O.A.)		S	3.23							
							0+34.00 NW				
	Laying off 36" Branch	BR.	B	3.44							16.64
							0+37.44 SW				
2	Straights, Field Weld 1st Straight to Tee			32.06							
							0+69.50 SW				
1	Closure, Bell to Bell			11.42							
							0+80.92 SW				

SECTION XV 36" PIPE

SECTION XIII 54" PIPE

SECTION XV 36" PIPE

APPROVED FOR CONSTRUCTION
M. Stanowski DATE July 24/59
Approval of this drawing covers only the design and arrangement of material or equipment and does not in any way relieve the Contractor of any liability or responsibility.

APPENDIX D

Major Equipment List

Hurst Pumping Station and Drainage Lift Station

Equipment Tag	Description	Training Required	Lamacoid	Shop Drawing Required	Drawing Number
Hurst Pumping Station					
P-M500	Sump Pump	Yes	Yes	Yes	1-0650M-M0006-002
CP-M500	Sump Pump Control Panel	Yes	Yes	Yes	1-0650M-E0023-001
DS-AHU-1	AHU-1 Disconnect Switch	No	Yes	Yes	1-0650M-E0003-001
DS-AHU-2	AHU-2 Disconnect Switch	No	Yes	Yes	1-0650M-E0003-001
SW-C700	Chlorine Exhaust Fan Toggle Switch (Stairwell)	No	Yes	No	1-0650M-E0023-001
SW-C701	Chlorine Exhaust Fan Toggle Switch (Chlorine storage entrance)	No	Yes	No	1-0650M-E0023-001
JB-Y800	Ethernet Extender Junction Box	No	Yes	Yes	1-0650M-E0023-001
MS-EEF-1	Chlorine Exhaust Fan EEF-1 Motor Starter	No	Yes	Yes	1-0650C-E0004-001
AA-C801	Chlorine Sensor Horn/Strobe.	No	Yes	Yes	1-0650M-E0023-001
AA-C802	Chlorine Sensor Horn/Strobe.	No	Yes	Yes	1-0650M-E0023-001
CP-C800	Chlorine Exhaust Fan Control Panel	Yes	Yes	Yes	1-0650C-E0003-001
DS-EF-M1	Rooftop Fan EF-1 Disconnect Switch	No	Yes	Yes	1-0650M-E0024-001
DS-EF-M2	Rooftop Fan EF-2 Disconnect Switch	No	Yes	Yes	1-0650M-E0024-001
DS-EF-M3	Rooftop Fan EF-3 Disconnect Switch	No	Yes	Yes	1-0650M-E0024-001
DS-CU-1	Rooftop Condensing Unit Disconnect Switch	No	Yes	Yes	1-0650M-E0024-001
DS-EEF-1	Chlorine Exhaust Fan EEF-1 Disconnect Switch	No	Yes	Yes	1-0650M-E0024-001
DS-FAN-1	Chlorine Exhaust Fan FAN-1 Disconnect Switch	No	Yes	Yes	1-0650M-E0024-001
-	Rooftop Maintenance Receptacles (x4)	No	No	No	1-0650M-E0024-001
-	Chlorine Room Three Way Light Switch	No	No	No	1-0650M-E0023-001
Drainage Lift Station					
P- Y103	Sampling Pump	Yes	Yes	Yes	1-0650Y-M0001-001
HS-Y103	Sampling Pump Start/Stop Pushbutton	No	Yes	Yes	1-0650Y-E0003-001
P-Y101	Chemical Dosing Pump 1	Yes	Yes	Yes	1-0650Y-M0001-001
P-Y102	Chemical Dosing Pump 2	Yes	Yes	Yes	1-0650Y-M0001-001
SF-Y601	Supply Fan	No	Yes	Yes	1-0650Y-M0002-001
ME-Y601	Dehumidistat	No	Yes	Yes	1-0650Y-E0003-001
FV-Y6010	Motorized Damper	No	Yes	Yes	1-0650Y-M0002-001
SPL-Y1	125 A Splitter	No	Yes	Yes	1-0650Y-E0001-001
PNL-Y10	120/240V, 1ph, 3w, 100 A, 18 CCT Panel	No	Yes	Yes	1-0650Y-E0004-001
UH-Y600	Existing 600 V Unit Heater	No	Yes	No	1-0650Y-E0001-001
JB-Y100	Low Level Float Switch LSL-Y100 Junction Box	No	Yes	No	1-0650Y-E0003-001
LSL-Y100	Chemical Batching Tank Low Level Float Switch	No	Yes	Yes	1-0650Y-E0003-001
LSH-Y802	Wet Well High Level Float Switch	No	Yes	Yes	1-0650Y-E0003-001
CP-Y800	RTU Control Panel	Yes	Yes	Yes	1-0650Y-E0005-001
-	Automation Junction Box JBA-Y801 Auxiliary Relays as Required	No	No	No	1-0650Y-E0003-001
-	Chemical Dosing Pump P-Y102 Simplex Receptacle	No	No	No	1-0650Y-E0003-001
-	Drainage Lift Station 240V, 30 A Receptacle	No	No	No	1-0650Y-E0003-001

General Note:

1. - Not all equipment required for the project is included in the list herein. This is a partial list of main equipment.

   Refer to the Drawings and Specifications for all equipment requirements.

2. - Include all costs for the supply and complete installation of all equipment herein, and all equipment shown on the Drawings and in the Specifications.
3. - Include all costs for new lamacoids, and training.
4. - In the event of discrepancy between this list and the Drawings/Specifications, the most onerous and costly option takes precedence prior to clarification from the City.