CITY OF WINNIPEG

Tender No.: 197-2022

DESIGN & CONTRACT ADMINISTRATION OF NEWPCC INTERIM PHOSPHOROUS REMOVAL

Construction Plan - DRAFT

Final:
Rev A

KGS Group Project:
21-0107-015

Date:
May 26, 2022

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PREPARED BY:
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Mechanical Engineer

REVIEWED BY:
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Mechanical Engineer

APPROVED BY:
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Senior Mechanical Engineer

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1.0 INTRODUCTION

The North End Sewage Treatment Plant (NEWPCC) is the largest of three sewage treatment plants servicing the City of Winnipeg. In the NEWPCC wastewater treatment process, ferric chloride is currently dosed at two points around the anaerobic digesters, being the primary and digested sludge. The purpose of the NEWPCC Interim Phosphorous Removal project is to provide an interim a way to reduce phosphorus in the effluent at NEWPCC until a permanent upgrade to the current biological nutrient removal system is built.

The interim dosing system will add three new chemical dosing scenarios to the wastewater treatment process for phosphorous removal. To make new dosing scenarios possible, two new buildings will be annexed on to the existing “Railcar Shelter 1” building to the south and to the east. The new “Railcar Shelter 2” building addition to the south will provide a second railcar unloading area. The new “Ferric Chloride Chemical Storage Room” building addition to the east will house two new ferric chloride storage tanks and chemical distribution systems. Finally, a new “Sodium Hydroxide Chemical Storage Building” will be constructed west of the existing dewatering building to house two new sodium hydroxide storage tanks and chemical distribution systems.

The new ferric chloride distribution system will include one main triplex chemical metering pump skid and two chemical transfers pumps located within the new Ferric Chloride Chemical Storage Room. Additionally, two local pump skids and dosing tanks will be installed to service chemical dosing points DP 2.1A/B and DP 4.1/4.2/4.3. The new sodium hydroxide chemical distribution system, located in the Sodium Hydroxide Chemical Storage Building, will include one main triplex chemical metering pump skid.

Ancillary systems within each of the building or building additions will include HVAC, plumbing, emergency shower/eyewash stations, flushing water, compressed air, and natural gas systems.

New dedicated process controls and automation systems to control chemical unloading, storage and distribution will be connected back to the NEWPCC site’s main DCS/PCS control system. Building mechanical controls will also be through the NEWPCC DCS/PCS with the exception of gas fired air handling equipment that will incorporate vendor specific controls that interface with the DCS/PCS.

This construction plan document provides the details of the proposed construction plan for the above scope. The plan indicates who the project personnel are and what the communication links between them will be. A project outline schedule is presented to illustrate the timeframe to complete the work.

The document is separated into sections defined by the applicable phase of construction. Each section describes generally the work done by the General Contractor and the steps involved in each task. It also illustrates how to minimize the risk to the project schedule posed by unpredictable weather, materials procurement, and other risks to the work at the North End treatment plant.

2.0 PROJECT CONTACT PERSONNEL

Communication for the project will be between various City, Contract Administrator, and Contractor personnel. The following plan for lines of communication is to be observed by the Contractor. See key instructions for communication listed below:

The Contractor will direct all enquiries and requests for clarification to Contract Administrator directly and copy City Project Manager. Contract Administrator will review with the City if necessary and advise the Contractor how to proceed.

Contract Administrator:

Prasan Silva, P.Eng.
KGS Group

- Mobile: 204 998 2278
- Email: psilva@kgsgroup.com

City Project Manager:

Erica Campbell, C.E.T.
City of Winnipeg – Water and Waste Department

- Mobile: 204-986-3150
- Email: ecampbell@winnipeg.ca

A table of contact persons and their information is provided in Appendix A. The Contractor may contact additional project personnel with Contract Administrator approval only. All correspondence between the Contractor and additional project personnel must be copied to the Contract Administrator and City Project Manager.

3.0 PROJECT CONSTRAINTS

A general discussion of the major constraints on the project is provided below. For a more detailed review of limitations on the project and their causes, refer to the Risk Assessment in Appendix B. This document illustrates the full set of project risks considered by the Contract Administrator, the City Engineering and PM team, and NEWPCC Plant Operations. The Contractor shall review this list and accept the responsibility to mitigate the risks described and the constraints listed below

3.1 Operating Plant

Due to the volume of effluent captured and treated by the facilities wastewater treatment process, and the lack of an alternative to treat the wastewater, it is not possible for the NEWPCC to entirely shut down for any length of time. So, the plant will remain in operation throughout the construction project. It is possible, however, to temporarily suspend some portion of the treatment system in order to install any tie-ins or work that cannot be done on or around a live system.

The above process stoppages must be planned during the window between December and March. At this time of year, the flow of wastewater to the plant is lowest due to the typically cold and dry conditions in the City. Because the wastewater treatment process at each dosing location represents a large segment of the total plant capacity, suspension of the process must not be for more than a few days at a time during this window. All work must be planned to limit the amount of time that each process is shut down and respect the limited window.

When the new dosing equipment is installed and operating, the wastewater treatment process operators will begin dosing with ferric chloride and sodium hydroxide. To ensure that the process is not upset, dosing point will be chosen conservatively, and the process will be monitored until further adjustment can be done safely. The Contractor will be responsible for effluent testing and sampling to monitor the process during performance verification. Testing and sampling will be coordinated with NEWPCC plant operations and the Contract Administrator.

3.2 Stakeholders

In addition, this construction plan is constrained by the project goal of having the phosphorous removal system installed by August 2023. This very tight construction time requirement is a result of the concerns made by Lake Winnipeg residents and stakeholders regarding the recent occurrence of green algae bloom at the south end of the lake. The algae bloom is understood to be the result of high concentrations of phosphorous in the lake water, which prompted the capital investment decision to build the interim phosphorous removal system to solve the issue while the larger plant replacement project is underway.

3.3 Seasonal Construction

Other seasonal limitations that relate to outdoor construction in colder climates will require that the Contractor may plan some activities earlier or later to facilitate work. Any special techniques needed to deal

with risks associated with winter construction activities should be planned such that the above constraints are met.

3.4 Work Area

Access to the plant by project staff will be limited to the areas necessary for the scope of the installation work. Generally speaking, this will mostly be in the South East area of the plant, around the existing Railcar Shelter 1 building. Access will also be required to the plant pipe galleries and electrical rooms to install new process tie-ins, dosing tanks, pumps, piping, and electrical and controls equipment. Access to the site will be from the main entrance to the plant off Main Street. Contractor Parking will be located outside the main administrative building and large vehicle access will be as shown in the mark-up of the site map/aerial view in Appendix C.

Also shown in the appendix is the planned equipment laydown area and construction trailer site. Active work areas for other projects and areas of overlap between this project and others are also shown. For the most part, ongoing work in the plant from other projects is not anticipated to interfere with this project.

Throughout the work the rail line leading to Railcar Shelter 1 building will remain active, and as such the Contractor must ensure that appropriate safety procedures are in place to avoid damage and injury as a result of rail traffic on that line. Furthermore, the Contract must keep the area surrounding the rail line clear of equipment or materials and make efforts necessary to avoid obstruction the railway.

4.0 CONSTRUCTION SCHEDULE

The scheduled award for the construction contract is July, 2022. A preliminary construction schedule is provided in Appendix D. The overall scope of work is broken into five main construction phases:

- Project Start-up June 2022
- Early Construction Works: July 2022 – November 2022
- Middle Construction Works: November 2022 – June 2023
- Late Construction Works: June 2023 – August 2023
- Project Closeout: September 2023 – May 2024

4.1 Project Start-Up

Prior to, and immediately after, the award of the construction contract, the proponent will be required to submit documentation for review by the Contract Administrator. The submittal review will include:

- Contractor Qualifications
- Procurement Information (vendor data)
- Construction Engineering Documents (fabrication/shop drawings)
- Construction Schedule

Each document will be reviewed and returned to the Contractor, and in some cases further re-submittals will be necessary. Approval of shop drawings, and procurement of long-lead items such as chemical tanks, pump skids, air handling equipment, packaged compressor, control valves, VFD panels, control panels and instrumentation should be prioritized to prevent later delays. Note that the above list of items shall not be considered a complete list and the Contractor shall be responsible to identify additional long lead items at the start of the project that may impact the overall project schedule and target completion date.

The Contractor will begin mobilizing their staff and equipment to the NEWPCC facility. When ready, the City will hand over control of the rail unloading area to the Contractor and their Subcontractors. However, because the system will remain in operation for the majority of the work, the City will require continuous access to specific areas such as:

- Building 100 – Existing chemical storage room 1
- Building 101A – Existing railcar shelter 101A
- All Piping Galleries on Site
- Junction Chamber
- All Electrical Rooms on Site

4.2 Early Construction Works

As soon as access to the rail unloading building and chemical storage room is provided, critical path early works such as the items listed below should begin as quickly as possible. In order to allow for the new rail line and new building construction to proceed, the following activities must be complete.

- Site survey
- Soil sampling and testing for contaminated soil
- Demolition of old rail line
- Clearing and grubbing, fencing removal
- Site grading and drainage
- Underground utilities installation, tie-ins

Concurrently with the initial site preparatory works, some preliminary mechanical and electrical work inside the plant may proceed as procurement of materials allows. Additionally, equipment procurement of long lead items must also be initiated as early as possible to avoid delaying future mechanical and electrical installation work. Lastly, modifications to the existing Railcar Shelter 1 roof, roof support, gas system, and HVAC can also proceed soon after mobilization. However, work in this area will be performed around an active rail line, and care must be taken to avoid interruption of service.

Following the initial site preparatory works, and procurement activity, installation of the new rail should begin (including modification of existing), concurrently with construction of building foundations, with the aim of completing before winter 2022/23.

4.3 Middle Construction Works

Once the early construction works on the new buildings planned for summer and fall 2022 is complete, more intensive structural work can begin such as the unit masonry walls and interior access structures. This work will continue through the winter, and heating/hoarding may be required. Construction on the buildings will continue until they are structurally complete leaving only minor architectural work and civil works for the late construction period.

Inside the plant, if mechanical and electrical equipment is successfully procured with short enough lead times, installation work may begin on the ferric chloride and sodium hydroxide piping and remote dosing locations. Additionally, work that requires down time of wastewater process systems will also be required.

4.3.1 RAIL UNLOADING AREA

Once the foundations of the new building and building extensions are complete, and repairs to the existing Railcar Shelter 1 are done, construction of unit masonry walls, and equipment footings may proceed. Construction of interior access platforms and supports will follow along with installation of tanks and piping. New OWSJ roof supports will be installed and new roof deck poured as timing permits. However, as noted previously, work in this area will be performed around an active rail line, and care must be taken to avoid interruption of service.

4.3.2 ACTIVE PROCESS AREAS

4.3.2.1 Work Requiring Shut-Down

The following process tie-ins will result in temporary suspension of wastewater process systems and therefore must occur during the winter season of 2022/23 when sewage flows are lowest.

- 1.4 – Trucked Sludge (Ferric Chloride)
- 1.5A – Primary Sludge to Digesters (Sodium Hydroxide)
- 1.5B – Primary Sludge to Digesters (Sodium Hydroxide)
- 1.6 – Trucked Sludge (Sodium Hydroxide)
- 2.1A – Waste Activated Sludge (Ferric Chloride)
- 2.1B – Waste Activated Sludge (Ferric Chloride)
- 4.1 – Mixed Liquors (Ferric Chloride)
- 4.2 – Mixed Liquors (Ferric Chloride)
- 4.3 – Mixed Liquors (Ferric Chloride)

Because each wastewater treatment system is critical to the operation of the treatment plant, no two systems can be suspended simultaneously, and they may only be stopped one at a time during the low-flow winter season. Therefore, during this time, suspension of each system will be staggered to minimize the risk of upsetting the treatment process. Suspending or stopping of the plant process must be scheduled in advance and coordinated with NEWPCC Plant Operation staff to ensure the process interruption can be handled by the plant. Tie-ins must be coordinated with shut-downs currently planned for other projects currently under construction, such as the RAS/WAS Piping Refurbishment Project.

In addition to the process tie-ins, certain utilities tie-ins may require shut down of critical systems. These include the new connections listed below. These tie-ins may also need to be planned during the low flow period to limit impact to the plant depending on the anticipated impact to the process.

- Existing ferric chloride chemical dosing system
- Compressed air system
- Natural gas system
- Electrical connections in the Bioreactor Area, Grit Building, and Dewatering Building.
- Sanitary piping system

Each shut down requires a continuous and un-interrupted work effort on the part of the Contractor to minimize the length of the shut down and reduce impact of the work on the treatment plant operation. After a system has been shut down it will be followed by a 15-day (minimum 2-3 Solids Retention Time (SRT) periods) monitoring period to verify the water treatment process has stabilized before any other interruption of the same subprocess can be suspended.

The tie-ins listed in LST-M-007 will be prioritized due to the sensitivity of each system to interruption.

4.3.2.2 Work Not Requiring Shut-Down

Once delivery of mechanical equipment has been accepted, installation of long lead mechanical equipment can proceed in the active/operating areas of the plant. This includes the remote dosing tanks and pumps and associated emergency shower and eyewash stations. Also included will be the new air compressor and mechanical piping, fittings, and valves not installed in fall 2022.

The new PLC, LCP, RIO panels, and some control valves and instrumentation are anticipated to be long lead items. For this reason, electrical work on in the operating plant will by necessity be limited to MCC modifications, cabling, JBs and starters to supply power to new equipment. Control systems work will follow as new panels and instrumentation is delivered.

4.4 Late Construction Works

As construction of the new buildings reaches a conclusion, final grading, landscaping and architectural features will be completed. Interior and exterior wall and roof finishes will be installed along with other architectural features.

Control panel and instrumentation installation will progress towards completion, and static inspection and start-up testing will begin. Pre-commissioning documentation will be gathered for each piece ahead of functional testing of the new chemical unloading, dosing, transfer, and storage systems. For a detailed description of the commissioning process, refer to the Commissioning Plan Report located in Appendix E of the Tender document.

4.5 Project Close-Out

After commissioning work has proven the system to be functional and ready, the first phase of process verification will begin. During this time the wastewater treatment process will be treated with the new chemical dosing system, and the results will be monitored closely. Refer to the Commissioning Plan Report located in Appendix E of the Tender document for further information.

Concurrently with performance verification, de-mobilization of the temporary construction facilities will proceed. Project Close-out document submittals such as red-line drawings, operation and maintenance documents, etc. will be submitted to the Contract Administrator for review and approval.

5.0 CONCLUSION

This report has presented the details of the construction sequence for the project. Each portion of construction activity has been described with pertinent details highlighted. The scheduling and sequence of work provided are intended to be guidelines for the Work, and the Contractor must undertake each stage/phase in the way deemed to be most efficient for the project. Discrepancies or deviations should be reported as soon as they are noted.

APPENDIX A

Contact Information Table

Tender No. 197-2022: CONSTRUCTION PLAN - APPENDIX A
CONTACT LIST - (to be updated by Contractor)

First	Last	Organization	Role	Phone	Email
Contractor:					
name	name	GENERAL CONTRACTOR	Project Manager		
name	name	GENERAL CONTRACTOR	Job Superintendant		
name	name	GENERAL CONTRACTOR	Field Supervisor (Foreman)		
name	name	ELECTRICAL SUBCONTRACTOR	Project Manager		
name	name	ELECTRICAL SUBCONTRACTOR	Job Superintendant		
name	name	ELECTRICAL SUBCONTRACTOR	Field Supervisor (Foreman)		
		(additonal trades)			
KGS Group:					
Prasan	Silva	KGS GROUP	Assistant Project Manager	204-318-2202	psilva@kgsgroup.com
Adam	Pawlikewich	KGS GROUP	Project Manager	204-478-3244	apawlikewich@kgsgroup.com
Jason	Smith	KGS GROUP	Senior Mechanical Engineer	204-478-3214	jsmith@kgsgroup.com
Robin	Chen	KGS GROUP	Mechanical Engineer	-	rchen@kgsgroup.com
Jason	Bouchard	KGS GROUP	Electrical Engineer	-	jbouchard@kgsgroup.com
Colin	Siepman	KGS GROUP	Structural Engineer	204-318-2206	csiepman@kgsgroup.com
City of Winnipeg:					
Erica	Campbell	CITY WWSD	Project Manager	204-986-7642	ecampbell@winnipeg.ca
Neil	Abercrombie	CITY WWSD	Facility Leader	204-898-3000	x-naberc@winnipeg.ca
Jong	Hwang	CITY WWSD	Senior Project Engineer	204-619-2185	jhwang@winnipeg.ca

APPENDIX B

Risk Assessment

Risk Workshop | 1

Project Name: NEWPCC Interim Phosphorous Removal

For details and instructions on how to complete this document, click the [¶] icon under the Home tab to display the hidden text.

Date of Meeting:	November 5, 2021	**Time of Meeting:**	9:30 am
Meeting Location:	Online via MS Teams	**Minutes Issued:**	November 10, 2021

Meeting Type/Purpose: Risk Workshop 1

Project File No.: S-1146

Chairperson: Adam Pawlikewich, P.Eng.

Recorder: Prasan Silva, P.Eng.

Attendees

Name	Initials	Title	Organization	Contact #	Email
Erica Campbell	EC	Senior Project Engineer	CoW-WWD-ESD	(W) 204-986-7642; (M) 204-232-0317	ECampbell@winnipeg.ca
Neil Abercrombie	NWA	Facility Leader, Winnipeg, Municipal & Commercial Business	Veolia North America (VNA)	(W&M) 204-898-3000	x-naberc@winnipeg.ca
Michelle Paetkau	MP	Acting Wastewater Planning and Project Delivery (WWP&PD) Branch Head	CoW-WWD-Engineering Services Division (ESD)	(W) 204-986-4904; (M) 204-619-3874	mpaetkau@winnipeg.ca
Jong Hwang	JH	Senior Project Engineer	CoW-WWD-WWSD	(W&M) 204-619-2185	jhwang@winnipeg.ca
Dustan Fuerest	DF	Senior Operator – Dry Side	CoW-WWD-WWSD	(M) 204-391-5773	dfuerst@winnipeg.ca
Matthew Klowak	MK	Wastewater Contracts Officer – Chemical Supply	CoW-WWD-WWSD		MKlowak@winnipeg.ca
Joey Tarko	JT	E.I.T. at Wastewater Dept.	CoW-WWD-WWSD		JTarko@winnipeg.ca
Adam Pawlikewich	AP	Project Manager	KGS Group	(W) 204 896 1209 (M) 204 797-7772	apawlikewich@kgsgroup.com
Jason Smith	JS	Senior Mechanical Engineer	KGS Group	(W) 204 896 1209; (M) 204 223 8904	jsmith@kgsgroup.com
Prasan Silva	PS	Senior Mechanical Engineer	KGS Group	(W) 204 896 1209; (M) 204 998 2278	psilva@kgsgroup.com
Andrew Fustey	AF	Mechanical EIT	KGS Group	(W) 204 896 1209	afustey@kgsgroup.com
Keith Gerrits	KG	Lead Rail Design	HDR Inc.	(M) 403 869 6179	Keith.Gerrits@hdrinc.com
Jan Oleszkiewicz	JO	Senior Process Engineer	University of Manitoba	(W) 204 474 8722	Jan.Oleszkiewicz@umanitoba.ca

Regrets

Name	Initials	Title	Organization	Contact #	Email
Terry Josephson	TSJ	Wastewater Engineer, Treatment Branch Head	CoW-WWD-WWSD	(W(M) 204-47) 204-986-8609; 0-7745	TJosephson@winnipeg.ca
John Amos	JA	NEWPCC Plant Supervisor	CoW-WWD-WWSD	(W) 204-986-4845; (M) 204-470-7326	JAmos@winnipeg.ca
Brendan Hellrung	BH	Wastewater Treatment Operator 4	CoW-WWD-WWSD	(W) 204-986-3463; (M) 204-291-1739	bhellrun@winnipeg.ca
Robin Chen	RCC	Mechanical Engineer	KGS Group	(W) 204 896 1209; (M) 204 998 7929	rchen@kgsgroup.com
Chris Carroll	CC				ccarroll@winnipeg.ca
Cynthia Wiebe	CW				cwiebe@winnipeg.ca

Agenda

1.0 Safety Moment

2.0 Introduction
City of Winnipeg Treaty Acknowledgement:
I would like to begin by acknowledging that we are in Treaty One territory and the traditional homeland of the Metis Nation.

3.0 Project Scope Overview:
- Presentation (Approx. 20 min)
- Questions/Discussion (Approx. 10 min)

4.0 Risk Workshop 1:
- Review Risk Register (Approx. 1.5 hours)

5.0 Other Items

Item	Description	Action By
1.0	**Safety Moment**	**Action By**
1.1	Adam provided the safety moment: • In this project we are dealing with many different chemicals. We want to make sure that we are aware of their proper handling and safe use procedures to avoid any incidents that may occur.	Information
2.0	**Introduction**	**Action By**
2.1	City of Winnipeg Treaty Acknowledgement: I would like to begin by acknowledging that we are in Treaty One territory and the traditional homeland of the Metis Nation.	Information
2.2	Introductions • Adam began by having all members of the meeting introduce themselves to the group (role and organization)	Information
3.0	**Project Scope Overview**	**Action By**

3.1	Jason introduced the project with a general scope overview using a process flow diagram
	• Two existing chemical ferric chloride tanks dose to three points in the system
	  ○ Primary sludge
	  ○ Digested sludge
	  ○ Centrate
	New Dosing Scenarios
	• Scenario 1: Ferric dosing to the sludge
	• Scenario 2: Ferric dosing Upstream of primary clarifiers
	• Scenario 3: upstream of HPO reactors
	• Additional: dosing downstream of bio reactors – to be discussed in next week's design meeting
	• Sodium Hydroxide dosing system for pH control
	Jason used the 3D model to show the proposed design options of the railcar and chemical storage buildings
	• Second Ferric railcar shelter to be built
	• New Ferric storage tank building
	  ○ Double the storage volume of the two existing tanks
	  ○ Total volume will be triple that of the existing
		Information

	• Sodium Hydride storage
	  ○ Two storage tanks South of Sludge dewatering building
	  ○ 40,000 L each for redundant services
	• Dosing pumps will be included for both the ferric chloride and sodium hydroxide chemicals
	• Jason noted the rational for the two Sodium Hydroxide tanks:
	  ○ The building would be too large if all the tanks were under one roof. This could protrude into the roadway. Therefore, it is proposed to split the sodium hydroxide and ferric chloride tanks into two buildings.
	• Existing dosing points:
	  ○ Primary sludge
	  ○ Digested sludge
	  ○ Centrate
	• New Ferric Chloride dosing points:
	  ○ SEWPCC and WEWPCC truck sludge
	  ○ Day tank filling
	  ○ Future optional dosing points downstream of bioreactors
	• Sodium hydroxide dosing points:
	  ○ Primary sludge
	  ○ SEWPCC and WEWPCC truck sludge	

	• Jason noted if all three dosing scenarios were to be run all the time, 2 railcars would be required every 8 days. The new ferric chloride tanks allow for 28 days of reserve.	Information
	• Michelle noted that not all 1+2+3 scenarios are to run at a time, only to do 1+2 or 1+3. Jason responded that the dosing of scenario 3 does not add a lot of extra dosing volume. KGS will investigate further for the design meeting.	Information
	• Matt asked if the ferric chloride tanks will be connected with a bypass. Jason responded the tanks will be connected from an unloading standpoint. Operators could select which tank would be filled. Transfer between is to be incorporated into the design.	Information/KGS
	• Matt noted this a much larger ferric chloride usage than expected. Adam and Jason responded that scenario 1+2 are only to be run during wet/high flow. Jan confirmed.	Information
	• Dustan asked if the day tank would be providing metered dosing to scenario 2+3. Jason responded yes.	Information
	• Neil asked Matt if his primary concerns are about logistic issues. Matt responded that there can be issues with unloading, sometimes requiring NEWPCC staff having to fix rail car connections, etc. Typically, ½ day required to unload. Also, it takes CP 4 to 5 days to pick up a rail car, once the unloading is completed. CP only does drop offs/pickups 3 days per week. Matt noted that delivery times range from 15-42 days currently and it is a very volatile supply chain. Adam responded that storage reserve can reduce volatility issues. This is a large challenge that KGS is trying to address: can logistics be handled.	Information/KGS

4.0	Risk Workshop 1	Action By
4.1	Adam introduced the Risk Register provided by the City. Items 1 to 30 have been already workshopped under the previous project. Adam noted item 31 and above are new items added by the City and KGS. Adam explained how the weighted scoring system works.	Information

4.2	Discussion of Risk Outcome	
	• Damage to railcar facility ○ It is possible to truck in product if existing rail car facility is to be damaged. However, trucking in ferric can only be sustained for a short period of time	Information

	• Availability of a qualified contractor
	  ○ Jason noted the risk of an unqualified Contractor or no bidders is low.
	  ○ Keith noted the project is small for a rail contractor so getting a local Subcontractor to the general mechanical is the likely scenario.
	  ○ Adam noted the rail Subcontractor qualifications must be verified.
		Information

	• Ferric chloride dosing shutdown
	  ○ Jason noted under the current plan the existing points can still be dosed.
	  ○ Neil noted there are some tie-ins that will need to be performed. Shutdowns needs be short and calculated.	

	• Disruption of truck unloading operations
	  ○ Erica clarified that there could be disruption to ferric truck unloading. This is primarily a back-up system.
	  ○ Neil suggested that consequence should be rated highly, but the probability low because this is a back-up system.
	  ○ This situation was noted be unlikely, but consequence of not having the truck unloading available when needed is high.
	  ○ Solution was to include a contractual clause in the tender.
		Information
		Information/KGS

	• Delay in chemical unloading due to damaged railcars
	  ○ Clarified to be a long-term risk because of increased frequency of incoming railcars. More of a chance that a damaged railcar would arrive if the frequency were increased.
	  ○ This is an existing problem that will become worse with an increase in frequency.
		Information

	• Disruption of railcar delivery due to construction activity (new switch/turnout) ○ Adam clarified this risk outcome to be the probability that construction will delay current live rail track for ferric chloride. Keith noted it would be a low risk as the construction activity disruption to existing track can be accommodated in between the current deliveries (approx. every 14 days). Keith noted that the track construction can be completed within a week.	Information
	• Delay of project completion due to underground utilities at building construction ○ Delays the work. Utility locates to be completed as a mitigation measure, however, potential for not detecting smaller items.	Information

	• Disruption of Dewatering sludge truck traffic
	  ○ Dustan clarified this is for the exit side of truck unloading.
	  ○ Adam asked if it is possible to go out the entrance. It was confirmed this is possible, but an inconvenience.
		Information

	• Delay of project completion due to verification of south property line
	  ○ City owns the land, but project delays can be expected if new buildings encroach on the setback from the property line, requiring a variance application.
	  ○ Erica noted legal team is looking into this.
		Information/City

	• Disruption of traffic on road between rail car building and chemical storage building ○ Dustan confirmed this road is usually only used for ferric shipments;	

	otherwise, it is not used. ○ Neil clarified this should be for a scenario where the road is blocked for a few days. Therefore, the likelihood is lower. • Delay of project due to NEWPCC staff being overloaded with work at site (multiple projects happening on site at the same time) ○ Defined as project delay for long term (over a month) ○ Delay in responding to contractor needs ○ High probability. Multiple projects ongoing at NEWPCC ○ Need to include significant coordination and lead time planning in contract • Delay of project due to overlapping construction (multiple projects) ○ Defined as project delay of one month ○ Access to certain areas may not be available and physical system overlap ○ Example: likely to occur near the headworks project. ○ Dustan noted that this event is likely due to the Primary Upgrade project happening in the same area. • Loss of Ferric Chloride due to supply chain issues and demand of new systems (long term post construction) ○ Matt noted there are not enough trucks to supplement a long-term rail delivery outage. It takes 48-72 hours to get a truck delivery from the US, and only limited number of trucks available.	Information Information/KGS Information Information
4.3	Suggested Additional Risks • Neil suggested issues with running multiple dosing scenarios and how to cope with controlling the dosing ○ Adam clarified this would be for the risk where it would be difficult for operators to keep the process under control ○ Split into two categories: 1. Phosphorous non-compliance from system with inadequate feedback and 2. Phosphorous non-compliance due to improper commissioning ○ Neil clarified this concern: “difficult to keep process under control, as workload will be high to evaluate the different operating scenarios.” ○ Michelle existing online monitoring system is older version and may not be reliable, a newer online monitoring system may be required. • Adam suggested uncontrolled chemical leaks due to expanding ferric and caustic distribution network into new areas ○ Jason noted this is unlikely around the tanks due to containment, but ferric and caustic lines will be routed to new areas. The new lines may cause a risk. ○ Dustan noted there generally aren’t any leaks on the line themselves, but the hoses on the metering pumps tend to break. • Adam suggested expansion of corrosion environment ○ Could lead to corrosion on electrical equipment ○ Mitigated by isolating electrical equipment in new areas Adam opened the floor of the meeting for any other risks • Jong suggested that the price of ferric could rise. Neil clarified that this a risk that could be optimized via the process. Reduce unneeded consumption as stated by	Information Information Information

	Adam and Neil. ○ Differ to City • Jong suggested a change in operating requirements of license could occur ○ Erica noted this project will not reach the license requirement. City has an alteration to the license until major upgrade project is completed. ○ Neil clarified this risk is primarily a consequence of expectations between the City and Province ○ Erica will coordinate with Michelle and Province on expectations of the project. ○ There could be an increase in funding required if ferric requirements change. Neil noted this risk could be the trigger for another project ○ Follow up with Michelle on these expectations/risks is required	Information/KGS Information/KGS/ City Information/KGS/ City

Details for next meeting

Date of next meeting: **TBD**
Time: TBD
Location: TBD

Meeting adjourned at: 11:30 am

Report any errors or omissions in the meeting minutes within **3 business days** to Prasan Silva at 204 998 2278 or by e-mail at psilva@kgsgroup.com, otherwise these minutes are considered accurate and accepted.

Attachment(s): • n/a

Distribution (to be completed by Chairperson)

- Attendees
- Regrets
- Other:

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Risk Event Identification						Risk									
Risk ID No.	Risk Event Outcome	Threat or Opportunity?	As a result of (Risk Cause)	This event may occur (Uncertain Event)	Which leads to (Effect on objectives)	Probability	Consequence	Score	Risk Severity	Risk Response	Action (s) to be undertaken	Contingency Plan	Cost to Manage Risks (Identified in BOE with the "cost breakdown" detail shown on separate worksheet)	Risk Owner	Status
1	Digester capacity is exceeded because of chemical based sludge	Threat	Increase chemical-based sludge	The capacity of the treatment system may be exceeded	Loss of treatment/process, environment violations	3	5	15	Critical	Reduce	Monitor treatment parameters and limit chemical dosing to capacity of sludge treatment plant	Model and bench scale test to confirm reactions and capacities			
2	Digestion process upset/process instability	Threat	Ferric chloride toxicity on unstable/poor process performance (e.g. - temperature drop: spring 2019 - foaming: fall 2019 - poor dewaterability: winter 2020)	Process may become more unstable	Further instability and process upset	5	4	20	Critical	Reduce	Complete testing and verify digester ability to handle additional ferric chloride	Gradual increase of chemical dosing during the full scale applciation and wait for a period of minimum 15 days (or digesters SRT) before making another significant change in chemical dosing.			
3	Struvite precipitation in sludge processing facility (e.g. dewatering pipes, centrifuges)	Threat	BNR process at SEWPCC	Struvite precipitation as a result of excess P quantity in the SEWPCC sludge and is not removed prior to digestion in sidestream treatment	Reduced digesters capacity, pipe clogging, struvite precipitation in centrifuges, in general an upset process in sludge handling facility	3	5	15	Critical	Reduce	Consider sidestream P removal in scenarios 2 and 3. At minimum remove excess P from SEWPCC BNR and meet the current TP concentration in the treated centrate				
5	Dosing point for each scenario not accessible	Threat	Viability of dosing to the points shown in each scenario is not available	Additional space and infrastructure might be required	More funding and increased scope	4	4	16	Critical	Reduce	Consider using day tanks or pumping from the existing chemical dosing facilty for scenarios 2 and 3 (CEPT and HPO)- This study to confirm concept.				
6	Delayed interim phosphorous removal at NEWPCC	Threat	SEWPCC BNR Commissioning is delayed	Chemical trimming at NEWPCC is delayed	Delayed phosphorous removal	5	3	15	Critical	Accept					
7	Greater phosphorus loading from SEWPCC sludge than anticipated	Threat	Increased phosphorus load from BNR process at SEWPCC	Higher TP load in treated centrate and insufficient chemical addition at NEWPCC	Violate the sidestream current licence, increase maintenance in sludge processing facilty	3	5	15	Critical	Avoid	Start adding ferric to centrate				
8	Chemical P removal at SEWPCC	Threat	Implementation of chem P removal at SEWPCC prior to BNR commissioning	The capacity of the treatment system may be exceeded	Loss of treatment/process, environment violations	3	5	15	Critical	Avoid	Digester 11 should become online				
9	Interim P removal does not meet the 1 mg/L effluent limit	Threat	Higher phosphorus loading from SEWPCC and limited sludge processing capacity at NEWPCC	Exceeding secondary effluent phosphorus limit of 1 mg/L	Increased phosphorous to Lake Winnipeg	5	3	15	Critical	Reduce	Practice optimizing the ferric dosing during the jart testing and modeling to minimize the final effluent phosphorus concentration without overloading digesters	Facilitate the construction of the new sludge handling facility at NEWPCC to provide more capacity			
10	Additional chemical dosing for NEWPCC interim P removal results in low pH and process issues	Threat	Increased chemical dosing	pH may drop and lead to foaming and decreased reaction rates	Loss of treatment/process, environment violations	3	4	12	Serious	Avoid	Track alkalinity and model chemical reactions; increase doses gradually and track response of system	Limit chemical dosing			
11	Existing chemical tanks and dosing system cannot keep up with demand	Threat	Limited chemical dosing capacities	Phosphorous may bleed through and increase loads/concentration in final effluent at NEWPCC	Increased phosphorous discharges to the Red River and ultimately to Lake Winnipeg	4	2	8	Serious	Reduce	Install additional chemical dosing systems depending on the recommended scenario				
12	close - Chemical Delivery to NEWPCC	Threat	Increase in ferric dosing rate	The current delivery system railcar/truck cannot keep up with chemical demand	Not enough ferric available for P removal, increase in TP concentration in the effluent	3	4	12	Serious	Avoid	Evaluate the capacity of the delivery system. Additional infrastructure might be required (4 tanks?)				
13	Safety risk	Threat	Safety risks assocciated with additional chemical handling/multiple chemicals	storing and conveying higher amount of chemcials and different chemicals	Further concerns with chemical handling	3	3	9	Serious	Reduce	Consider appropriate safety measures for chemcial handling during the design and implementation of chem P removal				
14	close - Computer modeling and simulations are not representative of real-world conditions	Threat	Assumptions in the computer model	The dosing/efficiency of the chemical system may be off	Phosphorous bleeding through (in event of under dosing) or process upset (in event of overdosing)	2	3	6	Serious	Reduce	Verify modeling with jar testing	Gradual increase of chemical dosing during the full scale applciation			
15	Jar testing is not representative of operational experiences	Threat	No representative conditions during testing (e.g. mixing)	Jar testing may miskead designer on dosing amounts/requirements	Phosphorous bleeding through (in event of under dosing) or process upset (in event of overdosing)	3	3	9	Serious	Reduce	Increase dosing in full scale gradually with tracking for operating parameters (add to RFP, include SOP)				
16	Close - Jar test indicates low pH after chemical dosing	Threat	Increase in ferric dosing rate	pH adjustment to be added	Additional funding and increased scope	2	5	10	Serious	Avoid	Include provisions for pH adjustement, a cost estimate to be provided for the new facility. The City to evaluate the available funding and project schedule				
17	close - Jar testing results shows complexity to meet sidestream licence with the existing infrastructure	Threat	BNR process at SEWPCC	Additional infarstructure required to meet the licence	Additional funding and increased scope	3	3	9	Serious	Accept	Evaluate the additional chemical dosage or infrastructure required to meet the TP in the licence.				
19	Impact of chemicals on existing infrastructure material	Threat	Excess dosage of ferric	Corrosion of infrastructure material (pipes, mixers, etc.)	Shorter equipment life, increased operating and maintenance costs, increased infrastructure costs	3	4	12	Serious	Reduce	A review is required to evaluate the compatibility of existing infrastructure material incl new with higher ferric dosage, design material selection	Prevent exces concentration of ferric at areas where there is a risk of corrosion			
20	Higher sludge blanket in the primary and secondary clarifiers for scenarios 2 and 3	Threat	Increase chemical sludge	solids discharge with the effluent	Higher solids concentration in the primary and/or secondary effluent leading to licence violations	3	2	6	Serious	Avoid	The sludge production and sludge blanket depth will be evaluated during the jar testing.	Monitor sludge blanket depth and other operating parameters affecting the sludge depth (e.g. WAS flow) during the full scale application.			
21	Chemical interference with UV disinfection	Threat	Excess metal salt addition	High metal concentration in the secondary effluent and scale build up on UV bulbs	Increased operating and maintenance costs, licence violations	3	3	9	Serious	Avoid	Soluble iron and UVT will be two of the parameters monitored as part of jar testing. Soluble iron concentration in the secondary effluent will be monitored during modeling	Monitor UVT during the full scale applciation to adjust the ferric addition accordingly.			
22	High concentration of unreacted ferric in the centrate	Threat	Overdosing ferric chloride	loss of nitrifiers activity in the SBRs	Higher ammonia concentration in the treated centrate	2	4	8	Serious	Reduce	Try to find an optimum ferric dose during the jar testing and modeling	Monitor the iron concentration in the centrate duirng the optimization period in full scale aplcation and adjust ferric dosage accordingly			

Risk Event Identification						Risk			Risk Severity	Risk Response	Action (s) to be undertaken	Contingency Plan	Cost to Manage Risks (Identified in BOE with the "cost breakdown" detail shown on separate worksheet)	Risk Owner	Status
Risk ID No.	Risk Event Outcome	Threat or Opportunity?	As a result of (Risk Cause)	This event may occur (Uncertain Event)	Which leads to (Effect on objectives)	Probability	Consequence	Score							
23	Phosphorous is reduced in final effluent	Opportunity	Chemical phosphorous removal	Phosphorous in final effluent will decrease	Less phosphorous discharged to Lake Winnipeg	4	2	8	Serious	Accept					
24	Minimize struvite precipitation	Opportunity	Chemical phosphorous removal	less struvite precipitation in sludge handling facilty when SEWPCC is online	Less maintenance required on centrifuges	3	2	6	Serious	Accept					
25	Poor public perception because system cannot treat to 1 mg/L total phosphorous removal	Threat	Constraints in sludge treatment system	phosphorous removal may be limited	Criticisms from the public and local environmental groups regarding lack of phosphorous reduction	5	1	5	Serious	Accept	Communicate about decreasing phosphorous trends and highlight actions taken to reduce phosphorous to Lake Winnipeg				
26	Uncertainties in SEWPCC Operation	Threat	Commissioning and operation of new plant creates a new/different sludge	Decreases efficiency of chemical phosphorous removal at NEWPCC	Reduced phosphorous removal	3	3	9	Serious	Avoid	Implement interim P removal at NEWPCC when SEWPCC BNR is fully commissioned				

Risk Workshop 2

NEWPCC Interim Phosphorous Removal

For details and instructions on how to complete this document, click the [¶] icon under the Home tab to display the hidden text.

Date of Meeting:	April 20, 2022	**Time of Meeting:**	1:00 pm
Meeting Location:	Online via MS Teams	**Minutes Issued:**	April 25, 2022

Meeting Type/Purpose: Risk Workshop 2

Project File No.: S-1146

Chairperson: Adam Pawlikewich, P.Eng.

Recorder: Prasan Silva, P.Eng.

Attendees

Name	Initials	Title	Organization	Contact #	Email
Erica Campbell	EC	Senior Project Engineer	CoW-WWD-ESD	(W) 204-986-7642; (M) 204-232-0317	ECampbell@winnipeg.ca
Jong Hwang	JH	Senior Project Engineer	CoW-WWD-WWSD	(W&M) 204-619-2185	jhwang@winnipeg.ca
Dustan Fuerest	DF	Senior Operator – Dry Side	CoW-WWD-WWSD	(M) 204-391-5773	dfuerst@winnipeg.ca
Matthew Klowak	MK	Wastewater Contracts Officer – Chemical Supply	CoW-WWD-WWSD	-	MKlowak@winnipeg.ca
Adam Pawlikewich	AP	Project Manager	KGS Group	(W) 204 896 1209 (M) 204 797-7772	apawlikewich@kgsgroup.com
Jason Smith	JS	Senior Mechanical Engineer	KGS Group	(W) 204 896 1209; (M) 204 223 8904	jsmith@kgsgroup.com
Prasan Silva	PS	Senior Mechanical Engineer	KGS Group	(W) 204 896 1209; (M) 204 998 2278	psilva@kgsgroup.com
Robin Chen	RCC	Mechanical Engineer	KGS Group	(W) 204 896 1209; (M) 204 998 7929	rchen@kgsgroup.com
Andrew Fustey	AF	Mechanical EIT	KGS Group	(W) 204 896 1209	afustey@kgsgroup.com

Regrets

Name	Initials	Title	Organization	Contact #	Email
Neil Abercrombie	NWA	Facility Leader, Winnipeg, Municipal & Commercial Business	Veolia North America (VNA)	(W&M) 204-898-3000	x-naberc@winnipeg.ca
Michelle Paetkau	MP	Acting Wastewater Planning and Project Delivery (WWP&PD) Branch Head	CoW-WWD-Engineering Services Division (ESD)	(W) 204-986-4904; (M) 204-619-3874	mpaetkau@winnipeg.ca
Terry Josephson	TSJ	Wastewater Engineer, Treatment Branch Head	CoW-WWD-WWSD	(W(M) 204-47) 204-986-8609; 0-7745	TJosephson@winnipeg.ca
John Amos	JA	NEWPCC Plant Supervisor	CoW-WWD-WWSD	(W) 204-986-4845; (M) 204-470-7326	JAmos@winnipeg.ca
Brendan Hellrung	BH	Wastewater Treatment Operator 4	CoW-WWD-WWSD	(W) 204-986-3463; (M) 204-291-1739	bhellrun@winnipeg.ca

Joey Tarko	JT	E.I.T. at Wastewater Dept.	CoW-WWD-WWSD		JTarko@winnipeg.ca
Chris Carroll	CC				ccarroll@winnipeg.ca
Cynthia Wiebe	CW				cwiebe@winnipeg.ca

Agenda

1.0 Safety Moment

2.0 Introduction
City of Winnipeg Treaty Acknowledgement:
I would like to begin by acknowledging that we are in Treaty One territory and the traditional homeland of the Metis Nation. Our drinking water comes from Shoal Lake 40 First Nation in Treaty No. 3 territory.

3.0 Project Scope Overview:

4.0 Risk Workshop 2:
- Review Risk Register

5.0 Other Items

Item	Description	Action By
1.0	**Safety Moment**	**Action By**
1.1	Adam provided the safety moment: • Plan ahead while driving through the City and in rural areas. Weather conditions can change rapidly. Keep to the safe routes if possible.	Information
2.0	**Introduction**	**Action By**
2.1	City of Winnipeg Treaty Acknowledgement: I would like to begin by acknowledging that we are in Treaty One territory and the traditional homeland of the Metis Nation. Our drinking water comes from Shoal Lake 40 First Nation in Treaty No. 3 territory.	Information
2.2	Introductions • Introductions were skipped for this meeting.	Information
3.0	**Project Scope Overview**	**Action By**
3.1	Robin provided an update on the new developments on the project. • Dosing scenario 4 after the bio reactors is being kept. Dosing scenario 3 before the bioreactors will be deleted. • Compressed air upgrade will be incorporated into the IFC submission. This will include a third air compressor/dryer added to the existing system. • A Saferack system will be incorporated into the new railcar shelter unloading platform.	Information
4.0	**Risk Workshop 2**	**Action By**
4.1	Adam presented the risk register and reviewed the previously assessed items.	Information
4.2	Rail construction activity • Adam noted this should be performed during shoulder seasons. Property line • Adam asked Erica if any further action is required for building across the property lines. Erica said no further action is required, but the email can be printed and submitted with the permit application to ensure no hold-ups occur. Interference with other projects • Laydown area and other potential conflicts will be discussed with the City.	Information Information Information/City/ KGS

	Product supply chain issues and high demand of new systems • Adam noted the delays in product delivery are still a risk. Erica asked if pre-ordering or scheduled ordering would be considered. Matt confirmed that a standing order would be discussed with Kemira.	Information
	Non-compliance from a system with inadequate feedback • Adam asked if the Chemscan system will be implemented. Prasan confirmed that a Chemscan system would not be installed.	Information
	Additional chemical storage causing increased corrosive environment • Score probability was updated to a lower score of 1 because a separate electrical room will be built. This would reduce the item to a total score of 4. • Adam noted that no pre-risk or post-risk evaluation score tally is available. Jong asked if Adam could check with Neil Abercrombie on the scoring system of the risk register for pre and post.	Information/KGS
	Contaminated Soil • Adam added a risk item for contaminated soil. Contaminated soil may be found from digging around the existing railcar shelter facility. This item was noted as likely to occur. This item would be associated with a moderate cost. The response for the risk would be to include a cost per unit in the RFP.	Information
4.3	Critical items	
	Digester capacity is exceeded because of chemical based sludge • Monitor treatment parameters and limit chemical dosing to capacity of sludge treatment plant	Information
	Ferric chloride toxicity on unstable/poor process performance • Complete testing and verify digester ability to handle additional ferric chloride.	Information
	Dosing point for each scenario not accessible • Adam confirmed day tank will be used for storage at the dosing points	Information
	Jar testing is not representative of operational experiences • Adam asked if the City would like the installer or KGS to be present during commissioning or is this task an operator item. Jong confirmed it is an operator item. Erica confirmed that KGS will need to be present during commissioning and post commissioning to ensure the system operates as intended. Dustan added that components/instrumentation must be present within the system that allows operations to base operating decisions from data.	Information
	Jar test indicates low pH after chemical dosing • Robin confirmed this will be controlled through the sodium hydroxide dosing	Information

	Impact of chemicals on existing infrastructure material • Robin confirmed that pipe sections will be replaced around the dosing points to ensure that the existing system is not damaged. Poor public perception • City of Winnipeg action to address.	Information Information
	Other Questions/Comments Equipment footprint at remote dosing points • Erica asked if there will be enough room at the new dosing locations to construct them properly. KGS will ensure that there is a set footprint on the drawings that the pump skids and containment will have to fit. Robin responded that at the junction chamber there will be access to bring a skid inside and install it. Additionally, KGS will confirm the placement and access of the skid for the dosing point located after grit removal. • Robin added the size of the skids have been kept to a minimum. Robin presented a drawing of a representative dosing skid. Erica clarified that she wanted to ensure that the space allocation has been considered. Junction Chamber – Corrosive Environment • Dustan voiced a concern that the air quality is not the best in the junction chamber. He added the items in the area are corroded. Dustan believes that this could be mitigated by adding covers on top of the aluminum grates. Robin confirmed this is not in the scope of work currently. Adam asked if this should be added to the risk register. • Adam added this item to the risk register. Junction chamber could be a corrosive environment. This would lead to failure of electrical equipment and early replacement. Probability is placed at low because corrosive resistance items have been selected. Other • Adam asked if SEWPCC BNR will be fully commissioned in time for this project. Jong confirmed it is expected to be. • Adam to follow up with Prasan and Jan to confirm KGS involvement with bench scale testing. KGS involvement with commissioning progress will need to be further discussed. • Robin confirmed that a meeting is scheduled next week for operator touch points. Dosing point locations will be discussed with operations to finalize dosing locations and skid placement. • Prasan confirmed tender submission is scheduled for Wednesday May 18, 2022	Information/KGS Information Information Information Information Information/KGS Information/City/ KGS Information

Details for next meeting

Date of next meeting: **TBD**
Time: TBD
Location: TBD

Meeting adjourned at: 2:00 pm

Report any errors or omissions in the meeting minutes within **3 business days** to Prasan Silva at 204 998 2278 or by e-mail at psilva@kgsgroup.com, otherwise these minutes are considered accurate and accepted.

Attachment(s):
- Attachment 1_S-1146 RMP 2022-04-20

Distribution (to be completed by Chairperson)
- Attendees
- Regrets
- Other:

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2	Digestion process upset/process instability	Threat	Ferric chloride toxicity on unstable/poor process performance (e.g. - temperature drop: spring 2019 - foaming: fall 2019 - poor dewaterability: winter 2020)	Process may become more unstable	Further instability and process upset	5	4	20	Critical	Reduce	Complete testing and verify digester ability to handle additional ferric chloride	Gradual increase of chemical dosing during the full scale applciation and wait for a period of minimum 15 days (or digesters SRT) before making another significant change in chemical dosing.			
3	Struvite precipitation in sludge processing facility (e.g. dewatering pipes, centrifuges)	Threat	BNR process at SEWPCC	Struvite precipitation as a result of excess P quantity in the SEWPCC sludge and is not removed prior to digestion in sidestream treatment	Reduced digesters capacity, pipe clogging, struvite precipitation in centrifuges, in general an upset process in sludge handling facility	3	5	15	Critical	Reduce	Consider sidestream P removal in scenarios 2 and 3. At minimum remove excess P from SEWPCC BNR and meet the current TP concentration in the treated centrate				
5	Dosing point for each scenario not accessible	Threat	Viability of dosing to the points shown in each scenario is not available	Additional space and infrastructure might be required	More funding and increased scope	4	4	16	Critical	Reduce	Consider using day tanks or pumping from the existing chemical dosing facilty for scenarios 2 and 3 (CEPT and HPO)- This study to confirm concept. (PRP _ Day tanks in use)				
6	Delayed interim phosphorous removal at NEWPCC	Threat	SEWPCC BNR Commissioning is delayed	Chemical trimming at NEWPCC is delayed	Delayed phosphorous removal	5	3	15	Critical	Accept					
7	Greater phosphorus loading from SEWPCC sludge than anticipated	Threat	Increased phosphorus load from BNR process at SEWPCC	Higher TP load in treated centrate and insufficient chemical addition at NEWPCC	Violate the sidestream current licence, increase maintenance in sludge processing facilty	3	5	15	Critical	Avoid	Start adding ferric to centrate				
8	Chemical P removal at SEWPCC	Threat	Implementation of chem P removal at SEWPCC prior to BNR commissioning	The capacity of the treatment system may be exceeded	Loss of treatment/process, environment violations	3	5	15	Critical	Avoid	Digester 11 should become online				
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16	Close - Jar test indicates low pH after chemical dosing	Threat	Increase in ferric dosing rate	pH adjustment to be added	Additional funding and increased scope	2	5	10	Serious	Avoid	Include provisions for pH adjustement, a cost estimate to be provided for the new facility. The City to evaluate the available funding and project schedule				
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23	Phosphorous is reduced in final effluent	Opportunity	Chemical phosphorous removal	Phosphorous in final effluent will decrease	Less phosphorous discharged to Lake Winnipeg	4	2	8	Serious	Accept					
24	Minimize struvite precipitation	Opportunity	Chemical phosphorous removal	less struvite precipitation in sludge handling facility when SEWPCC is online	Less maintenance required on centrifuges	3	2	6	Serious	Accept					
25	Poor public perception because system cannot treat to 1 mg/L total phosphorous removal	Threat	Constraints in sludge treatment system	phosphorous removal may be limited	Criticisms from the public and local environmental groups regarding lack of phosphorous reduction	5	1	5	Serious	Accept	Communicate about decreasing phosphorous trends and highlight actions taken to reduce phosphorous to Lake Winnipeg				
26	Uncertainties in SEWPCC Operation	Threat	Commissioning and operation of new plant creates a new/different sludge	Decreases efficiency of chemical phosphorous removal at NEWPCC	Reduced phosphorous removal	3	3	9	Serious	Avoid	Implement interim P removal at NEWPCC when SEWPCC BNR is fully commissioned				
27	HRC Sludge from SEWPCC results in process insability in the NEWPCC digesters	Threat	New HRC process at SEWPCC- More chemical sludge hauled to NEWPCC	Overloading sludge processing facility	Loss of treatment/process, environment violations	2	5	10	Serious	Reduce	Keep all 6 digesters in service during the wet weather months	Stop or reduce dosing chemicals for P removal at NEWPCC during digester cleaning			
28	Chemical availability is limited	Threat	Increase in ferric dosing rate	The Supplier cannot keep up with demand	Not enough ferric available for P removal, increase in TP concentration in the effluent	1	4	4	Important	Avoid	Update supply contract				
29	Excess phosphorus removal from primary effluent starves downstream processes	Threat	Chemically enhanced primary treatment (CEPT)	Lack of nutrients in the primary effluent	Loss of biomass growth in the HPO reacators, filamentous growth and sludge bulking	2	2	4	Important	Reduce	Optimize ferric dose during jar testing and modeling. Conduct SOUR as part of jar testing	Increase ferric dosing in full scale gradually with monitoring ortho-phosphate concentration in the primary effluent			
30	Reduced dewaterability of biosolids	Threat	Increased chemical dosing	Reduced sludge dewaterability	Increased amount of polymer consumption and/or higher moisture concentration in the biosolids	2	2	4	Important	Reduce	During the jar testing, the generated sludge will be tested for capillary Suction Time (CST) which shows the changes in the sludge dewaterability	Monitor solids concentration in the dewatered biosolids and Polymer consumption during the full scale application			
31	Damage to existing Railcar Facility	Threat	Construction so close to existing building	Damage to existing equipment	Staff won't be able to unload new chemical shipments or deliver chemicals to processes	2	4	8	Serious		Add some notes to RFP?				
32	Delay to project completion	Threat	Availability of qualified contractors	Might get a less qualified contractor	Poorer or riskier installation	1	4	4	Important		Note that rail experience required for subcontractor				
32	Delay to project completion	Threat	Availability of qualified contractors	Might get no bidders	Significant delays	1	5	5	Serious		Note to get bidders well informed and lined up.				
33	Ferric chloride dosing system shutdown	Threat	Construction activities, replacing ferric chloride piping	Plant loses the ability to perform ferric chloride dosing	Higher levels of phosphorus in plant effluent, other damage to the process	2	3	6	Serious		Keep exisiting as operational	Plan to handle, make sure response plans are in place			
34	Disruption of the Ferric Truck unloading operations	Threat	Loss of backup unbading capabilites, when you need them.	Construction activities, large vehicles disrupt access	interupption of truck deliveries	3	5	15	Critical		Contractual requirements to coordinate and keep access to truck unloading	Need to minimize window if blocked			
35	Delay in chemical unloading which is made worse because of long term operational needs etc.	threat	Routine damage to railcar Itself	longer unloading,	half day delay or longer delays are increased	5	2	10	Serious						
36	Disruption of rail car delivery	Threat	Rail construction activities (new switch / turnout)	Delayed Rail access	extended delivery outage	1	4	4	Important		Do work at high supply time (Emphasize Shoulder seasons, - not winter)				
37	Delay to project completion	Threat	Unkown underground utilities - At building construction.	Construction delays of a month	delay in new dosing	2	3	6	Serious						
38	Disruption of dewatered sludge truck traffic	Threat	Proximity of new construction to roadway exiting dewatered sludge building.	disruption to traffic	operational limit (Can't be stopped, but could be inconvenient)	2	2	4	Important						
39	Delay to project completion	Threat	Proximity of new construction to south property line	Variance required	Project Delays (3 months-ish)	2	4	8	Serious		Verify limits in advance to mitigate risk - Has been looked into, we are OK to proceed. E-mail should be included with permit application for clarity.				
40	Disruption of traffic on road between rail car buidling and chemical storage building	Threat	Construction activities - new buried lines under roadway	a traffic route is blocked for more than a few days	Congestion on the site	2	2	4	Important						
41	Delay to project completion (Over a month)	Threat	Interference with other project works at NEWPCC (e.g., new scum dewatering building)	if staff are over loaded with other work at the site	delays in responding to contractor needs	4	4	16	Critical		Need to include significant coordination and lead time and planning into contract - Had this discussion - Ongoing				

Risk Event Identification						Risk			Risk Severity	Risk Response	Action (s) to be undertaken	Contingency Plan	Cost to Manage Risks (Identified in BOE with the "cost breakdown" detail shown on separate worksheet)	Risk Owner	Status
Risk ID No.	Risk Event Outcome	Threat or Opportunity?	As a result of (Risk Cause)	This event may occur (Uncertain Event)	Which leads to (Effect on objectives)	Probability	Consequence	Score							
41	Delay to project completion (One month)	Threat	Interference with other project works at NEWPCC (e.g., new scum dewatering building)	Areas have overlapping construction and are not available	Delays in access to certain items - for instance day tank location and PCS/ DCS tie in / Primary upgrade	4	3	12	Serious		Coordination with other projects - Coordinate laydown with RV City				
42	Loss of Ferric - Long term post construciton	Threat	Product supply chain issues and high demand of new systems	Outage of product	Delays in delivery	2	5	10	Serious	Accept	Validate supply chain / look at storage - Look into pre-order / Schedule order / Standing order likley required to mitigate this risk				
43	non-compliance from improper commissioning for post construction	Threat	increased operating scenarios and features during post construction optimization	It may be difficult for operators to keep process under control, as workload will be high to evaluate the different operating scenarios	Phospherous non-compliance or process issues	3	3	9	Serious		careful commissioning and monitoring online feedback - Will not use chemscan, will stick with manual testing/lab results	Ensure adequate focus for operations staff in this window			
43	non-compliance from a system with inadequate feedback	Threat	increased scenarios	Insufficient instruemntation	A system with inadequate feedabck	1	5	5	Serious		Verify reliable operation of the chemscan unit, and for locations - Chemscan is an issue, will not be used	May need to review locations			
44	Additional chemical leak exposure	Threat	Expanding the Ferric distribution network and adding Caustic distribution	Increased leackage points	uncontrolled chemical leak around piping and tanks have extra containment, terminations may need additional containment / monitoring	1	3	3	Important						
45	Additional chemical storage causing increased corrosive environment	Threat	expanding corrosive environment	corrosion on electrical equipemnt	Failure of power supply to area	3	4	12	Serious		Isolate electrical distribution to cleaner room - mitigated this item - Update score - Would be a 1 probailty - reducing to a 4 score.				
46	Increased operating costs	Threat	Increase consumption of Ferric	Increase Price of Ferric	significnt increased operating costs to the City	3	4	12	Serious		Differ to City (Action outside project team)	use as little additional ferric as possible			
47		Threat	Change in operating requirements of licence	changes to need to use ferric	increased needs for funding and triggers another project						Differ to City (Action outside project team)				
47		Threat	Operating requirements will still not meet license but will be closer	Province may not accept or be happy with levels (Expectations may not be aligned)	Future dispute between City and Province						Differ to City (Action outside project team)				
48		Threat	Upon digging in old rail line	Contaminated soil may be found	Increased mitigation costs	3	2	6	Serious	Accept	Including cost per unit in the RFP - to pin down certainty				
49	No room to build dosing points	Threat	Tight space	May be difficult to get access	Reconfiguration on the fly	1	4	4	Important	Accept	Verify all new equipment locations in the existing space on site				
50	Highly corrosive environment	Threat	Highly corrosive environment	Early failure of electrical and equipment	early replacement and lack of reliability	1	3	3	Important	Accept	Already includes corrosion resistant elements.				

APPENDIX C

Site Map

CONTRACTOR PARKING, SITE ACCESS, AND LAYDOWN AREAS

PROPOSED LAYDOWN AREA & NEARBY ENTRANCE

Duckworth Sheetmetal

BLOWER BUILDING MECHANICAL SHOP ENTRANCE

15'-9" x 9'-10" ACCESS HATCH & GANTRY FOR LARGE EQUIPMENT

ACCESS TO BE COORDINATED WITH PLANT OPERATIONS

ACCESS STAIRWELLS

ENTRY/EXIT TO/FROM HPO TANK PIPE GALLERY

SECONDARY CLARIFIERS MAIN ENTRANCE

ENTRY/EXIT TO/FROM CENTRE OF RAS PIPE GALLERY

FREQUENT USE BY PLANT OPERATIONS AND OTHER CONTRACTORS

ACCESS TO BE COORDINATED WITH PLANT OPERATIONS

PROPOSED LAYDOWN AREA & NEARBY ENTRANCE

CONTRACTOR PARKING AREA

CONTRACTOR PARKING AREA OUTSIDE OF MAIN ADMISTRATIVE BUILDING.

SNOW CLEARING BY THE CITY.

PROPOSED LAYDOWN AREA & NEARBY ENTRANCE

PROPOSED LAYDOWN AREA & NEARBY ENTRANCE

PROPOSED LAYDOWN AREA & NEARBY ENTRANCE

CONTRACTOR LAYDOWN AREA

SNOW CLEARING OF THE CONSTRUCTION SITE AND SITE ACCESS AS AND WHEN REQUIRED IS THE RESPONSIBILITY OF THE CONTRACTOR.

FOR LIGHT VEHICLE USE ONLY

PROJECT SHIPPING/RECEIVING ROUTE

ACCESS FOR EQUIPMENT AND MATERIALS DELIVERY AND REMOVAL. NO TUNR-AOURND AVAILABLE, DRIVER REQUIRED TO REVERSE FOR ENTRY.

THIS ROUTE IS ALSO USED FOR TRUCKED SLUDGE PICK-UP, CONTRACTOR TO COORDINATE WITH PLANT OPERATIONS.

Google Earth

100 m

PLANT OPERATIONS AND OUTSIDE PROJECT WORK AREAS

Duckworth Sheetmetal

NEWPCC HEADWORKS UPGRADE PROJECT

RAS PIPING REFURBISHMENT PROJECT

CONSTRUCTION INSIDE ACTIVE PLANT PROCESS AREAS

Winnipeg Water Pollut

NOTE:

LOCATIONS OF AVAILABLE TEMPORARY POWER CONNECTIONS TO BE PROVIDED IN FUTURE REVISION

PROJECT CONSTRUCTION AREA

ACTIVE OPERATIONS (CHEMICAL DELIVERY VIA RAIL AND CHEMICAL STORAGE) INSIDE CONSTRUCTION AREA

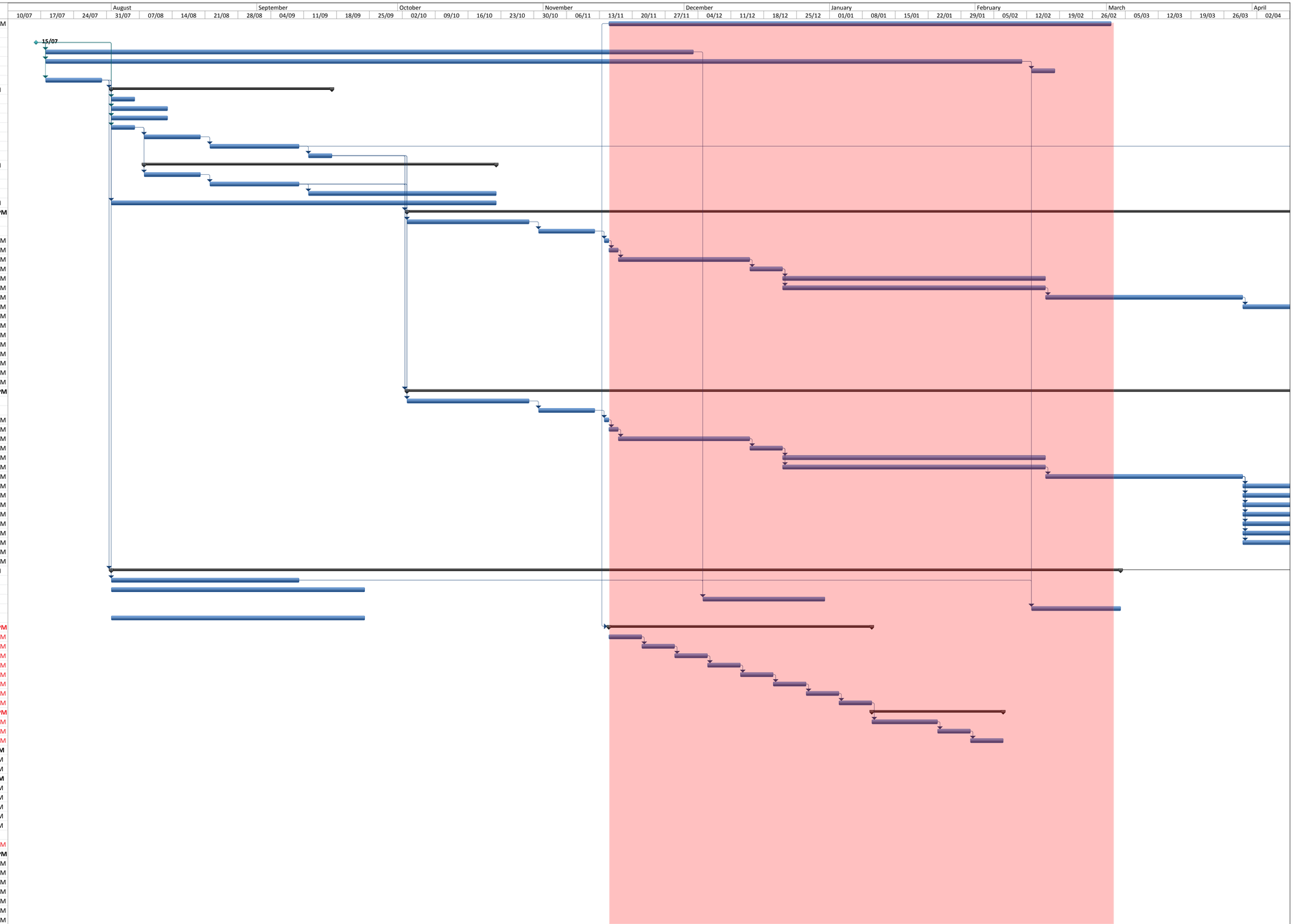
N

100 m

APPENDIX D

Schedule

ID	WBS	Task Name	Duration	Start	Finish
1	1	Winter Shut-Down Window 2022-23	77 days	Tue 15/11/22 8:00 AM	Wed 01/03/23 5:00 PM
2	2	Winter Shut-Down Window 2023/24	78 days	Wed 15/11/23 8:00 AM	Fri 01/03/24 5:00 PM
3	3	AWARD OF CONTRACT	1 day	Fri 15/07/22 8:00 AM	Fri 15/07/22 5:00 PM
4	4	Mechanical Procurement	100 days	Mon 18/07/22 8:00 AM	Fri 02/12/22 5:00 PM
5	5	Electrical Procurement	150 days	Mon 18/07/22 8:00 AM	Fri 10/02/23 5:00 PM
6	6	Panel FATs	5 days	Mon 13/02/23 8:00 AM	Fri 17/02/23 5:00 PM
7	7	Mobilise	10 days	Mon 18/07/22 8:00 AM	Fri 29/07/22 5:00 PM
8	**8**	**CIVIL WORKS**	**35 days**	**Mon 01/08/22 8:00 AM**	**Fri 16/09/22 5:00 PM**
9	8.1	Site survey	5 days	Mon 01/08/22 8:00 AM	Fri 05/08/22 5:00 PM
10	8.2	Soil testing	10 days	Mon 01/08/22 8:00 AM	Fri 12/08/22 5:00 PM
11	8.3	Rail and building vibration and crack monitoring	10 days	Mon 01/08/22 8:00 AM	Fri 12/08/22 5:00 PM
12	8.4	Utilities location	5 days	Mon 01/08/22 8:00 AM	Fri 05/08/22 5:00 PM
13	8.5	Site grubbing, tree/bush/fence removal	10 days	Mon 08/08/22 8:00 AM	Fri 19/08/22 5:00 PM
14	8.6	New LDS & utilites piping, tie-ins, CBs	15 days	Mon 22/08/22 8:00 AM	Fri 09/09/22 5:00 PM
15	8.7	Site grading	5 days	Mon 12/09/22 8:00 AM	Fri 16/09/22 5:00 PM
16	**9**	**NEW RAIL**	**55 days**	**Mon 08/08/22 8:00 AM**	**Fri 21/10/22 5:00 PM**
17	9.1	Site grubbing, tree/bush/fence removal	10 days	Mon 08/08/22 8:00 AM	Fri 19/08/22 5:00 PM
18	9.2	Rail bed grading and drainage	15 days	Mon 22/08/22 8:00 AM	Fri 09/09/22 5:00 PM
19	9.3	New switch and rail spur line	30 days	Mon 12/09/22 8:00 AM	Fri 21/10/22 5:00 PM
20	**10**	**MODS TO EXISTSING RAILCAR SHELTER 1**	**60 days?**	**Mon 01/08/22 8:00 AM**	**Fri 21/10/22 5:00 PM**
21	**11**	**BUILDING 101 EXTENSIONS**	**208 days**	**Mon 03/10/22 8:00 AM**	**Wed 19/07/23 5:00 PM**
22	11.1	Piling	20 days	Mon 03/10/22 8:00 AM	Fri 28/10/22 5:00 PM
23	11.2	Formwork & rebar	10 days	Mon 31/10/22 8:00 AM	Fri 11/11/22 5:00 PM
24	11.3	Concrete pour	1 day	Mon 14/11/22 8:00 AM	Mon 14/11/22 5:00 PM
25	11.4	Formwork teardown	2 days	Tue 15/11/22 8:00 AM	Wed 16/11/22 5:00 PM
26	11.5	Pump, tank footings	20 days	Thu 17/11/22 8:00 AM	Wed 14/12/22 5:00 PM
27	11.6	Storage tank installation	5 days	Thu 15/12/22 8:00 AM	Wed 21/12/22 5:00 PM
28	11.7	Unit masonry	40 days	Thu 22/12/22 8:00 AM	Wed 15/02/23 5:00 PM
29	11.8	Access platforms, supports	40 days	Thu 22/12/22 8:00 AM	Wed 15/02/23 5:00 PM
30	11.9	Roof supports, deck, penetrations	30 days	Thu 16/02/23 8:00 AM	Wed 29/03/23 5:00 PM
31	11.10	Building Mech (plumbing, HVAC)	25 days	Thu 30/03/23 8:00 AM	Wed 03/05/23 5:00 PM
32	11.11	Process - Piping, valves, fittings, pumps	45 days	Thu 04/05/23 8:00 AM	Wed 05/07/23 5:00 PM
33	11.12	Power - Equipment feeds, lighting misc.	30 days	Thu 04/05/23 8:00 AM	Wed 14/06/23 5:00 PM
34	11.13	Security, fire alarm systems	30 days	Thu 04/05/23 8:00 AM	Wed 14/06/23 5:00 PM
35	11.14	Process Controls - New LCPs, RIO Panels	20 days	Thu 04/05/23 8:00 AM	Wed 31/05/23 5:00 PM
36	11.15	Process Controls - Analog I/O, discrete I/O connections	30 days	Thu 04/05/23 8:00 AM	Wed 14/06/23 5:00 PM
37	11.16	Architectural improvements (doors, wall& floor finishes etc.)	30 days	Thu 04/05/23 8:00 AM	Wed 14/06/23 5:00 PM
38	11.17	Final grading	10 days	Thu 15/06/23 8:00 AM	Wed 28/06/23 5:00 PM
39	11.18	Landscaping	15 days	Thu 29/06/23 8:00 AM	Wed 19/07/23 5:00 PM
40	**12**	**BUILDING 102**	**183 days**	**Mon 03/10/22 8:00 AM**	**Wed 14/06/23 5:00 PM**
41	12.1	Piling	20 days	Mon 03/10/22 8:00 AM	Fri 28/10/22 5:00 PM
42	12.2	Formwork & rebar	10 days	Mon 31/10/22 8:00 AM	Fri 11/11/22 5:00 PM
43	12.3	Concrete pour	1 day	Mon 14/11/22 8:00 AM	Mon 14/11/22 5:00 PM
44	12.4	Formwork teardown	2 days	Tue 15/11/22 8:00 AM	Wed 16/11/22 5:00 PM
45	12.5	Pump, tank footings	20 days	Thu 17/11/22 8:00 AM	Wed 14/12/22 5:00 PM
46	12.6	Storage tank installation	5 days	Thu 15/12/22 8:00 AM	Wed 21/12/22 5:00 PM
47	12.7	Unit masonry	40 days	Thu 22/12/22 8:00 AM	Wed 15/02/23 5:00 PM
48	12.8	Access platforms, supports	40 days	Thu 22/12/22 8:00 AM	Wed 15/02/23 5:00 PM
49	12.9	Roof supports, deck, penetrations	30 days	Thu 16/02/23 8:00 AM	Wed 29/03/23 5:00 PM
50	12.10	Building Mech (plumbing, HVAC)	25 days	Thu 30/03/23 8:00 AM	Wed 03/05/23 5:00 PM
51	12.11	Process - Piping, valves, fittings, pumps	45 days	Thu 30/03/23 8:00 AM	Wed 31/05/23 5:00 PM
52	12.12	Power - Equipment feeds, lighting misc.	30 days	Thu 30/03/23 8:00 AM	Wed 10/05/23 5:00 PM
53	12.13	Security, fire alarm systems	30 days	Thu 30/03/23 8:00 AM	Wed 10/05/23 5:00 PM
54	12.14	Process Controls - New LCPs, RIO Panels	20 days	Thu 30/03/23 8:00 AM	Wed 26/04/23 5:00 PM
55	12.15	Process Controls - Analog I/O, discrete I/O connections	30 days	Thu 30/03/23 8:00 AM	Wed 10/05/23 5:00 PM
56	12.16	Architectural improvements (doors, wall& floor finishes etc.)	30 days	Thu 30/03/23 8:00 AM	Wed 10/05/23 5:00 PM
57	12.17	Final grading	10 days	Thu 11/05/23 8:00 AM	Wed 24/05/23 5:00 PM
58	12.18	Landscaping	15 days	Thu 25/05/23 8:00 AM	Wed 14/06/23 5:00 PM
59	**13**	**EXISTING PLANT M&E**	**155 days**	**Mon 01/08/22 8:00 AM**	**Fri 03/03/23 5:00 PM**
60	13.1	New equipment footings, racks, supports	30 days	Mon 01/08/22 8:00 AM	Fri 09/09/22 5:00 PM
61	13.2	Piping, valves, fittings	40 days	Mon 01/08/22 8:00 AM	Fri 23/09/22 5:00 PM
62	13.3	Mech. Equipment (pumps, tanks etc.)	20 days	Mon 05/12/22 8:00 AM	Fri 30/12/22 5:00 PM
63	13.4	Control panels, instrumentation	15 days	Mon 13/02/23 8:00 AM	Fri 03/03/23 5:00 PM
64	13.5	Power/control cabling	40 days	Mon 01/08/22 8:00 AM	Fri 23/09/22 5:00 PM
65	**13.6**	**Process tie-ins (SHUTDOWN REQUIRED)**	**40 days**	**Tue 15/11/22 8:00 AM**	**Mon 09/01/23 5:00 PM**
66	13.6.1	1.4 - Trucked Sludge - FeCl3	5 days	Tue 15/11/22 8:00 AM	Mon 21/11/22 5:00 PM
67	13.6.2	1.5 A/B - Sludge to Digesters - NaOH	5 days	Tue 22/11/22 8:00 AM	Mon 28/11/22 5:00 PM
68	13.6.3	1.6 - Trucked Sludge - NaOH	5 days	Tue 29/11/22 8:00 AM	Mon 05/12/22 5:00 PM
69	13.6.4	2.1A/B - Effluent - FeCl3	5 days	Tue 06/12/22 8:00 AM	Mon 12/12/22 5:00 PM
70	13.6.5	3.1 - Effluent to HPO Reactors - FeCl3	5 days	Tue 13/12/22 8:00 AM	Mon 19/12/22 5:00 PM
71	13.6.6	4.1 - Effluent to Secondary Clarifiers - FeCl3	5 days	Tue 20/12/22 8:00 AM	Mon 26/12/22 5:00 PM
72	13.6.7	4.2 - Effluent to Secondary Clarifiers - FeCl3	5 days	Tue 27/12/22 8:00 AM	Mon 02/01/23 5:00 PM
73	13.6.8	4.3 - Effluent to Secondary Clarifiers - FeCl3	5 days	Tue 03/01/23 8:00 AM	Mon 09/01/23 5:00 PM
74	**13.7**	**Utilities tie-ins (SHUTDOWN REQUIRED)**	**20 days**	**Tue 10/01/23 8:00 AM**	**Mon 06/02/23 5:00 PM**
75	13.7.1	Electrical tie-ins	10 days	Tue 10/01/23 8:00 AM	Mon 23/01/23 5:00 PM
76	13.7.2	Compressed air	5 days	Tue 24/01/23 8:00 AM	Mon 30/01/23 5:00 PM
77	13.7.3	Natural gas	5 days	Tue 31/01/23 8:00 AM	Mon 06/02/23 5:00 PM
78	**14**	**PRE-COMMISSIONING**	**1 day**	**Thu 20/07/23 8:00 AM**	**Thu 20/07/23 5:00 PM**
79	14.1	TAB document submission	1 day	Thu 20/07/23 8:00 AM	Thu 20/07/23 5:00 PM
80	14.2	Start-up inspection and static tst checklists submission	1 day	Thu 20/07/23 8:00 AM	Thu 20/07/23 5:00 PM
81	**15**	**COMMISSIONING SUMMER/FALL 2023**	**113 days**	**Fri 21/07/23 8:00 AM**	**Tue 26/12/23 5:00 PM**
82	15.1	Commissioning - Phase 1A	30 days	Fri 21/07/23 8:00 AM	Thu 31/08/23 5:00 PM
83	15.2	Commissioning - Phase 1B	15 days	Fri 21/07/23 8:00 AM	Thu 10/08/23 5:00 PM
84	15.3	Rail and building vibration and crack monitoring	10 days	Fri 21/07/23 8:00 AM	Thu 03/08/23 5:00 PM
85	15.4	Process Verification - Phase 2	30 days	Fri 21/07/23 8:00 AM	Thu 31/08/23 5:00 PM
86	15.5	Process Verification - Phase 3	30 days	Wed 15/11/23 8:00 AM	Tue 26/12/23 5:00 PM
87	16	Certificate of Substantial Performace	1 day	Fri 21/07/23 8:00 AM	Fri 21/07/23 5:00 PM
88	17	Certificate of Total Performace	1 day	Wed 27/12/23 8:00 AM	Wed 27/12/23 5:00 PM
89	**18**	**Post Construction Services**	**298 days**	**Thu 27/07/23 8:00 AM**	**Mon 16/09/24 5:00 PM**
90	18.1	Operation and Maintenance Manuals	30 days	Thu 27/07/23 8:00 AM	Wed 06/09/23 5:00 PM
91	18.2	Final Asset Registry	30 days	Thu 27/07/23 8:00 AM	Wed 06/09/23 5:00 PM
92	18.3	Final Construction Report	30 days	Thu 27/07/23 8:00 AM	Wed 06/09/23 5:00 PM
93	18.4	Record Drawings	30 days	Thu 27/07/23 8:00 AM	Wed 06/09/23 5:00 PM
94	18.5	Warranty Period	260 days	Tue 05/09/23 8:00 AM	Mon 02/09/24 5:00 PM
95	18.6	Provide a Certificate of Acceptance	0 days	Mon 02/09/24 5:00 PM	Mon 02/09/24 5:00 PM
96	18.7	Close-Out Meeting	0 days	Mon 16/09/24 5:00 PM	Mon 16/09/24 5:00 PM



Project: 21-0107-015 Commission
Date: Tue 17/05/22 9:01 PM

Task | Milestone | Project Summary | External Milestone | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | Deadline
Split | Summary | External Tasks | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | Progress

ID	WBS	Task Name	Duration	Start
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31	11.10	Building Mech (plumbing, HVAC)	25 days	Thu 30/03/23 8:00 AM
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33	11.12	Power - Equipment feeds, lighting misc.	30 days	Thu 04/05/23 8:00 AM
34	11.13	Security, fire alarm systems	30 days	Thu 04/05/23 8:00 AM
35	11.14	Process Controls - New LCPs, RIO Panels	20 days	Thu 04/05/23 8:00 AM
36	11.15	Process Controls - Analog I/O, discrete I/O connections	30 days	Thu 04/05/23 8:00 AM
37	11.16	Architectural improvements (doors, wall& floor finishes etc.)	30 days	Thu 04/05/23 8:00 AM
38	11.17	Final grading	10 days	Thu 15/06/23 8:00 AM
39	11.18	Landscaping	15 days	Thu 29/06/23 8:00 AM
40	**12**	**BUILDING 102**	**183 days**	**Mon 03/10/22 8:00 AM**
41	12.1	Piling	20 days	Mon 03/10/22 8:00 AM
42	12.2	Formwork & rebar	10 days	Mon 31/10/22 8:00 AM
43	12.3	Concrete pour	1 day	Mon 14/11/22 8:00 AM
44	12.4	Formwork teardown	2 days	Tue 15/11/22 8:00 AM
45	12.5	Pump, tank footings	20 days	Thu 17/11/22 8:00 AM
46	12.6	Storage tank installation	5 days	Thu 15/12/22 8:00 AM
47	12.7	Unit masonry	40 days	Thu 22/12/22 8:00 AM
48	12.8	Access platforms, supports	40 days	Thu 22/12/22 8:00 AM
49	12.9	Roof supports, deck, penetrations	30 days	Thu 16/02/23 8:00 AM
50	12.10	Building Mech (plumbing, HVAC)	25 days	Thu 30/03/23 8:00 AM
51	12.11	Process - Piping, valves, fittings, pumps	45 days	Thu 30/03/23 8:00 AM
52	12.12	Power - Equipment feeds, lighting misc.	30 days	Thu 30/03/23 8:00 AM
53	12.13	Security, fire alarm systems	30 days	Thu 30/03/23 8:00 AM
54	12.14	Process Controls - New LCPs, RIO Panels	20 days	Thu 30/03/23 8:00 AM
55	12.15	Process Controls - Analog I/O, discrete I/O connections	30 days	Thu 30/03/23 8:00 AM
56	12.16	Architectural improvements (doors, wall& floor finishes etc.)	30 days	Thu 30/03/23 8:00 AM
57	12.17	Final grading	10 days	Thu 11/05/23 8:00 AM
58	12.18	Landscaping	15 days	Thu 25/05/23 8:00 AM
59	**13**	**EXISTING PLANT M&E**	**155 days**	**Mon 01/08/22 8:00 AM**
60	13.1	New equipment footings, racks, supports	30 days	Mon 01/08/22 8:00 AM
61	13.2	Piping, valves, fittings	40 days	Mon 01/08/22 8:00 AM
62	13.3	Mech. Equipment (pumps, tanks etc.)	20 days	Mon 05/12/22 8:00 AM
63	13.4	Control panels, instrumentation	15 days	Mon 13/02/23 8:00 AM
64	13.5	Power/control cabling	40 days	Mon 01/08/22 8:00 AM
65	**13.6**	**Process tie-ins (SHUTDOWN REQUIRED)**	**40 days**	**Tue 15/11/22 8:00 AM**
66	13.6.1	1.4 - Trucked Sludge - FeCl3	5 days	Tue 15/11/22 8:00 AM
67	13.6.2	1.5 A/B - Sludge to Digesters - NaOH	5 days	Tue 22/11/22 8:00 AM
68	13.6.3	1.6 - Trucked Sludge - NaOH	5 days	Tue 29/11/22 8:00 AM
69	13.6.4	2.1A/B - Effluent - FeCl3	5 days	Tue 06/12/22 8:00 AM
70	13.6.5	3.1 - Effluent to HPO Reactors - FeCl3	5 days	Tue 13/12/22 8:00 AM
71	13.6.6	4.1 - Effluent to Secondary Clarifiers - FeCl3	5 days	Tue 20/12/22 8:00 AM
72	13.6.7	4.2 - Effluent to Secondary Clarifiers - FeCl3	5 days	Tue 27/12/22 8:00 AM
73	13.6.8	4.3 - Effluent to Secondary Clarifiers - FeCl3	5 days	Tue 03/01/23 8:00 AM
74	**13.7**	**Utilities tie-ins (SHUTDOWN REQUIRED)**	**20 days**	**Tue 10/01/23 8:00 AM**
75	13.7.1	Electrical tie-ins	10 days	Tue 10/01/23 8:00 AM
76	13.7.2	Compressed air	5 days	Tue 24/01/23 8:00 AM
77	13.7.3	Natural gas	5 days	Tue 31/01/23 8:00 AM
78	**14**	**PRE-COMMISSIONING**	**1 day**	**Thu 20/07/23 8:00 AM**
79	14.1	TAB document submission	1 day	Thu 20/07/23 8:00 AM
80	14.2	Start-up inspection and static tst checklists submission	1 day	Thu 20/07/23 8:00 AM
81	**15**	**COMMISSIONING SUMMER/FALL 2023**	**113 days**	**Fri 21/07/23 8:00 AM**
82	15.1	Commissioning - Phase 1A	30 days	Fri 21/07/23 8:00 AM
83	15.2	Commissioning - Phase 1B	15 days	Fri 21/07/23 8:00 AM
84	15.3	Rail and building vibration and crack monitoring	10 days	Fri 21/07/23 8:00 AM
85	15.4	Process Verification - Phase 2	30 days	Fri 21/07/23 8:00 AM
86	15.5	Process Verification - Phase 3	30 days	Wed 15/11/23 8:00 AM
87	16	Certificate of Substantial Performace	1 day	Fri 21/07/23 8:00 AM
88	17	Certificate of Total Performace	1 day	Wed 27/12/23 8:00 AM
89	**18**	**Post Construction Services**	**298 days**	**Thu 27/07/23 8:00 AM**
90	18.1	Operation and Maintenance Manuals	30 days	Thu 27/07/23 8:00 AM
91	18.2	Final Asset Registry	30 days	Thu 27/07/23 8:00 AM
92	18.3	Final Construction Report	30 days	Thu 27/07/23 8:00 AM
93	18.4	Record Drawings	30 days	Thu 27/07/23 8:00 AM
94	18.5	Warranty Period	260 days	Tue 05/09/23 8:00 AM
95	18.6	Provide a Certificate of Acceptance	0 days	Mon 02/09/24 5:00 PM
96	18.7	Close-Out Meeting	0 days	Mon 16/09/24 5:00 PM

Project: 21-0107-015 Commission
Date: Tue 17/05/22 9:01 PM

Task | Milestone | Project Summary | External Milestone | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | Deadline
Split | Summary | External Tasks | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | Progress

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