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MAGIC LAKE ESTATES WATER AND SEWER COMMITTEE
Notice of Meeting on **Tuesday, June 14, 2022 at 9:30 a.m. in the Goldstream Conference Room, 479 Island Highway Victoria BC**

For members of the **public who wish to listen to the meeting** via telephone please call **1-833-353-8610** and enter the **Participant Code 1911461 followed by #.** You will not be heard in the meeting room but will be able to listen to the proceedings.

M. Fossl (Chair)
W. Foster
R. Sullivan
J. Deschenes (Vice Chair)
K. Heslop
P. Brent, Acting Electoral Area Director
D. Reed

AGENDA

1. **APPROVAL OF AGENDA**

2. **ADOPTION OF MINUTES** 2
   Recommendation*: That the minutes of the May 10, 2022 meeting be adopted.*

3. **CHAIR'S REMARKS**

4. **PRESENTATIONS/DELEGATIONS**

   The public are welcome to attend Commission meetings in-person.

   Delegations will have the option to participate electronically. Please complete the online application for "Addressing the Board" on our website and staff will respond with details.

   Alternatively, you may email your comments on an agenda item to the Magic Lake Estates Water and Sewer Committee at iwsadministration@crd.bc.ca.

   Requests must be received no later than 4:30 p.m. two calendar days prior to the meeting.

5. **COMMITTEE BUSINESS**

   5.1. **Magic Lake Estates Project and Operations Update** 5
   Recommendation: *There is no recommendation. This report is for information only.*

   5.2. **Magic Lake Estates 2021 Annual Report**
   Recommendation: *There is no recommendation. This report is for information only.*

6. **CORRESPONDENCE**

7. **NEW BUSINESS**

8. **ADJOURNMENT**

Next Meeting: Tuesday, July 12, 2022

*To ensure quorum, advise **Mikayla Risvold 250.474.9518** if you cannot attend.*

IWSS-297445977-8052

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MINUTES OF A MEETING OF THE Magic Lake Estates Water and Sewer Committee, held Tuesday, May 10, 2022 at 9:30 a.m., In the Goldstream Conference Room, 479 Island Highway, Victoria, BC

PRESENT: **Committee Members:** M. Fossl (Chair); J. Deschenes (Vice Chair) (EP) (9:57 am); W. Foster; K. Heslop; D. Reed; R. Sullivan (EP); P. Brent for D. Howe (EP)

Staff: I. Jesney, Senior Manager, Infrastructure Engineering; M. McCrank, Senior Manager, Wastewater Infrastructure Operations; M. Cowley, Manager, Regional Wastewater; M. Risvold, Committee and Administrative Clerk (Recorder)

REGRETS: D. Howe, Electoral Area Director

EP = Electronic Participation

The meeting was called to order at 9:33 am.

1. APPROVAL OF AGENDA

MOVED by K. Heslop, **SECONDED** by W. Foster,
That the agenda be approved.

CARRIED

2. ADOPTION OF MINUTES

MOVED by K. Heslop, **SECONDED** by P. Brent,
That the minutes of the March 8, 2022 meeting be adopted.

CARRIED

3. CHAIR'S REMARKS

The Chair welcomed R. Sullivan to the committee.

4. PRESENTATIONS/DELEGATIONS

There were no presentations or delegations.

5. COMMITTEE BUSINESS

5.1. Project and Operations Update

I. Jesney introduced the Project and Operations Report, and provided the capital projects update.

Staff responded to a question from the committee regarding the Process Pipe Replacement Project. Staff advised the project covers quality control of the welding on the pipe, and the pipe has been replaced where necessary. Remaining funds from the settlement for the project have been placed in a special capital reserve at the committee's recommendation.

M. McCrank provided the Operations update.

Discussion ensued regarding a change to the water chlorine dosage.

M. Cowley provided the wastewater update.

Discussion ensued regarding:

- Pump station and treatment plant conceptual design
- The four wastewater treatment technology options
- Treatment of the wastewater
- Method of disinfection for the effluent

M. McCrank provided the Operational Wastewater update.

The report was received for information.

5.2. Discussion on investigating and mitigating the loss of 1/3 of treated water as per the last annual report

Staff provided examples of contributing factors that can attribute to water loss. There are currently no apparent leaks in the water system, and it is not recommended to replace the system.

Discussion ensued regarding:

- Potential of installing zone meters
- Demand management
- Increasing population
- Conservation efforts

Staff advised that the annual report provides seven years of data, including water loss, and that the report will be presented to the committee at the next meeting. The report will also be published on the Capital Regional District (CRD) website in June.

5.3. Discussion regarding garburator use impacts on the sewage system

Staff advised garburators do not a use a significant amount of water, and the use of garburators is incorporated into the provincial building code. When garburators are used, there is increased loading by putting organic matter into the wastewater treatment plant. Staff noted that composting is advisable for green waste. Staff will investigate the possibility of including a message on water bills regarding the use of garburators.

6. CORRESPONDENCE

There was no correspondence.

7. NEW BUSINESS

I. Jesney advised the current Manager, Capital Projects is leaving the CRD effective June 10, 2022.

The committee queried having additional water tests completed to achieve a baseline of levels in the event there is an algae bloom.

8. ADJOURNMENT

MOVED by W. Foster, **SECONDED** by D. Reed,
That the May 10, 2022 meeting be adjourned at 10:33 am.

CARRIED

_____
CHAIR

_____
SECRETARY

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REPORT TO MAGIC LAKE ESTATES WATER AND SEWER COMMITTEE
MEETING OF TUESDAY, JUNE 14, 2022

SUBJECT **Capital Project Status Reports and Operational Updates**

ISSUE SUMMARY

To provide the Magic Lake Estates Water and Sewer Committee with capital project status reports and operational updates up to and including May 31, 2022.

BACKGROUND

The Magic Lake Estates (MLE) Water System is located on the south shore of North Pender Island in the Southern Gulf Islands Electoral Area and provides drinking water to approximately 1,036 customers. Capital Regional District (CRD) Integrated Water Services is responsible for the overall operation of the water system with day-to-day operation and maintenance, design and construction of water system facilities provided by the CRD Infrastructure Engineering and Operations Divisions. The quality of drinking water provided to customers in the Magic Lake Estates Water System is overseen by the CRD Water Quality Division.

CAPITAL PROJECT UPDATE

Magic Lake Estates Water

21-02 | Design and Construction Buck Lake and Magic Lake Adjustable Intakes

Project Description: Detailed design and construction of adjustable intakes to inform future capital works to maintain water quality.

Project Rationale: Both the Buck and Magic Lake adjustable intakes are unsafe to clean and adjust without employing divers. Funds are required to design and construct adjustable intakes.

Project Update and Milestones:

- A consultant was retained in November 2021 and they produced a draft design report summarizing design requirements for the intakes and floats on December 6, 2021.
- Preliminary design drawings are to be received by staff March 4, 2022 for review.
- Tendering scheduled for mid-May 2022 and construction in the fall of 2022.
- Notification of works to the Ministry of Environment through Front Counter BC is required. This is not approvals as permitting is not required based on the scope of works.

Milestone	Completion Date
Consultant retained	November 12, 2021
Draft conceptual design report received	December 6, 2021
Design submitted to Front Counter BC for notification	April 21, 2022

21-04 | Buck Lake Dam Repairs - Phase 1

Project Description: Conduct additional inspections, minor repairs, and performance analysis highlighted in the 2019 Dam Safety Review. Phase 2 dam improvements to be completed in the following five years.

Project Rationale: Resulting from the Hatch 2019 Dam Safety Review, funds are required to conduct additional inspections, minor dam repairs, and performance analysis. Phase 2 dam improvements to be completed in the following five years. The November 26, 2020 staff report outlines the detailed expenditure plan for Phase 1.

Project Update and Milestones:

- Detailed scope of work and acceptable options for preventing high live loads at Buck Lake Dam's west dam have been developed. Work is to be complete in September 2022.
- Consultant has been retained to conduct a dam breach analysis for both dams to confirm the dam flood area and improve the dam emergency plan. The kick off meeting is tentatively scheduled for the week of March 7, 2022.
- Operations to coordinate with CRD Protective Services so that dam emergencies are part of CRD's Public Alert Notification System.
- CRD staff have started compiling required information for the dam emergency plan and operating and maintenance manuals. Updates are to be completed by December 2022.

Milestone	Completion Date
Consultant retained to conduct dam breach analysis	December 20, 2021

22-01 | Failed Valve Replacement

Project Description: Replace 6 failed water main valves.

Project Rationale: Through annual operations of the water system, three valves have been identified as having failed. Funding is required to replace these valves at 4708 Capstan Crescent, Schooner Way and Privateers, 3710 Rum Road, Schooner Way and Ketch Road, 4742 Bosun Way, and 37140 Galleon Way.

Project Update and Milestones:

- Project to commence upon CRD Board approval of the 5-year capital plan at the March 16, 2022 meeting.
- Operations is currently scheduling for works to commence in September and October unless an earlier opportunity is available.

22-02 | EV Charging Station

Project Description: Construct a new Electric Vehicle (EV) Charging Station at the Water Treatment Plant, project to be split across MLE Water, Wastewater, and a possible grant.

Project Rationale: Construct a new EV Charging station at the water treatment plant, project is to be partially funded through a cost matching grant and the MLE Wastewater Service.

Project Update and Milestones:

- Project delivery is currently being planned with CRD Facilities and Operations.
- Execution to occur in October pending equipment delivery, early delivery will occur if possible.

Milestone	Completion Date
Notification of conditional grant approval	January 18, 2022

22-03 | Process Pipe Replacement

Project Description: Replace corroded process pipe in the water treatment plant.

Project Rationale: The water treatment plant has corroded process piping. Funding is required to plan and replace the affected pipe.

Project Update and Milestones:

- This project is deferred until there is noticeable leakage identified through ongoing inspections.
- The financial component of the project will remain open so there is funding available on short term notice.

OPERATIONAL UPDATE

This is an operational update report for May 2022.

- Completed the annual valve exercising program.
- Replacement of exterior lighting fixtures on the Buck Lake raw water pump station.
- Emergency response to extended power outage due to wind storm event on May 18 and 19.

Magic Lake Estates Sewer Utility

20-01 | Wastewater Improvements – Sewer Replacement

Project Description:

1. Replace about 3 kilometers (km) of failing asbestos cement (AC) pipe and install Cannon forcemain pipe (2021).
2. Replace as much failing AC pipe as possible with remaining funds left from $6 million loan (2022-23).

Project Rationale: Several km of failing AC sewer pipe requires replacement (to be completed over three years from 2021-2023).

Project Update and Milestones:

- No further updates are required until the next phase of sewer replacement work commences which will be after the pump station and treatment plant tender is closed so that we know the remaining funds left from the $6 million loan.

Milestone	Completion Date
Construction	Substantial Completion on December 17, 2021
Warranty Period	December 17, 2022

21-01 | Wastewater Improvements – Pump Station and Treatment Plant Upgrades

Project Description:

1. Renew Buccaneer, Galleon, Schooner, Capstan, Cutlass and Masthead Pump Stations.
2. Replace Cannon Wastewater Treatment Plant (WWTP) with a new pump station.
3. Upgrade Schooner WWTP.

Project Rationale: Successfully received an Infrastructure Canada grant to complete upgrades on six pump stations, install a new pump station at Cannon to pump to Schooner WWTP, and upgrade Schooner WWTP to treat flow from Cannon and renew many components to bring the wastewater system into compliance with environmental regulations.

Project Update and Milestones:

- McElhanney has completed its review and evaluation of four wastewater treatment technologies. They are proceeding with the membrane bio-reactor (MBR) technology (Appendix A is a copy of their Recommendation).
- McElhanney has completed a conceptual site plan layout showing the proposed upgrades at Schooner WWTP (Appendix B). The plan needs some adjustment, but it gives an idea of the overall footprint at the plant site.
- Staff visited a similar-sized MBR plant in a residential area of Mill Bay and were able to confirm with Cowichan Valley Regional District staff that the plant performs well, (with no obvious noise or odours), and operates efficiently with a budget that is within the Magic Lake Estates Sewer operating budget (see Appendix C for photos from the site visit).
- If interested, staff can arrange for another tour of Mill Bay WWTP with MLE Committee members.
- Overall, the project schedule has slipped a bit in order to complete the technology analysis and site visit to Mill Bay WWTP.

Milestone	Completion Date
Preliminary Design	June 30, 2022
Detailed Design	October 15, 2022
Tender Period	November 30, 2022
Construction	December 31, 2023
Warranty Period	December 31, 2024

22-01 | EV Charging Station

Project Description: Construct a new EV Charging Station at the Water Treatment Plant, project to be split across MLE Water, Wastewater, and a possible grant.

Project Rationale: Construct a new EV Charging Station at the Water Treatment Plant, project to be split across MLE Water, Wastewater, and a possible grant.

Project Update and Milestones:

- Project delivery is currently being planned with CRD Facilities and Operations.
- Execution to occur in October pending equipment delivery, early delivery will occur if possible.

OPERATIONAL UPDATE

This is an operational update report for May 2022.

- Emergency response to extended power outage due to wind storm event on May 18 and 19 that included the use of vacuum truck services for pumping down various sewage lift stations.
- Corrective maintenance completed for Manhole #79 flood float communications link.
- Environmental Incident Reporting (EIR) issued for Cannon Wastewater Treatment Plant non-compliance effluent quality.

Table 1: Operating Permit Regulatory Non-compliance reporting for May 2022

Facility	May Reports Issued	Reports YTD 2022	Total Reports 2021	Cause
Schooner WWTP	1	8	24	Environmental Incidence Reports are issued typically as a result of: 1. Facility power outage causing loss of UV disinfection resulting in exceedance of fecal coliform (FC) regulatory requirements (permit <200 cfu/100ml). 2. Exceedance of permitted daily maximum flows (< 640m3/day). Flow exceedances are due to excessive collection system inflow and infiltration (I&I). 3. Exceedance of permitted total suspended solids (TSS) (<45mg/l). This is type of exceedance is the result of high I&I.
Schooner Pump Station	0	0	2	Typically, these are overflow events into the marine environment (Boat Nook) due to extended power failures in the area. There is no standby power at the facility.
Cannon WWTP	1*	5	52	Exceeding maximum daily flows due to storm water entering through I&I. * Permit exceedance: total suspended solids (TSS) (<60mg/l) and carbonaceous biochemical oxygen demand (CBOD) (<45mg/l)

RECOMMENDATION

There is no recommendation. This report is for information only.

Submitted by:	Ian Jesney, P.Eng., Senior Manager, Infrastructure Engineering
Submitted by:	Matt McCrank, M.Sc., P.Eng, Senior Manager, Wastewater Infrastructure Operations
Concurrence:	Ted Robbins, B.Sc., C.Tech., General Manager, Integrated Water Services

ATTACHMENTS:

Appendix A: McElhanney's Recommendation
Appendix B: McElhanney's Conceptual Site Plan Layout for Proposed Upgrades at Schooner WWTP
Appendix C: Photos from Mill Bay WWTP

8. Recommendations

McElhanney has reviewed and evaluated four wastewater treatment technologies for the proposed upgrades at Schooner WWTP including extended aeration activates sludge (EAAS), sequencing batch reactor (SBR), moving bed biological reactor (MBBR), and membrane bioreactor (MBR). The Rapid Impact Assessment Matrix (RIAM) tool was used to complete the evaluation and included scoring received from CRD Operations and Engineering. The RIAM analysis included 17 individual criteria in the general categories of environmental, social, operations, and costs (capital, operating, and life-cycle). The RIAM analysis determined that the advanced treatment options of MBBR and MBR have a better overall score and advantages over the conventional technologies of EAAS and SBR.

To further compare the two preferred technologies, the following table summarizes some of the differences between MBBR and MBR to help provide the rationale for the recommended technology selection at Schooner.

Table 18: Comparison between MBBR and MBR Technologies

Criterion	MBBR	MBR
Capital Costs	Estimated to be about $250,000 higher than MBR due to larger reactor tank and additional clarifier.	Estimated to be about $250,000 lower in capital cost.
Annual O&M Costs	Electrical costs are lower but this is offset by higher solids hauling and disposal costs, so the annual O&M costs are very similar for both technologies.	The MBR process has higher electrical costs by about $5-7.5k/year, but this is offset by lower solids hauling and disposal costs.
Life-cycle Costs	Less equipment needs to be replaced with MBBR over the 25-year life cycle, but due to higher initial capital costs the overall life cycle cost is comparable to MBR.	Membranes need to be replaced after 10 to 15 years. The cost to replace is about $150,000 (2022 dollars). However, this cost is offset by the lower capital cost of MBR.

Criterion	MBBR	MBR
Redundancy	Two parallel trains are required due to the system configuration and servicing requirements. Each train will process 50% of the design flow (refer to Figure 10). All mechanical equipment (pumps and blowers) will be redundant (i.e., 1 duty, 1 standby). Unless servicing of aeration diffusers in the MBBR tanks is required, there is no need for the operators to enter the bioreactor. The process allows for more MBBR media to be added in the future to either increase the throughput or improve the effluent quality provided that the initial media fill fraction is 50% or less.	The process can be configured as a single train (resulting in a smaller footprint) with a provision for step feed and internal bypass. Servicing is possible by partitioning the bioreactor and switching to step feed and/or bypass, when required (refer to Figure 11). The remaining configuration will process 50% of the design flow. All mechanical equipment (pumps and blowers) will be redundant (i.e., 1 duty, 1 standby). Six membrane modules will provide for flexibility of operation. Unless servicing of aeration diffusers in the MBR bioreactor is required, there is no need for the operators to enter the bioreactor.
Operational Simplicity	Continuous flow, single pass fixed-film process with no internal recycles and periodic sludge wasting from secondary clarifiers. The process is PLC controlled. MBBR also requires clarifiers which can require a bit more operational effort. Sludge dewatering operations are typically initiated and attended by the operators. Based on the configuration complexity, the plant is expected to be Level II facility.	Continuous flow, activated sludge process with internal RAS recycle and periodic sludge wasting from the MBR bioreactor. The process is PLC controlled. Sludge dewatering operations are typically initiated and attended by the operators. Based on the configuration complexity, the plant is expected to be Level II facility.

Criterion	MBBR	MBR
Specific Operational Issues and Procedures	The MBBR media may require, although unlikely, pump-out of the MBBR tanks for periodic inspections of aeration diffusers. Coarse bubble diffusers, employed in the process, are not prone to plugging and may not require periodic inspections and this procedure. However, in case this procedure is necessary, it may be required once over the WWTP operational life (e.g., after approximately 15 years of operation). The media will have to be pumped out of the MBBR tanks, one chamber at a time, into external metal containers (e.g., garbage containers) brought to the site. Portable submersible pumps with recessed impellers are to be used for this procedure as these pumps can handle the media without damaging it. Rising sludge in secondary clarifiers may be a periodic operational issue due to denitrification taking place in the clarifiers upon the onset of significant nitrification in the bioreactor, specifically over the summer period. Manual addition of coagulant may be required, on an as-required basis.	The membrane CIP (cleaning in place) for flux recovery is required 3 to 4 times a year. This is an in-situ operation wherein diluted chlorine solution is injected through a membrane manifold from a dedicated tank (typically 400 L) via a small pump or by gravity, if the tank is located above the membranes. Typically, 200 L to 250 L of 0.2% to 0.5% chlorine solution is used for one CIP cycle per membrane cassette. The solution is applied typically for up to 6 hours. The annual amount of bleach at 12% concentration based on 6 membrane cassettes, 4 CIPs/year, and chlorine solution concentration of 0.3% is 160 L/yr (~$200/yr), i.e., less than a standard chemical drum per year. Rising sludge is not an issues in the MBR process.
Process/Mechanical Complexity	Process requires two secondary clarifiers for solids separation. The second (new) clarifier will be larger (appr. 5 m diameter) than the existing reusable clarifier (3 m diameter). Also, the second clarifier will likely be cast in place. Flow splitter will be required to proportionally split the flow between the clarifiers. Thickening is required for sludge management after secondary clarification as raw sludge is too thin (appr. 0.25% DS), i.e., clarifier sludge cannot be dewatered directly without an intermediate thickening step. Existing SHTs can be used as gravity thickeners prior to dewatering. MBBR sludge can be dewatered up to 12% DS provided that clarifier sludge will be pre-thickened to about 1.0% in SHTs.	The technology does not require secondary clarifiers. Existing two clarifiers can be abandoned. Effluent is extracted from the MBR reactor by permeate pumps. MBR sludge can be dewatered without thickening to produce dewatered sludge with up to 12% DS if an MLSS concentration in the bioreactor is maintained between 0.8% and 1.0%. Sludge can be wasted directly from the MBR reactor, i.e., existing sludge holding tanks can be bypassed or used either for emergency or weekend storage. Optionally, existing SHTs can be used as gravity thickeners prior to dewatering to increase DS% of dewatered sludge to 15% to 18% provided that MBR sludge will be pre-thickened to about 3.0% in SHTs.

Criterion	MBBR	MBR
Sludge Production and Process Implications	The MBBR process generates more sludge than the MBR technology. The estimated sludge production is 146 kg/day of dry solids and 57 m^3/day of raw (wet) sludge at 0.25% DS and average annual design flow (refer to Table 8). As the three existing SHTs have a combined capacity of about 60 m^3, sludge produced by the MBBR process can be stored on site only for one day and would require dewatering over the weekend unless additional sludge storage capacity is added to increase a holding time. Sludge dewatering is possible only with prior pre-thickening in existing SHTs. Dewatered sludge volume is estimated at 1.2 m^3/day based on pre-thickened sludge feed at 1.0% DS and dewatered sludge at 12% DS. The MBBR option complemented with sludge dewatering could reduce the hauling and disposal quantities from a half to a third resulting in today's annual saving of up to approximately $90,000/year in sludge handling and disposal costs.	The MBR process generates less sludge than the MBBR technology. The estimated sludge production is 105 kg/day of dry solids and 12 m^3/day of raw (wet) sludge at 1.0% DS and average annual design flow (refer to Table 8). As the three existing SHTs have a combined capacity of about 60 m^3, sludge produced by the MBR process can be stored on site for five days and would not require dewatering over the weekend. Sludge dewatering is more flexible as dewatering is possible either directly from the MBR bioreactor or with pre-thickening in existing SHTs. Dewatered sludge volume is estimated at 1.0 m^3/day based on raw sludge feed at 1.0% DS (i.e., directly from the MBR reactor) and dewatered sludge at 12% DS. Dewatered sludge volume is estimated at 0.7 m^3/day based on pre-thickened sludge feed at 3.0% DS (i.e., feed from SHTs) and dewatered sludge at 18% DS. The MBR option complemented with sludge dewatering could reduce the hauling and disposal quantities from a half to a third resulting in today's annual saving of up to approximately $90,000/year in sludge handling and disposal costs. The lower sludge production could reduce the number of sludge hauling days by up to five days annually compared to MBBR.
Effectiveness of Technology to Reduce Microplastics	The MBBR technology is not able to remove microplastics or emerging contaminants without further upgrades.	Research has demonstrated efficiency of the ultrafiltration membranes in removing microplastics with a minimum pore size of 0.1 microns. The Toray flat plate membranes proposed for the project have a nominal pore size of 0.08 microns. Also, various studies demonstrated coincidental removal of emerging contaminants, such as pharmaceuticals and endocrine disrupting substances (EDS), in the order of 60% to 70%.

Criterion	MBBR	MBR
Suitability of Technology for Reclaimed Water Use	Less suitable than the MBR process. The process would require addition of filtration and disinfection. This addition is not considered practical for the minimum gain that can be achieved. The facility classification will require upgrade to Level III. Also, the Ministry of Health should be added to the list of stakeholders.	Better suitable than the MBBR process. The process would require addition of disinfection. This addition may not be considered practical for the minimum gain that can be achieved. The facility classification will require upgrade to Level III. Also, the Ministry of Health should be added to the list of stakeholders.
Worker Safety	The process does not require confined space entry for regular maintenance. Submersible pumps will be installed with guide rails and lifting davits for servicing and/or replacement. Blowers will be located in the blower room above grade.	The process does not require confined space entry for regular maintenance. Submersible pumps will be installed with guide rails and lifting davits for servicing and/or replacement. Permeate pumps and blowers will be located in above grade. Membrane cassettes will also be installed with guide rails to facilitate membrane replacement anticipated to occur once over the facility life. Bringing crane to the site will be required for membrane replacement.

In comparison to conventional treatment technologies, the MBBR and MBR options have many advantages, such as: more compact design, smaller footprint, less visual impact, less site disturbance, process reliability, operational simplicity, and the lowest capital and life-cycle costs.

Further advantages of the MBR option in comparison to the MBBR option are: better effluent quality, a more compact design, smaller footprint, less visual impact, less site disturbance during construction, simpler configuration (i.e., no need for dual trains, secondary clarifiers, or additional sludge holding tanks), better process reliability, operational simplicity, more flexible sludge management, lower sludge production, the lowest capital cost, and comparable life-cycle cost to the MBBR option. Specific operational procedures that are MBR technology specific are not routine operational procedures and will be required only periodically.

Based on the foregoing and the above noted tangible benefits, the MBR technology is more advantageous over the MBBR option and is recommended as the treatment technology choice for the Schooner WWTP upgrade.

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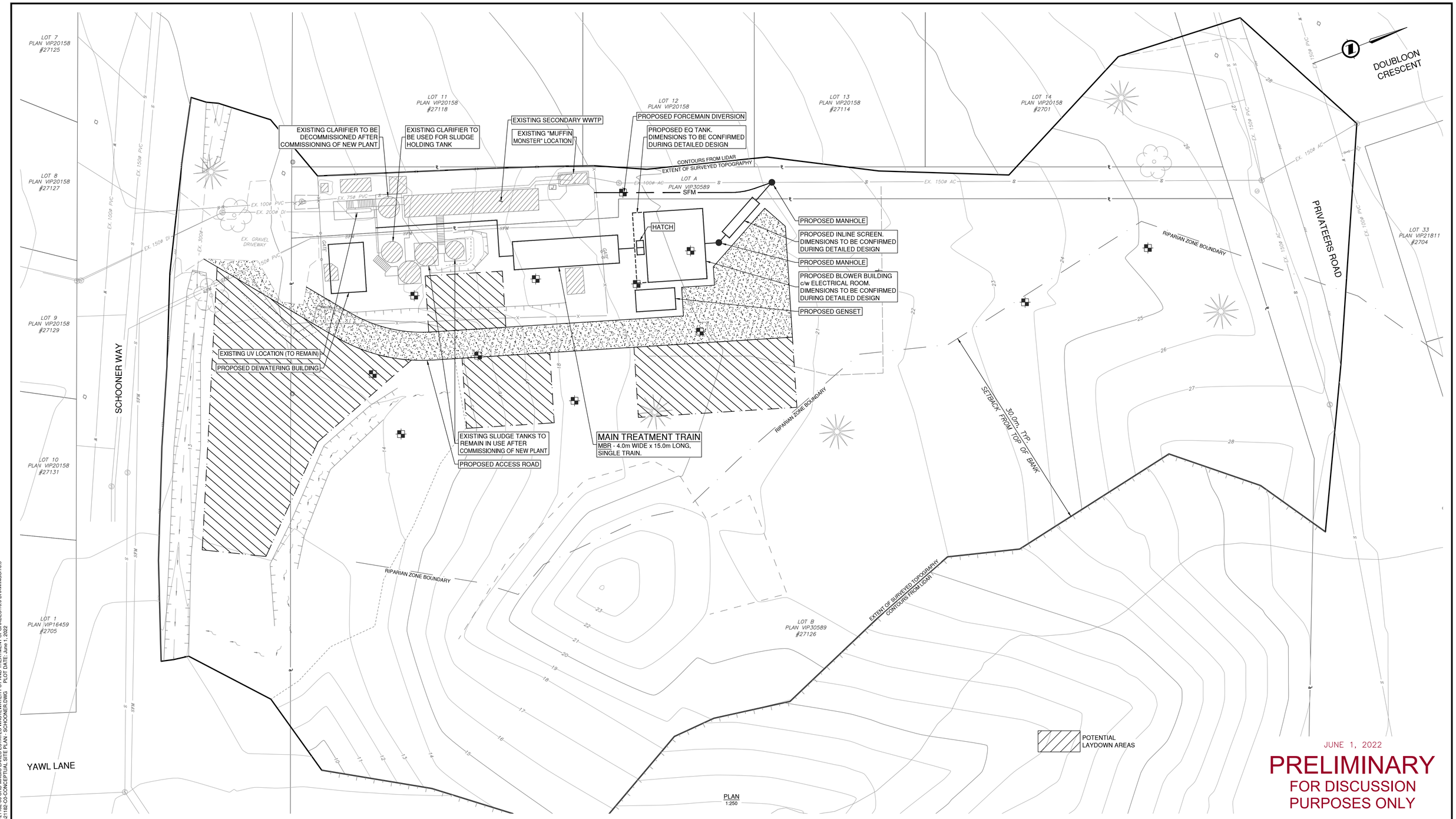
APPENDIX B



PLAN
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JUNE 1, 2022

PRELIMINARY

FOR DISCUSSION PURPOSES ONLY

SEAL	BY	DATE	No.	REVISION	ENG.	No.	DATE	ISSUE
						A	-	-

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Capital Regional District | Integrated Water Services

DESIGNED	HG	SURVEYED	-
DRAWN	MTK/GP	DATE	MARCH 2022
SCALE HORIZONTAL	1:250	CHECKED	-
SCALE VERTICAL	N/A	APPROVED	-

SCHOONER WASTEWATER TREATMENT FACILITY

CONCEPTUAL SITE LAYOUT

CONTRACT NUMBER	DRAWING NUMBER	ISSUE	SHT. No.
-	-	X	X OF X

X:\2021 CWN PROJECTS\2041.21 WD-00 ORD MAGIC LAKE ESTATES WASTEWATER PIST AND TREATMENT UPGRADES\10.0 DRAWINGS\10.3 ENGINEERING\10.3.2 SHEETS\21182-C0-CONCEPTUAL SITE PLAN - SCHOONER.DWG PLOT DATE: June 1, 2022

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APPENDIX C

Photos from Mill Bay WWTP Site Visit

Overview of Screening Area

Membrane Bio-reactor Tank

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APPENDIX C

Screen and Discharge Chute

Screen Sitting Inside Channel

View of Primary Aeration Tank
Pump Bldg

View of Sludge Tank and Permeate

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