Making a difference...together

MAGIC LAKE ESTATES WATER AND SEWER COMMITTEE
Notice of Meeting on **Tuesday, November 29, 2022 at 9:30 a.m.**
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)	J. Deschenes (Vice Chair)	P. Brent, Electoral Area Director
W. Foster	K. Heslop	D. Reed
R. Sullivan		

AGENDA

1. APPROVAL OF AGENDA

2. ADOPTION OF MINUTES 3

***Recommendation**: That the minutes of the September 13, 2022 meeting be adopted.*

3. CHAIR'S REMARKS

4. PRESENTATIONS/DELEGATIONS

The public are welcome to attend Committee 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. SENIOR MANAGER'S REPORT

6. COMMITTEE BUSINESS

6.1. 2023 Operating and Capital Budget 6

***Recommendation:** That the Magic Lake Estates Water and Sewer Committee:*

1. *Approve the 2023 operating and capital budget for the:*
   (a) *Magic Lake Estates Water System Local Service as presented and that the 2022 actual operating deficit be balanced on the 2022 Reserve Funds transfer (CRF and/or ORF); and*
   (b) *Magic Lake Estates Sewerage System Local Service as presented and that the 2022 actual operating surplus or deficit be balanced on the 2022 Reserve Funds transfer (CRF and/or ORF); and*
2. *Recommends that the Electoral Areas Committee recommend that the CRD Board approve the 2023 Operating and Capital Budget and the five-year Financial Plan for the Magic Lake Estates Water and Sewer Services as presented.*

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

IWSS-297445977-9839

Next Meeting: At the call of the Chair

Making a difference...together

MINUTES OF A MEETING OF THE Magic Lake Estates Water and Sewer Committee, held Tuesday, September 13, 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); K. Heslop (EP); R. Sullivan (EP); D. Reed

Staff: I. Jesney, Senior Manager, Infrastructure Engineering; J. Dales, Senior Manager, Wastewater Infrastructure Operations; M. Cowley, Manager, Wastewater Engineering and Planning; D. Robson, Manager, Saanich Peninsula and Gulf Islands Operations; M. Risvold, Committee and Administrative Clerk (recorder)

REGRETS: W. Foster; P. Brent, Acting Electoral Area Director

EP = Electronic Participation

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

1. APPROVAL OF AGENDA

MOVED by D. Reed, **SECONDED** by J. Deschenes,
That the agenda be approved.

CARRIED

2. ADOPTION OF MINUTES

MOVED by K. Heslop, **SECONDED** by J. Deschenes,
That the minutes of the June 14, 2022 meeting be adopted.

CARRIED

3. CHAIR'S REMARKS

The Chair had no remarks.

I. Jesney introduced J. Dales, Acting Senior Manager, Wastewater Infrastructure Operations to the committee.

4. PRESENTATIONS/DELEGATIONS

There were none.

5. COMMITTEE BUSINESS

5.1. Project and Operations Update

Staff provided updates on water capital projects and operations.

Staff advised funding has been identified for project 22-03 Process Pipe Replacement, and the item will be removed from the capital budget until it is required.

Staff provided updates on wastewater capital projects and operations.

Staff provided photos of the road restoration that has taken place. The following documents are on file and available upon request:

- Pre-Construction Photos Showing Typical Road Condition
- Typical Trench Excavation Along Road Shoulder
- Backfilling of Trench – Re-instatement of New Gravel Shoulder
- Pavement Restoration of Driveways and Road Crossings

Staff responded to questions from the committee and the following was noted:

- Staff would like to use local contractors to assist a general contractor for the Wastewater Improvements – Pump Station and Treatment Plant Upgrades, and there will be a public tender for anyone to bid on.
- McElhanney's design is based on a full build-out of the area. The water treatment residue would be treated and filtered the same way as sewage, and the sludge will be taken off island in a liquid or cake form.
- The odours and noise will not exceed the current levels.
- The CRD would not support secondary suites if it has a negative impact on the capacity of the system, and can revisit later depending on growth patterns.
- Staff will transfer project 22-01 EV Charging Station for Magic Lake Estates Sewer to Magic Lake Estates Water. The project is part of a CRD climate action and carbon reduction program.

6. CORRESPONDENCE

The Chair provided correspondence from the Chair of the Pender Island Parks and Recreation Commission regarding a Dog Park Proposal for Ketch Road.

Discussion ensued regarding:

- Location
- Liability
- Funding
- Parking
- Exposed pipe
- Zoning

The committee advised they do not wish to fund the project but are willing to have a discussion. The Chair will respond to the letter. There was no direction for staff at this time.

7. NEW BUSINESS

Staff responded to a question from the committee regarding the election process due to the elimination of annual general meetings (AGM's). Staff advised that committee vacancies have been posted on the CRD website, locally in the Magic Lake Estates community and published in the Pender Post. The Electoral Area Director will recommend individuals to the CRD Board for appointment to the Committee.

Staff advised the committee of a cyanobacteria bloom in both Buck Lake and Magic Lake. Water Quality has suggested pre-oxidation as part of the treatment process in advance of the Dissolved Air Flotation (DAF) plant. The process deals with the iron and manganese that exist within the raw water supply. As a result of this process, it has a negative effect on the cyanobacteria cells. Implications could include brown water which is iron that is not removed and developing within the distribution system. The colour of water will be monitored closely within the system. In the event of water discolouration, a notice will be issued indicating the aesthetic issue and advising it is not a health and safety concern. Water samples will be taken weekly.

8. ADJOURNMENT

MOVED by D. Reed, **SECONDED** by J. Deschenes,
That the September 13, 2022 meeting be adjourned at 11 am.

CARRIED

_____
CHAIR

_____
SECRETARY

Making a difference...together

REPORT TO MAGIC LAKE ESTATES WATER AND SEWER COMMITTEE
TUESDAY, NOVEMBER 29, 2022

SUBJECT **MAGIC LAKE ESTATES WATER AND SEWER SERVICE 2023 OPERATING AND CAPITAL BUDGET**

ISSUE SUMMARY

To present the 2023 Operating and Capital Budget for Committee approval pursuant to Bylaw No. 2339 "Magic Lake Estates Water and Sewer Committee Bylaw 1995".

BACKGROUND

The Capital Regional District (CRD) is required by legislation under the *Local Government Act* (LGA) to prepare an annual Operating and Capital budget and a five-year Financial Plan. CRD staff have, therefore, prepared the financial plans for the following services:

- Magic Lake Estates Water System Local Service (Appendix A)
- Magic Lake Estates Sewerage System Local Service (Appendix B)

The Operating Budgets include the regular annual costs to operate the service. The Capital Expenditure Plan shows the anticipated expenditures for capital additions. These may include purchases of new assets or infrastructure upgrades, improvements to existing assets or asset review and study work potentially leading to future capital improvements.

In preparing the Operating Budget, CRD staff considered:

- Actual expenditures incurred between 2020 and 2022
- Anticipated changes in level of service (if any)
- Maximum allowable tax requisition
- Annual cost per taxpayer and per single family equivalent (SFE)

In preparing the Capital Expenditure Plan, CRD staff considered:

- Available funds on hand
- Projects in progress
- Condition of existing assets and infrastructure
- Regulatory, environmental and health and safety factors

Adjustments for surpluses or deficits from 2022 may be made in January 2023. The CRD Board will give final approval to the budget and financial plan in March 2023.

The Financial Plan for the years 2024 – 2027 may be changed in future years.

BUDGET OVERVIEW

Magic Lake Estates Water System Local Service (Appendix A)

Operating Budget

It is projected that the 2022 operating expenses will be approximately $33,240 over budget. Factors contributing to the operating overage include emergency response and corrective maintenance primarily due to the following events:

- Water Treatment Plant:
  - Air saturator system equipment troubleshooting
  - Air blower system troubleshooting and control modifications
  - Emergency safety lighting repairs
  - Replacement of backwash flow meter equipment
  - Replacement of Dissolved Air Flotation (DAF) train 2 skimmer gearbox equipment
- Service line leak repairs:
  - Yardarm Road
  - Frigate Road
- Captains Reservoir (Tank) structural roof assessment to address safety concerns so that preventative maintenance tasks can be completed
- Unplanned SCADA system software upgrade to address the risk of continued reliable operation.

These events resulted in additional labour and materials/services costs that go beyond operating budget contingencies.

It is projected that the 2022 operating revenue will be $4,374 lower than budget mainly due to projected lower water sales revenue partially offset by higher user charge revenue due to additional water service connection requests.

This results in an overall estimated operating deficit of $37,614. To balance the operating budget, it is proposed that the 2022 transfer to the Capital Reserve Fund (CRF) be reduced by $22,390 and that there be a recovery from the Operating Reserve Fund (ORF) of $15,224 as revenue to cover the remaining deficit in 2022. This reduced reserve fund transfer and recovery from reserve fund result in a deficiency within the reserve funding target levels, which might require replenishment in 2023 and future years' planning. Otherwise, the resulting deficiency in 2022 must immediately be included as an expenditure to be recovered from revenue in 2023 financial plan as required by *Local Government Act Section* 374(11).

The 2023 over 2022 operating costs (excluding 2023 one-time non-cyclical program funded by ORF to obtain a Statutory Right of Way over private property for the operation of the Magic Lake North Dam) has been increased by $32,161 (4.8%). The increase is primarily to account for inflation and increased labour charges.

Increased labour charges are a result of the addition of a dedicated 'on-island' Manager of Operations that will be based on Salt Spring Island and have operational oversight of all CRD local services on Salt Spring Island and Southern Gulf Islands. The total labour cost for this position will be cost shared among 14 local utility services on SSI and SGI.

The primary drivers for this role are to address regulatory requirements, workload management, capital project coordination and integration and to provide additional oversight and support to worker health and safety.

Municipal Finance Authority (MFA) Debt

Loan Authorization Bylaw 3633 (LA3633) was approved and adopted in 2009 to borrow $2,560,000 to upgrade water treatment and water systems. Table 1 below summarizes the detailed information for existing MFA debt issue related to LA3633.

Table 1 – Existing Debt Summary

MFA Issues	*Term*	*Borrowing Year*	*Retirement Year*	*Refinance Year*	*Original Interest Rate*	*Current Interest Rate*	*Principal*	*Principal Payment*	*Interest Payment*	*Total Annual Debt Cost*
LA3633-110	15	2010	2025	2020	4.50%	1.28%	$723,000	$38,812	$9,254	$48,066
LA3633-116	15	2011	2026	2021	4.20%	1.47%	$250,000	$13,420	$3,675	$17,095
LA3633-121	15	2012	2027	2022	2.90%	3.39%	$559,500	$30,035	$18,967	$49,002
LA3633-124	15	2013	2028	2023	3.15%	3.15%	$1,002,500	$50,066	$31,579	$81,645
LA3633-126	15	2013	2028	2023	3.85%	3.85%	$25,000	$1,249	$964	$2,213
Total							**$2,560,000**	**$133,582**	**$64,439**	**$198,021**

Operating Reserve Fund

The Operating Reserve Fund is used to undertake cyclical maintenance activities that typically do not occur on an annual basis. Typical maintenance activities include hydrant/standpipe maintenance, reservoir cleaning and inspection. The operating reserve also funds the procurement of equipment and supplies that are not purchased on an annual basis. Additionally, the operating reserve could be used for emergency unplanned repairs.

It is proposed that transfers to the operating reserve fund be set at $10,000 in 2023 to ensure future maintenance activities are fully funded and an optimal reserve balance be maintained. There is $50,000 of cyclical maintenance planned over the next five years that will be funded from this reserve.

The operating reserve balance at the end of 2022 is projected to be $55,162.

Capital Reserve Fund

The Capital Reserve Fund is used to pay for capital expenditures that are not funded by other sources such as grants, operating budget, or debt.

It is proposed that the budgeted transfer to the CRF be set at $82,415 in 2023. Reserve fund transfer planning is influenced by funding requirements to support the five-year capital expenditure plan, the emergency response to infrastructure failures and guided by *Capital Reserve Funding Guidelines* endorsed by the CRD Board in aiming to achieve the optimal reserve fund level to ensure long-term prudent and sustainable management of service delivery objectives through capital investments.

The capital reserve fund balance at the end of 2022 is projected to be $567,913.
There is a separate reserve fund from the insurance settlement of $592,842 in 2021, which is dedicated to fund the Water Treatment Plant Upgrades in the future. This balance at the end of 2022 is projected to be $605,753.

Capital Expenditure Plan

The 5-year plan includes $597,000 of expenditures to be funded by a combination of capital on hand, grants, and the service's CRF.

Proposed 2023 capital expenditures include Phase 1 of Buck Lake Dam Repairs (21-04) and construction of an Electric Vehicle Charging Station (22-02).

Other future planned works include Decommissioning the Magic Lake Old Syphon (23-01), ISOPAC Permanent Handling and Storage (23-02), and Buck Lake Dam Repairs (26-01), all funded by CRF. The Design and Construction of Buck Lake and Magic Lake Adjustable Intakes (21-02) was started in 2021 and has been carried forward into 2023 funded by capital on hand.

Capital Projects Fund

As specific capital projects are approved, the funding revenues for them are transferred into the capital project fund from multiple funding sources if applicable, including CRF, grant funding, external contributions, and debt. Any funds remaining upon completion of a project are transferred back to the CRF for use on future capital projects or its original non-CRF funding sources if required.

User Charge and Parcel Tax

The service is funded by fixed user charges, parcel taxes, and variable water consumption charges. Properties connected to the water system pay the annual user charge and water consumption and all properties within the local service area are responsible for the parcel tax. The tiered water consumption rates remain unchanged from 2022.

Table 3 below summarizes the 2023 over 2022 changes for parcel tax and user charge.

Table 3 – Parcel Tax and User Charge Summary

Budget Year	*Parcel Tax*	*Taxable Folios Numbers*	*Parcel Tax per Folio**	*User Charge*	*SFE Numbers*	*User Charge per SFE*	*Parcel Tax & User Charge*
2022	$579,148	1,199	$508.38	$351,288	1,050	$334.56	**$842.94**
2023	$580,000	1,196	$510.41	$377,411	1,059	$356.38	**$866.79**
Change ($)	$852	-3	$2.03	$26,123	9	$21.82	**$23.85**
Change (%)	0.15%	-0.25%	0.40%	7.44%	0.86%	6.52%	**2.83%**

* Includes the 5.25% admin fee charged by the Ministry of Finance (not CRD revenue)

Magic Lake Estates Sewerage System Local Service (Appendix B)

Operating Budget

It is projected that the 2022 operating expenses will be approximately $47,805 over budget. Factors contributing to the projected overage include emergency response and corrective maintenance primarily due to the following events:

- Schooner Wastewater Treatment Plant
    - Replacement of damaged valves due to freezing during December/January cold weather event; installation of freeze protection equipment
    - Replacement of air blower variable frequency drive equipment
    - Replacement of influent sewage grinder electrical motor
    - Replacement of Return Activated Sludge (RAS) pump #2
    - Replacement of laboratory oven and vacuum pump
- Schooner Sewer Lift Station mechanical check valve removal and repair
- Sewer lateral repairs for Pirates Road
- Chart Drive Lift Station pump and pump check valve removal and replacement
- Sewer collection system backup near Schooner Way

It is projected that the 2022 operating revenue will be approximately $1,216 over budget primarily due to additional user charge revenue as a result of three new property sewer connections.

These results in an overall operating deficit of approximately $46,589. To balance the operating budget, it is proposed that the 2022 transfer to the Capital Reserve Fund be reduced by the deficit amount. This reduced reserve fund transfer results in a deficiency within the reserve funding target levels, which might require replenishment in 2023 and future years' planning. Otherwise, the resulting deficiency in 2022 must immediately be included as an expenditure to be recovered from revenue in 2023 financial plan as required by *Local Government Act Section* 374(11).

The 2023 over 2022 operating costs (excluding 2022 one-time cyclical program funded by ORF for outfall inspection and Schooner WWTP maintenance) has been increased by $27,474 (4.6%). The increase is primarily to account for inflation and increased labour charges.

Increased labour charges are a result of the addition of a dedicated 'on-island' Manager of Operations that will be based on Salt Spring Island and have operational oversight of all CRD local services on Salt Spring Island and Southern Gulf Islands. The total labour cost for this position will be cost shared among 14 local utility services on SSI and SGI. The primary drivers for this role are to address regulatory requirements, workload management, capital project coordination and integration and to provide additional oversight and support to worker health and safety.

Municipal Finance Authority Debt

Loan Authorization Bylaw 4048 (LA4048) to borrow $1,530,000 was approved and adopted in 2016 for wastewater system renewal and upgrade. Table 3 below summarizes the detailed information for existing MFA debt issues related to LA4048.

Table 3 – Existing Debt Summary (applicable to all Properties in the service area)

MFA Issues	*Term*	*Borrowing Year*	*Retirement Year*	*Refinance Year*	*Interest Rate*	*Principal*	*Principal Payment*	*Interest Payment*	*Total Annual Debt Cost*
LA4048-139	10	2016	2026	NA	2.10%	$745,000	$64,987	$15,645	$80,632
LA4048-142	10	2017	2027	NA	3.15%	$250,000	$21,808	$7,875	$29,683
LA4048-146	10	2018	2028	NA	3.20%	$535,000	$46,668	$17,120	$63,788
Total						**$1,530,000**	**$133,463**	**$40,640**	**$174,103**

Loan Authorization Bylaw 4320 (LA4320) to borrow up to $6,000,000 was approved and adopted in 2019 for Wastewater Treatment Plant Improvements. One-time lump-sum special payment option was provided to the ratepayers and 137 properties exercised the payment option. As the result, $1,130,268 was collected from lump-sum payments. In 2021, total of $3,760,000 was borrowed through two debt issuances, LA4320-153 in the spring and LA4320-156 in the fall, and another $1,000,000 was borrowed through LA4320-157 in the spring of 2022 to finance the Wastewater Treatment Plant Improvements project. Only the properties that didn't exercise the one-time lump sum payment option will pay the debt servicing cost related to LA4320 for the debt term of 30 years.

Table 4 below summarizes the detailed information for existing MFA debt issues related to LA4320.

Table 4 – Existing Debt Summary (only applicable to properties no one-time payment received)

MFA Issues	*Term*	*Borrowing Year*	*Retirement Year*	*Refinance Year*	*Interest Rate*	*Principal*	*Principal Payment*	*Interest Payment*	*Total Annual Debt Cost*
LA4320-153	30	Spring 2021	2051	2031	2.41%	$2,500,000	$59,248	$60,250	**$119,498**
LA4320-156	30	Fall 2021	2051	2031	1.98%	$1,260,000	$29,861	$24,948	**$54,809**
LA4320-157	30	Spring 2022	2052	2032	3.36%	$1,000,000	$22,778	$33,600	**$56,378**
Total						**$4,760,000**	**$111,887**	**$118,798**	**$230,685**

Operating Reserve Fund

The Operating Reserve Fund is used to undertake cyclical maintenance activities that typically do not occur on an annual basis. Typical maintenance activities include treatment facility tank draining/cleaning/inspection and outfall inspections. The operating reserve also funds the procurement of equipment and supplies that are not purchased on an annual basis. Additionally, the operating reserve could be used for emergency unplanned repairs.

It is proposed that the 2023 transfer to the Operating Reserve Fund be set at $13,260 to ensure future maintenance activities are fully funded and an optimal reserve fund balance be maintained. There is $55,000 of cyclical maintenance planned over the next five years that will be funded from this reserve.

The Operating Reserve Fund balance at the end of 2022 is projected to be approximately 22,635.

Capital Reserve Fund

The Capital Reserve Fund is to be used to pay for capital expenditures that are not funded by other sources such as grants, operating budget, or debt.

It is proposed that the budgeted transfer to the CRF be set at $55,735 in 2023. Reserve fund transfer planning is influenced by funding requirements to support the five-year capital expenditure plan, the emergency response to infrastructure failures and guided by *Capital Reserve Funding Guidelines* endorsed by the CRD Board in aiming to achieve the optimal reserve fund level to ensure long-term prudent and sustainable management of service delivery objectives through capital investments.

The capital reserve balance at the end of 2022 is projected to be approximately $360,338.

Capital Expenditure Plan

The 5-year plan includes $8,660,000 of expenditures. In 2023, $6,230,000 in expenditures are forecasted to be funded by a combination of the service's debt (indicated as capital on hand after debt borrowed in 2021 and 2022) and new grant funding as announced by the Province in August of 2021. The existing debt, which was displayed in Table 4 above, will fund replacement sewers, and the local ratepayer share of the grant will fund the upgrading of six pumpstations, installing a new pumpstation at Cannon to replace Cannon Wastewater Treatment Plant, and upgrading the Schooner Wastewater Treatment Plant to treat flow from Cannon and renew many components to bring the wastewater system into compliance with environmental regulations.

Capital Projects Fund

As specific capital projects are approved, the funding revenues for them are transferred into the Capital Project Fund from multiple funding sources if applicable, including CRF, grant funding, external contributions, and debt. Any funds remaining upon completion of a project are transferred back to the CRF for use on future capital projects or its original non-CRF funding sources if required.

User Charge and Parcel Tax

The service is mainly funded by user charge and parcel tax. Properties connected to the wastewater system pay the annual user charge and all properties within the local service area are responsible for the parcel tax. Table 6 below summarizes the 2023 over 2022 changes for parcel tax and user charge.

Table 6 – Parcel Tax 1 and User Charge Summary

Budget Year	Parcel Tax 1	Taxable Folios Numbers	Parcel Tax per Folio*	User Charge	SFE Numbers	User Charge per SFE	Parcel Tax & User Charge
2022	$586,010	712	$866.26	$259,320	639	$405.70	**$1,271.96**
2023	$586,010	709	$869.92	$267,099	642	$416.04	**$1,285.96**
Change ($)	$0	-3	$3.66	$7,779	3	$10.34	**$14.00**
Change (%)	0.00%	-0.42%	0.42%	3.00%	0.47%	2.55%	**1.10%**

* Includes the 5.25% admin fee charged by the Ministry of Finance (not CRD revenue)

In 2020 property owners were provided the option of paying a one-time lump sum of $8,249.30 for their share of the cost of the Wastewater Treatment Plant Upgrade or to pay debt servicing costs over 30 years through parcel tax. The new debt servicing cost must be budgeted and levied separately through a second parcel tax roll (Parcel Tax 2) in order to facilitate a parcel tax only levied to those taxable folios that did not pay the lump-sum.

The estimated parcel tax on the second parcel roll (Parcel Tax 2) related to the debt servicing cost is displayed in Table 7 below.

Table 7 – Parcel Tax 2 Summary – New Debt Only

Budget Year	Parcel Tax 2	Taxable Folios Numbers	Parcel Tax per Folio*
2022	$211,616	575	**$387.35**
2023	$230,255	573	**$422.94**
Change ($)	$18,639	-2	**$35.59**
Change (%)	8.81%	-0.35%	**9.19%**

* Includes the 5.25% admin fee charged by the Ministry of Finance (not CRD revenue)

Parcel Tax 2 excludes 137 folios that elected to pay one-time lump sums totaling $1,130,268.

A summary of total parcel tax (1 and 2) and user charge arranged by payment option on new debt is displayed in table 8 below.

Table 8 – Comparative - Total Parcel Tax and User Charge per Folio by Payment Option

Parcel Tax and User Charge	2022	2023 Lump-sum option			2023 Debt-servicing option		
		Amount	Change ($)	Change (%)	Amount	Change ($)	Change (%)
Parcel Tax 1	$866.26	$869.92	$3.66	0.42%	$869.92	$3.66	0.42%
Parcel Tax 2	$387.35				$422.94	$35.59	9.19%
User Charge	$405.70	$416.04	$10.34	2.55%	$416.04	$10.34	2.55%
Total	**$1,659.31**	**$1,285.96**	**$14.00**	**1.10%**	**$1,708.90**	**$49.59**	**2.99%**

RECOMMENDATION

That the Magic Lake Estates Water and Sewer Committee:

1. Approve the 2023 operating and capital budget for the:
   (a) Magic Lake Estates Water System Local Service as presented and that the 2022 actual operating deficit be balanced on the 2022 Reserve Funds transfer (CRF and/or ORF); and
   (b) Magic Lake Estates Sewerage System Local Service as presented and that the 2022 actual operating surplus or deficit be balanced on the 2022 Reserve Funds transfer (CRF and/or ORF); and

2. Recommends that the Electoral Areas Committee recommend that the CRD Board approve the 2023 Operating and Capital Budget and the five-year Financial Plan for the Magic Lake Estates Water and Sewer Services as presented.

Submitted by:	Jason Dales, B.Sc., WD IV, Senior Manager, Wastewater Infrastructure Operations
Submitted by:	Rianna Lachance, B.Com, CPA, CA, Senior Manager, Financial Services
Concurrence:	Ian Jesney, P.Eng., Acting General Manager, Integrated Water Services
Concurrence:	Ted Robbins, B.Sc., C.Tech., Chief Administrative Officer

ATTACHMENTS:

Appendix A: 2023 Magic Lake Estates Water Operating and Capital Budget
Appendix B: 2023 Magic Lake Estates Sewer Operating and Capital Budget

CAPITAL REGIONAL DISTRICT

2023 Budget

Magic Lake Water

Commission Review

NOVEMBER 2022

15

APPENDIX A

Service: 2.630 Magic Lake Estates Water **Committee:** Electoral Area

DEFINITION:

LSA -1 To provide and operate water supply and distribution facilities for the Magic Lake Estates Water System. Specified Area on North Pender Island. Bylaw No. 1874 (June 11, 1991).

PARTICIPATION:

Local Service Area # 1 - D(764) LSA #9.

MAXIMUM LEVY:

Greater of $160,000 or $3.50 / $1,000 of actual assessed value of land and improvements. To a maximum of $2,649,600.

MAXIMUM CAPITAL DEBT:

AUTHORIZED:	LA Bylaw No. 3633 (Nov 2009).	$	2,560,000
BORROWED:	SI Bylaw 3677 (Feb 2010).	$	(723,000)
BORROWED:	SI Bylaw 3769 (Feb 2011).	$	(250,000)
BORROWED:	SI Bylaw 3850 (Aug 2012).	$	(559,500)
BORROWED:	SI Bylaw 3882 (Apr 2013).	$	(1,002,500)
BORROWED:	SI Bylaw 3910 (July 2013).	$	(25,000)
REMAINING AUTHORIZATION:		$	0

COMMITTEE:

Magic Lake Estates Water & Sewer Committee established by Bylaw No. 1870 (November 28, 1990).

FUNDING:

Any deficiencies after user charge and/or frontage tax or parcel tax to be levied on taxable school assessments.

User Charge: Annual charge per single family equivalency unit connected to the system.
The consumption charge for water will be the total volume of water metered to the water service connections, measured in cubic meters at the following rate:

- Greater than 50 cubic metres - $0.50 / cubic metre
- Greater than 80 cubic metres - $1.00 / cubic metre

Parcel Tax: LSA-1 Annual charge only on properties capable of being connected to the system.

Turn on/Turn Off Fee: $0 during normal working hours; $25 outside of normal working hours

Connection Charges: Actual Engineering and Construction costs, plus 15% Administration costs. The minimum charge is $500

RESERVE FUND:

Magic Lake Estates - Water System Capital Reserve Fund. Bylaw No. 1498
Magic Lake Estates - Water System Operating Reserve Fund. Bylaw No. 4144

15

16

APPENDIX A

2.630 - Magic Lake Water	2022 BOARD BUDGET	2022 ESTIMATED ACTUAL	BUDGET REQUEST 2023 CORE BUDGET	BUDGET REQUEST 2023 ONGOING	BUDGET REQUEST 2023 ONE-TIME	BUDGET REQUEST 2023 TOTAL	FUTURE PROJECTIONS 2024	FUTURE PROJECTIONS 2025	FUTURE PROJECTIONS 2026	FUTURE PROJECTIONS 2027
OPERATING COSTS										
Repairs & Maintenance	31,520	30,350	32,470	-	-	32,470	33,120	33,770	74,430	35,130
Allocations	54,332	54,332	54,398	-	-	54,398	55,480	56,588	57,720	58,878
Water Testing	19,550	17,500	19,941	-	-	19,941	20,340	20,747	21,162	21,585
Electricity	49,610	49,700	51,100	-	-	51,100	52,120	53,160	54,220	55,300
Supplies	55,520	55,880	57,180	-	-	57,180	58,320	59,490	60,690	61,900
Labour Charges	402,400	435,630	402,780	26,140	-	428,920	450,830	459,840	469,030	478,410
Other Operating Expenses	53,752	56,532	54,836	-	10,000	64,836	56,150	57,510	58,920	60,360
TOTAL OPERATING COSTS	**666,684**	**699,924**	**672,705**	**26,140**	**10,000**	**708,845**	**726,360**	**741,105**	**796,172**	**771,563**
*Percentage Increase over prior year			0.9%	3.9%	1.5%	6.3%	2.5%	2.0%	7.4%	-3.1%
DEBT / RESERVES										
Transfer to Operating Reserve Fund	10,000	10,000	10,000	-	-	10,000	10,000	10,000	15,000	20,000
Transfer to Capital Reserve Fund	92,390	70,000	82,415	-	-	82,415	74,065	83,541	128,700	143,928
MFA Debt Reserve Fund	670	670	570	-	-	570	570	570	570	570
MFA Debt Principal	131,489	131,489	133,582	-	-	133,582	133,582	133,582	94,770	81,350
MFA Debt Interest	61,697	61,697	64,439	-	-	64,439	64,439	59,812	53,348	51,509
TOTAL DEBT / RESERVES	**296,246**	**273,856**	**291,006**	**-**	**-**	**291,006**	**282,656**	**287,505**	**292,388**	**297,357**
TOTAL COSTS	**962,930**	**973,780**	**963,711**	**26,140**	**10,000**	**999,851**	**1,009,016**	**1,028,610**	**1,088,560**	**1,068,920**
FUNDING SOURCES (REVENUE)										
Transfer from Operating Reserve Fund	-	(15,224)	-	-	(10,000)	(10,000)	-	-	(40,000)	-
Sales - Water	(22,000)	(15,000)	(22,000)	-	-	(22,000)	(22,000)	(22,000)	(22,000)	(22,000)
User Charges	(351,288)	(354,300)	(351,271)	(26,140)	-	(377,411)	(384,946)	(392,680)	(400,530)	(408,540)
Lease Revenue	(8,100)	(7,714)	(8,100)	-	-	(8,100)	(8,100)	(8,100)	(8,100)	(8,100)
Other Revenue	(2,394)	(2,394)	(2,340)	-	-	(2,340)	(2,370)	(2,400)	(2,430)	(2,470)
TOTAL REVENUE	**(383,782)**	**(394,632)**	**(383,711)**	**(26,140)**	**(10,000)**	**(419,851)**	**(417,416)**	**(425,180)**	**(473,060)**	**(441,110)**
REQUISITION - PARCEL TAX	**(579,148)**	**(579,148)**	**(580,000)**	**-**	**-**	**(580,000)**	**(591,600)**	**(603,430)**	**(615,500)**	**(627,810)**
*Percentage increase over prior year										
Sales - Water			0.0%			0.0%	0.0%	0.0%	0.0%	0.0%
User Fees			0.0%	7.4%		7.4%	2.0%	2.0%	2.0%	2.0%
Requisition			0.1%			0.1%	2.0%	2.0%	2.0%	2.0%
Combined			**0.1%**	**2.7%**		**2.8%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**

16

17

APPENDIX A

Magic Lake Water
Reserve Summary Schedule
2023 - 2027 Financial Plan

Reserve/Fund Summary

	Estimated	Budget				
	2022	2023	2024	2025	2026	2027
Operating Reserve Fund	55,162	55,162	65,162	75,162	50,162	70,162
Capital Reserve Fund	567,913	620,328	554,393	615,934	599,634	668,562
Capital Reserve Fund - Settlement Funds	605,753	605,753	605,753	605,753	605,753	605,753
Total	**1,228,828**	**1,281,243**	**1,225,308**	**1,296,849**	**1,255,549**	**1,344,477**

17

APPENDIX A

Reserve Schedule

Reserve Fund: 2.630 Magic Lakes Estate Water - Operating Reserve Fund - Bylaw 4144

Reserve fund used for: unforeseen operational repairs and maintenance; infrequent maintenance activities such as reservoir cleaning and inspection, hydrant maintenance etc.

Reserve Cash Flow

Fund:	1500	Estimated	Budget				
Fund Centre:	105212	2022	2023	2024	2025	2026	2027
Beginning Balance		59,516	55,162	55,162	65,162	75,162	50,162
Transfer from Ops Budget		10,000	10,000	10,000	10,000	15,000	20,000
Transfer to Ops Budget		-	(10,000)	-	-	(40,000)	-
Planned Maintenance Activity			Acquire SRW over MLE North Dam			Frigate and Captains Reservoir cleaning & inspection	
Deficit Recovery		(15,224)					
Interest Income*		870					
Ending Balance $		**55,162**	**55,162**	**65,162**	**75,162**	**50,162**	**70,162**

Assumptions/Background:

* Interest is included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

APPENDIX A

Reserve Schedule

Reserve Fund: 2.630 Magic Lakes Estate Water - Capital Reserve Fund

Bylaw 1498

Reserve Cash Flow

Fund:	1024	Estimated	Budget				
Fund Centre:	101368	2022	2023	2024	2025	2026	2027
Beginning Balance		548,938	567,913	620,328	554,393	615,934	599,634
Transfer from Ops Budget		70,000	82,415	74,065	83,541	128,700	143,928
Transfer to Cap Fund		(90,000)	(30,000)	(140,000)	(22,000)	(145,000)	(75,000)
Transfer from Cap Fund		27,838	-	-	-	-	-
Interest Income*		11,137					
Ending Balance $		**567,913**	**620,328**	**554,393**	**615,934**	**599,634**	**668,562**

Assumptions/Background:

* Interest is included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

APPENDIX A

Reserve Schedule

Reserve Fund: 2.630 Magic Lakes Estate Water - Capital Reserve Fund (Settlement Funds)

Bylaw 1498

Reserve Cash Flow

Fund:	1024	Estimated	Budget				
Fund Centre:	102245	2022	2023	2024	2025	2026	2027
Beginning Balance		602,977	605,753	605,753	605,753	605,753	605,753
Settlement Funds		-	-	-	-	-	-
Transfer to Cap Fund		-					
Interest Income*		2,775					
Ending Balance $		**605,753**	**605,753**	**605,753**	**605,753**	**605,753**	**605,753**

Assumptions/Background:

* Interest is included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

21

APPENDIX A

CAPITAL REGIONAL DISTRICT

FIVE YEAR CAPITAL EXPENDITURE PLAN SUMMARY - 2023 to 2027

Service No. 2.630 Magic Lake Estates Water (Pender)	Carry Forward from 2022	2023	2024	2025	2026	2027	TOTAL
EXPENDITURE							
Buildings	$0	$0	$0	$0	$0	$0	$0
Equipment	$185,000	$190,000	$0	$0	$0	$0	$190,000
Land	$0	$0	$0	$0	$0	$0	$0
Engineered Structures	$0	$25,000	$140,000	$22,000	$145,000	$75,000	$407,000
Vehicles	$0	$0	$0	$0	$0	$0	$0
	$185,000	**$215,000**	**$140,000**	**$22,000**	**$145,000**	**$75,000**	**$597,000**
SOURCE OF FUNDS							
Capital Funds on Hand	$180,000	$180,000	$0	$0	$0	$0	$180,000
Debenture Debt (New Debt Only)	$0	$0	$0	$0	$0	$0	$0
Equipment Replacement Fund	$0	$0	$0	$0	$0	$0	$0
Grants (Federal, Provincial)	$2,500	$5,000	$0	$0	$0	$0	$5,000
Donations / Third Party Funding	$0	$0	$0	$0	$0	$0	$0
Reserve Fund	$2,500	$30,000	$140,000	$22,000	$145,000	$75,000	$412,000
	$185,000	**$215,000**	**$140,000**	**$22,000**	**$145,000**	**$75,000**	**$597,000**

21

22

APPENDIX A

CAPITAL REGIONAL DISTRICT
5 YEAR CAPITAL PLAN
2023 - 2027

Project Number
Project number format is "yy-##"
"yy" is the last two digits of the year the project is planned to start.
"##" is a numberical value. For example, 23-01 is a project planned to start in 2023.

For projects in previous capital plans, use the same project numbers previously assigned.

Capital Expenditure Type
Study - Expenditure for feasibility and business case report.
New - Expenditure for new asset only
Renewal - Expenditure upgrades an existing asset and extends the service ability or enhances technology in delivering that service
Replacement - Expenditure replaces an existing asset

Capital Project Title
Input title of project. For example "Asset Name - Roof Replacement", "Main Water Pipe Replacement".

Capital Project Description
Briefly describe project scope and service benefits.
For example: *"Full Roof Replacement of a 40 year old roof above the swimming pool area; The new roofing system is built current energy standards, designed to minimize maintenance and have an expected service life of 35 years".*

Total Project Budget
Provide the total project budget, even if it extends beyond the 5 years of this capital plan.

Asset Class
L - Land
S - Engineering Structure
B - Buildings
V - Vehicles

Funding Source Codes
Debt = Debenture Debt (new debt only)
ERF = Equipment Replacement Fund
Grant = Grants (Federal, Provincial)
Cap = Capital Funds on Hand
Other = Donations / Third Party Funding
Res = Reserve Fund
STLoan = Short Term Loans
WU - Water Utility
If there is more than one funding source, use additional rows for the project.

Carryforward from 2022
Input the carryforward amount from the 2022 capital plan that is remaining to be spent Forecast this spending in 2023 to 2027.

Project Drivers
Maintain Level of Service = Project maintains existing or improved level of service.
Advance Board or Corporate Priority = Project is a Board or Corporate priority.
Emergency = Project is required for health or safety reasons.
Cost Benefit = Economic benefit to the organization.
Other = Project is not driven by one of the other options provided.

Long-term Planning
Master Plan / Servicing Plan = Plan that identifies new assets required to meet future needs.
Asset Management Plan / Sustainable Service Delivery Plan = Integrated plan that identifies asset replacements based on level of service, criticality, condition, risk, replacement costs as well as external impacts.
Replacement Plan = Plan that identifies asset replacements based primarily on asset age or asset material/type.
Condition Assessment = Assessment that identifies asset replacements based on asset condition.

Cost Estimate Class
Class A (±10-15%) = Estimate based on final drawings and specifications; used to evaluate tenders.
Class B (±15-25%) = Estimate based on investigations, studies or preliminmary design; used for budget planning.
Class C (±25-40%) = Estimate based on limited site information; used for program planning.
Class D (±50%) = Estimate based on little/no site information; used for long-term planning.

Service #: 2.630

Service Name: Magic Lake Estates Water (Pender)

Project List and Budget

Project Number	Capital Expenditure Type	Capital Project Title	Capital Project Description	Total Project Budget	Asset Class	Funding Source	Carryforward from 2022	2023	2024	2025	2026	2027	5 - Year Total
21-02	Replacement	Design and Construction Buck Lake and Magic Lake Adjustable Intakes	Destailed design and construction of adjustable intakes to inform future capital works to maintain water quality.	$225,000	E	Cap	$180,000	$180,000	$0	$0	$0	$0	$180,000
21-04	Renewal	Buck Lake Dam Repairs - Phase 1	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.	$200,000	S	Res	$0	$25,000	$45,000	$22,000	$0	$0	$92,000
22-02	New	EV Charging Station	Construct a new EV Charging Station at the Water Treatment Plant, project to be split across MLE Water, Waste Water, and a possible grant.	$10,000	E	Res	$2,500	$5,000	$0	$0	$0	$0	$5,000
22-02	New	EV Charging Station	Construct a new EV Charging Station at the Water Treatment Plant, project to be split across MLE Water, Waste Water, and a possible grant.		E	Grant	$2,500	$5,000	$0	$0	$0	$0	$5,000
23-01	Renewal	Decommission Magic Lake old Syphon	The old syphon is still in place and will require decommissioning to ensure dam performance.	$35,000	S	Res	$0	$0	$35,000	$0	$0	$0	$35,000
23-02	New	ISOPAC Permanent Handling & Storage	Permenant solution to reduce drum waste and reduce handing is required.	$60,000	S	Res	$0	$0	$60,000	$0	$0	$0	$60,000
26-01	Renewal	Buck Lake Dam Repairs - Phase 2	Conduct additional geotechnical investigations, seepage analysis, monitoring, tree removal and the next DSR (2029).	$360,000	S	Res	$0	$0	$0	$0	$145,000	$75,000	$220,000
			GRAND TOTAL	**$890,000**			**$185,000**	**$215,000**	**$140,000**	**$22,000**	**$145,000**	**$75,000**	**$597,000**

22

APPENDIX A

Service:	2.630	Magic Lake Estates Water (Pender)

Project Number	21-04	**Capital Project Title**	Buck Lake Dam Repairs - Phase 1	**Capital 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.				

Project Number	22-02	**Capital Project Title**	EV Charging Station	**Capital Project Description**	Construct a new EV Charging Station at the Water Treatment Plant, project to be split across MLE Water, Waste Water, and a possible grant.
Project Rationale	Construct a new EV Charging station at the water treatment plan, proejct is to be partially funded through a cost matching grant and the MLE Waste Water Service.				

Project Number	23-01	**Capital Project Title**	Decommission Magic Lake old Syphon	**Capital Project Description**	The old syphon is still in place and will require decommissioning to ensure dam performance.
Project Rationale	The old syphon at Magic Lake is no longer required, and does not function. Funds are required to remove the overland and underwater pipe, and decommission the underground pipe.				

Project Number	23-02	**Capital Project Title**	ISOPAC Permanent Handling & Storage	**Capital Project Description**	Permenant solution to reduce drum waste and reduce handing is required.
Project Rationale	Safety improvements to reduce Operator injury when handling the ISOPAC drums were carried out in 2019-2020. A permanent solution to reduce the use of drums which cannot be readily disposed of, and reduce handling of the product is proposed in 2023.				

Project Number	26-01	**Capital Project Title**	Buck Lake Dam Repairs - Phase 2	**Capital Project Description**	Conduct additional geotechnical investigations, seepage analysis, monitoring, tree removal and the next DSR (2029).
Project Rationale	Resulting from the Hatch 2019 Dam Safety Review, funds are required to conduct additional geotechnical investigations, seepage analysis and monitoring, tree removal, and the next Dam Safety				

Project Number	21-02	**Capital Project Title**	Design and Construction Buck Lake	**Capital Project Description**	Destailed design and construction of
Project Rationale	Both the Buck and Magic Lake adjustable intakes are unsafe to clean and adjust without the employing divers. Funds are required to design and construct adjustable intakes.				

24

APPENDIX A

2.630 - Magic Lake Water Utility (Pender)

Capital Projects

Updated @ Oct 20, 2022

Year	Project#	Status	Capital Project Description	Total Project Budget	Spending		Total Funding in Place
					Expenditure Actuals	Remaining Spending	
2010	CE.258	Open	Water System Upgrade	8,932,557	8,655,668	276,889	8,932,557
2019	CE.678.5501	Open	2019 Buck Lake Dam - Dam Safety Review	50,000	45,715	4,285	50,000
2020	CE.671	Open	MLE Wtr Air Valve Upgrades	110,000	69,314	40,686	110,000
2021	CE.743	Open	MLE WTP SCADA Hot Standby	17,000	16,253	747	17,000
2021	CE.744	Open	MLE Safety Improvements	20,000	11,604	8,396	20,000
2021	CE.779.7501	Open	Design and Construction of Buck Lake and Magic Lake Adjustable Intakes	225,000	37,810	187,190	225,000
2021	CE.779.1601	Closed	Buck Lake Lighting Replacement	10,487	10,487	-	10,487
2021	CE.678	Open	Buck Lake Dam Repairs	110,000	36,141	73,859	110,000
2022	CE.779.7502	Open	Failed Valve Replacement	50,000	29,537	20,463	50,000
			Totals	**9,525,044**	**8,912,529**	**612,515**	**9,525,044**

24

APPENDIX A

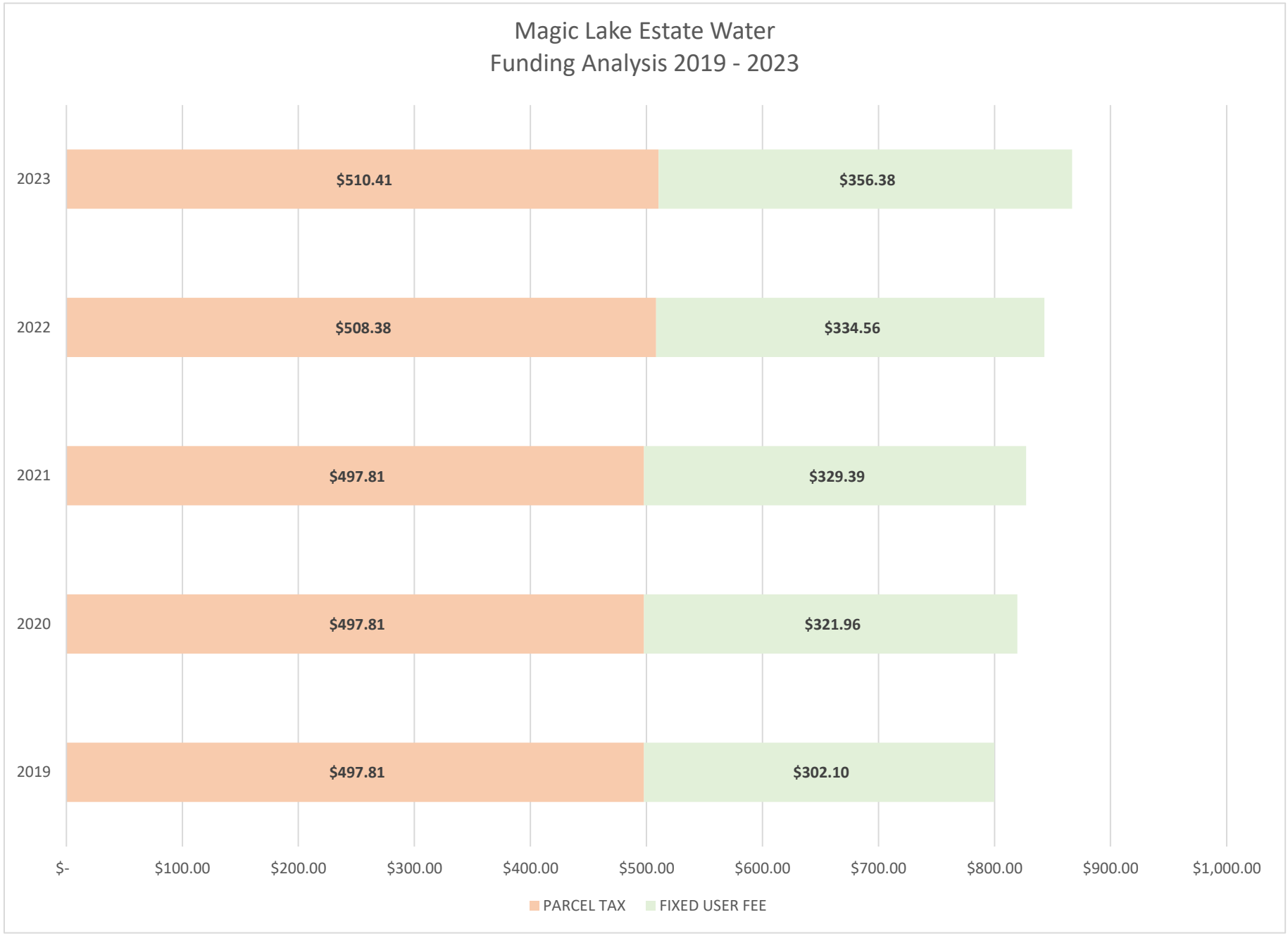
Service:	2.630	Magic Lake Water	Committee: Electoral Area

Year	Taxable Folios	Parcel Tax Per Folio	SFE's	User Charge Per SFE*	Total Tax & Charges	Bylaw	Actual Assessments $(000's)
2012	1,206	$496.57	1,005	$250.00	**$746.57**	3847	$390,273.10
2013	1,206	$496.57	1,008	$250.00	**$746.57**	3892	$356,311.00
2014	1,206	$496.57	1,011	$250.00	**$746.57**	3924	$336,525.60
2015	1,206	$496.57	1,012	$250.00	**$746.57**	3987	$327,129.00
2016	1,205	$496.98	1,015	$281.69	**$778.67**	4074	$327,129.00
2017	1,203	$497.81	1,020	$280.31	**$778.12**	4170	$328,976.80
2018	1,203	$497.81	1,020	$291.37	**$789.18**	4233	$407,278.90
2019	1,203	$497.81	1,028	$302.10	**$799.91**	4274	$469,844.20
2020	1,202	$497.81	1,034	$321.96	**$819.76**	4337	$510,125.00
2021	1,202	$497.81	1,043	$329.39	**$827.20**	4389	$544,463.70
2022	1,199	$508.38	1,050	$334.56	**$842.94**	4471	$757,028.70
2023	1,196	$510.41	1,059	$356.38	**$866.79**		
Change from 2022 to 2023		*$2.03*		*$21.82*	*$23.85*		
		0.40%		*6.52%*	*2.83%*		

* Parcel Tax authority under LSA-1

**User Charge is an annual charge per connected SFE

APPENDIX A


Magic Lake Estate Water
Funding Analysis 2019 - 2023
2023
$510.41
$356.38
2022
$508.38
$334.56
2021
$497.81
$329.39
2020
$497.81
$321.96
2019
$497.81
$302.10
$-
$100.00
$200.00
$300.00
$400.00
$500.00
$600.00
$700.00
$800.00
$900.00
$1,000.00
PARCEL TAX
FIXED USER FEE

27

CAPITAL REGIONAL DISTRICT

2023 Budget

Magic Lake Estates Sewer

Commission Review

NOVEMBER 2022

27

28

APPENDIX B

Service: **3.830 Magic Lake Sewer Utility (Pender)** **Committee: Electoral Area**

DEFINITION:

To provide, operate and maintain sewage collection and disposal facilities for the Magic Lake Estates Sewerage System Specified Area on North Pender Island (Local Service Establishment Bylaw No. 1873 - June 26, 1991).

PARTICIPATION:

Specified Area - B(764) SA#8

MAXIMUM LEVY:

Greater of $200,000 or $7.10 / $1,000 on actual assessed value of land and improvements. To a maximum of $3,284,880.

MAXIMUM CAPITAL DEBT:

AUTHORIZED: LA Bylaw No. 4048 (Dec 2015). Fall Borrowing $1,530,000 for 10 years

COMMITTEE:

Magic Lake Estates Water & Sewer Committee established by Bylaw No. 1870 (November 28, 1990).

FUNDING:

User Charge: Per single family equivalency unit to connected properties only

Parcel Tax: Only on properties capable of being connected to system.

Connection Charge: Actual Engineering and Construction costs, plus 15% Administration costs. The minimum charge is $500.

RESERVE FUND:

Magic Lake Estates sewage system capital reserve fund (Dec 17, 1986). Bylaw No. 1497.

28

29

APPENDIX B

3.830 - Magic Lake Estates Sewer	2022 BOARD BUDGET	2022 ESTIMATED ACTUAL	BUDGET REQUEST 2023 CORE BUDGET	2023 ONGOING	2023 ONE-TIME	2023 TOTAL	FUTURE PROJECTIONS 2024	2025	2026	2027
OPERATING COSTS										
Sludge Hauling Contracts	90,720	75,000	93,440	-	-	93,440	95,310	97,220	99,160	101,140
Grit & Waste Sludge Disposal	90,720	75,000	93,440	-	-	93,440	95,310	97,220	99,160	101,140
Repairs & Maintenance	36,600	41,180	11,940	-	-	11,940	12,190	12,440	52,690	27,950
Allocations	44,220	44,220	45,735	-	-	45,735	46,655	47,588	48,534	49,505
Electricity	23,660	24,000	24,370	-	-	24,370	24,860	25,360	25,870	26,390
Supplies	21,940	23,510	22,590	-	-	22,590	23,030	23,500	23,970	24,460
Labour Charges	280,445	343,000	280,836	17,420	-	298,256	313,072	319,337	325,721	332,233
Other Operating Expenses	33,822	44,022	34,830	-	-	34,830	35,660	36,512	37,382	38,281
TOTAL OPERATING COSTS	**622,127**	**669,932**	**607,181**	**17,420**	**-**	**624,601**	**646,087**	**659,177**	**712,487**	**701,099**
*Percentage Increase over prior year			-2.4%	2.8%		0.4%	3.4%	2.0%	8.1%	-1.6%
DEBT / RESERVES										
Transfer to Capital Reserve Fund	75,000	28,411	55,735	-	-	55,735	39,800	32,400	24,890	67,830
Transfer to Operating Reserve Fund	13,260	13,260	13,260	-	-	13,260	13,260	13,260	13,260	13,260
Debt Reserve Fund	320	320	290	-	-	290	290	290	290	290
MFA Principal Payment	133,463	133,463	133,463	-	-	133,463	133,463	133,463	133,463	68,476
MFA Interest Payment	40,640	40,640	40,640	-	-	40,640	40,640	40,640	40,640	24,995
TOTAL DEBT / RESERVES	**262,683**	**216,094**	**243,388**	**-**	**-**	**243,388**	**227,453**	**220,053**	**212,543**	**174,851**
TOTAL COSTS	**884,810**	**886,026**	**850,569**	**17,420**	**-**	**867,989**	**873,540**	**879,230**	**925,030**	**875,950**
Sludge Disposal Recovery	(10,870)	(10,870)	(11,200)	-	-	(11,200)	(11,420)	(11,650)	(11,880)	(12,120)
TOTAL COSTS NET OF RECOVERIES	**873,940**	**875,156**	**839,369**	**17,420**	**-**	**856,789**	**862,120**	**867,580**	**913,150**	**863,830**
FUNDING SOURCES (REVENUE)										
Transfer from Operating Reserve Fund	(25,000)	(25,000)	-	-	-	-	-	-	(40,000)	(15,000)
User Charges	(259,320)	(260,536)	(249,679)	(17,420)	-	(267,099)	(272,440)	(277,890)	(283,450)	(289,120)
Grants in Lieu of Taxes	(2,450)	(2,450)	(2,520)	-	-	(2,520)	(2,500)	(2,500)	(2,500)	(2,500)
Other Revenue	(1,160)	(1,160)	(1,160)	-	-	(1,160)	(1,170)	(1,180)	(1,190)	(1,200)
TOTAL REVENUE	**(287,930)**	**(289,146)**	**(253,359)**	**(17,420)**	**-**	**(270,779)**	**(276,110)**	**(281,570)**	**(327,140)**	**(307,820)**
REQUISITION - PARCEL TAX	**(586,010)**	**(586,010)**	**(586,010)**	**-**	**-**	**(586,010)**	**(586,010)**	**(586,010)**	**(586,010)**	**(556,010)**
*Percentage increase over prior year										
User Fees			-3.7%	6.7%		3.0%	2.0%	2.0%	2.0%	2.0%
Requisition			0.0%			0.0%	0.0%	0.0%	0.0%	-5.1%
Combined			**-1.1%**	**2.1%**		**0.9%**	**0.6%**	**0.6%**	**0.6%**	**-2.8%**

29

30

APPENDIX B

3.830 - Magic Lake Estates Sewer - Debt Only - 6M Phase 1 Wastewater Treatment Plan Upgrade	2022 BOARD BUDGET	2022 ESTIMATED ACTUAL	BUDGET REQUEST 2023 CORE BUDGET	2023 ONGOING	2023 ONE-TIME	2023 TOTAL	FUTURE PROJECTIONS 2024	2025	2026	2027
DEBT										
Debt Reserve Fund	10,500	10,500	570	-	-	570	570	570	570	570
MFA Principal Payment	89,110	89,110	111,887	-	-	111,887	111,887	111,887	111,887	111,887
MFA Interest Payment	105,148	105,148	118,798	-	-	118,798	118,798	118,798	118,798	118,798
TOTAL DEBT	**204,758**	**204,758**	**231,255**	**-**	**-**	**231,255**	**231,255**	**231,255**	**231,255**	**231,255**
FUNDING SOURCES (REVENUE)										
Deficit c/fwd from 2021 to 2022	7,772	7,772	-	-	-	-	-	-	-	-
MFA Debt Reserve Earning	(500)	(500)	(570)	-	-	(570)	(570)	(570)	(570)	(570)
Grants in Lieu of Taxes	(414)	(414)	(430)	-	-	(430)	(440)	(450)	(460)	(470)
REQUISITION - PARCEL TAX	**211,616**	**211,616**	**230,255**	**-**	**-**	**230,255**	**230,245**	**230,235**	**230,225**	**230,215**
*Percentage increase over prior year Requisition						8.8%	0.0%	0.0%	0.0%	0.0%

30

31

APPENDIX B

Magic Lake Estates Sewer
Reserve Summary Schedule
2023 - 2027 Financial Plan

Reserve/Fund Summary

	Estimated	Budget				
	2022	2023	2024	2025	2026	2027
Operating Reserve Fund	22,635	35,895	49,155	62,415	35,675	33,935
Capital Reserve Fund	360,338	416,073	395,873	428,273	453,163	520,993
Total	**382,973**	**451,968**	**445,028**	**490,688**	**488,838**	**554,928**

31

32

APPENDIX B

Reserve Schedule

Reserve Fund: 3.830 Magic Lake Sewer System - Operating Reserve Fund - Bylaw 4144

Reserve fund used for: unforeseen operational repairs and maintenance; infrequent maintenance activities such as treatment facility tankage draining/cleaning/inspection etc.

Reserve Cash Flow

Fund: 1500 / Fund Centre: 105217	Estimated 2022	Budget 2023	2024	2025	2026	2027
Beginning Balance	33,825	22,635	35,895	49,155	62,415	35,675
Transfer from Ops Budget	13,260	13,260	13,260	13,260	13,260	13,260
Planned Expenditures	(25,000)	-	-	-	(40,000)	(15,000)
Planned Maintenance Activity	Outfall inspection & Clean Schooner aeration ditch				Sewer System Flushing	Outfall Inspection
Interest Income*	550					
Ending Balance $	**22,635**	**35,895**	**49,155**	**62,415**	**35,675**	**33,935**

Assumptions/Background:

* Interest is included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

32

33

APPENDIX B

Reserve Schedule

Reserve Fund: 3.830 Magic Lake Sewer System - Capital Reserve Fund

Bylaw 1497

Reserve Cash Flow

Fund:	1042	Estimated	Budget				
Fund Centre:	101386	2022	2023	2024	2025	2026	2027
Beginning Balance		306,661	360,338	416,073	395,873	428,273	453,163
Transfer from Ops Budget		28,411	55,735	39,800	32,400	24,890	67,830
Transfer to Cap Fund		-	-	(60,000)	-	-	-
Transfer from Cap Fund		20,646					
Interest Income*		4,620					
Ending Balance $		**360,338**	**416,073**	**395,873**	**428,273**	**453,163**	**520,993**

Assumptions/Background:

* Interest is included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

33

34

APPENDIX B

CAPITAL REGIONAL DISTRICT

FIVE YEAR CAPITAL EXPENDITURE PLAN SUMMARY - 2023 to 2027

Service No.	3.830 Magic Lake Sewer Utility (Pender)	Carry Forward from 2022	2023	2024	2025	2026	2027	TOTAL
EXPENDITURE								
Buildings	B	$0	$0	$0	$0	$0	$0	$0
Equipment	E	$0	$0	$60,000	$0	$0	$0	$60,000
Land	L	$0	$0	$0	$0	$0	$0	$0
Engineered Structures	S	$8,600,000	$6,230,000	$2,370,000	$0	$0	$0	$8,600,000
Vehicles	V	$0	$0	$0	$0	$0	$0	$0
		$8,600,000	**$6,230,000**	**$2,430,000**	**$0**	**$0**	**$0**	**$8,660,000**
SOURCE OF FUNDS								
Capital Funds on Hand	Cap	$3,247,000	$1,730,000	$1,517,000	$0	$0	$0	$3,247,000
Debenture Debt (New Debt Only)	Debt	$0	$0	$0	$0	$0	$0	$0
Equipment Replacement Fund	ERF	$0	$0	$0	$0	$0	$0	$0
Grants (Federal, Provincial)	Grant	$5,353,000	$4,500,000	$853,000	$0	$0	$0	$5,353,000
Donations / Third Party Funding	Other	$0	$0	$0	$0	$0	$0	$0
Reserve Fund	Res	$0	$0	$60,000	$0	$0	$0	$60,000
		$8,600,000	**$6,230,000**	**$2,430,000**	**$0**	**$0**	**$0**	**$8,660,000**

34

35

APPENDIX B

CAPITAL REGIONAL DISTRICT
5 YEAR CAPITAL PLAN
2023 - 2027

Project Number
Project number format is "yy-##"
"yy" is the last two digits of the year the project is planned to start.
"##" is a numberical value. For example, 23-01 is a project planned to start in 2023.

For projects in previous capital plans, use the same project numbers previously

Capital Expenditure Type
Study - Expenditure for feasibility and business case report.
New - Expenditure for new asset only
Renewal - Expenditure upgrades an existing asset and extends the service ability or enhances technology in delivering that service
Replacement - Expenditure replaces an existing asset

Capital Project Title
Input title of project. For example "Asset Name - Roof Replacement", "Main Water Pipe Replacement".

Capital Project Description
Briefly describe project scope and service benefits.
For example: *"Full Roof Replacement of a 40 year old roof above the swimming pool area; The new roofing system is built current energy standards, designed to minimize maintenance and have an expected service life of 35 years".*

Total Project Budget
Provide the total project budget, even if it extends beyond the 5 years of this capital plan.

Asset Class
L - Land
S - Engineering Structure
B - Buildings
V - Vehicles

Funding Source Codes
Debt = Debenture Debt (new debt only)
ERF = Equipment Replacement Fund
Grant = Grants (Federal, Provincial)
Cap = Capital Funds on Hand
Other = Donations / Third Party Funding
Res = Reserve Fund
STLoan = Short Term Loans
WU - Water Utility
If there is more than one funding source, use additional rows for the project.

Carryforward from 2022
Input the carryforward amount from the 2022 capital plan that is remaining to be spent Forecast this spending in 2023 to 2027.

Project Drivers
Maintain Level of Service = Project maintains existing or improved level of service.
Advance Board or Corporate Priority = Project is a Board or Corporate priority.
Emergency = Project is required for health or safety reasons.
Cost Benefit = Economic benefit to the organization.

Long-term Planning
Master Plan / Servicing Plan = Plan that identifies new assets required to meet future needs.
Asset Management Plan / Sustainable Service Delivery Plan = Integrated plan that identifies asset replacements based on level of service, criticality, condition, risk, replacement costs as well as external impacts.
Replacement Plan = Plan that identifies asset replacements based primarily on asset age or asset material/type.
Condition Assessment = Assessment that identifies asset replacements based on asset condition.

Cost Estimate Class
Class A (±10-15%) = Estimate based on final drawings and specifications; used to evaluate tenders.
Class B (±15-25%) = Estimate based on investigations, studies or prelimminary design; used for budget planning.
Class C (±25-40%) = Estimate based on limited site information; used for program planning.
Class D (±50%) = Estimate based on little/no site information; used for long-term planning.

Service #: 3.830
Service Name: Magic Lake Sewer Utility (Pender)

Project List and Budget

Project Number	Capital Expenditure Type	Capital Project Title	Capital Project Description	Total Project Budget	Asset Class	Funding Source	Carryforward from 2022	2023	2024	2025	2026	2027	5 - Year Total
21-01	Renewal	Wastewater Improvements - Sewer Replacement	1. Replace about 3km of failing AC pipe and install Cannon forcemain pipe (2021) 2. Replace as much failing AC pipe as possible with remaining funds left from $6M loan (2023-24).	$3,943,916	S	Cap	$1,300,000	$100,000	$1,200,000	$0	$0	$0	$1,300,000
21-02	Renewal	Wastewater Improvements - Pump Station and Treatment Plant Upgrades	1. Renew Buccaneer, Galleon, Schooner, Capstan, Cutlass and Masthead Pump Stns 2. Replace Cannon WWTP with a new pump station 3. Upgrade Schooner WWTP (headworks, EQ tank, 2nd aeration tank, new clarifiers, electrical/genset)	$7,709,350	S	Cap	$1,947,000	$1,630,000	$317,000	$0	$0	$0	$1,947,000
21-02					S	Grant	$5,353,000	$4,500,000	$853,000	$0	$0	$0	$5,353,000
24-01	Replacement	Towable Genset Replacement	Replacement of the towable genset as it is nearing the end of life.	$60,000	E	Res	$0	$0	$60,000	$0	$0	$0	$60,000
			GRAND TOTAL	**$11,713,266**			**$8,600,000**	**$6,230,000**	**$2,430,000**	**$0**	**$0**	**$0**	**$8,660,000**

35

36

APPENDIX B

Service:	3.830	Magic Lake Sewer Utility (Pender)

Project Number	21-01	**Capital Project Title**	Wastewater Improvements - Sewer Replacement	**Capital Project Description**	1. Replace about 3km of failing AC pipe and install Cannon forcemain pipe (2021) 2. Replace as much failing AC pipe as possible with remaining funds left from $6M loan (2023-24).
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. Also, several km of failing AC sewer pipe requires replacement (to be completed over 3 years from 2021-2023).				

Project Number	21-02	**Capital Project Title**	Wastewater Improvements - Pump Station and Treatment Plant Upgrades	**Capital Project Description**	1. Renew Buccaneer, Galleon, Schooner, Capstan, Cutlass and Masthead Pump Stns 2. Replace Cannon WWTP with a new pump station 3. Upgrade Schooner WWTP (headworks, EQ tank, 2nd aeration tank, new clarifiers, electrical/genset)
Project Rationale	Wastewater Improvements - Pump Station and Treatment Plant Upgrades				

Project Number	24-01	**Capital Project Title**	Towable Genset Replacement	**Capital Project Description**	Replacement of the towable genset as it is nearing the end of life.
Project Rationale	Replacement of the towable genset as it is nearing the end of life.				

36

37

APPENDIX B

3.830 - Magic Lake Sewer Utility (Pender)

Capital Projects Fund

Updated @ Oct 20, 2022

Year	Project#	Capital Plan#	Status	Capital Project Description	Total Project Budget	Spending		Total Funding in Place	Funding Pending Receivable
						Expenditure Actuals	Remaining Spending		
2014	CE.409	N/A	Closed	Upgrade Radio RTU's	34,426	13,780	20,646	34,426	-
2020	CE.708	20-01	Open	MLE Wastewater Treatment Plant Upgrade	11,653,266	2,696,744	8,956,522	6,000,268	5,652,998
2021	CE.775	21-01	Open	MLE Safety Upgrades	30,000	10,408	19,592	30,000	-
				Total	**11,717,692**	**2,720,932**	**8,996,760**	**6,064,694**	**5,652,998**

37

38

APPENDIX B

Service: **3.830** **Magic Lake Sewer Utility (Pender)** **Committee: Electoral Area**

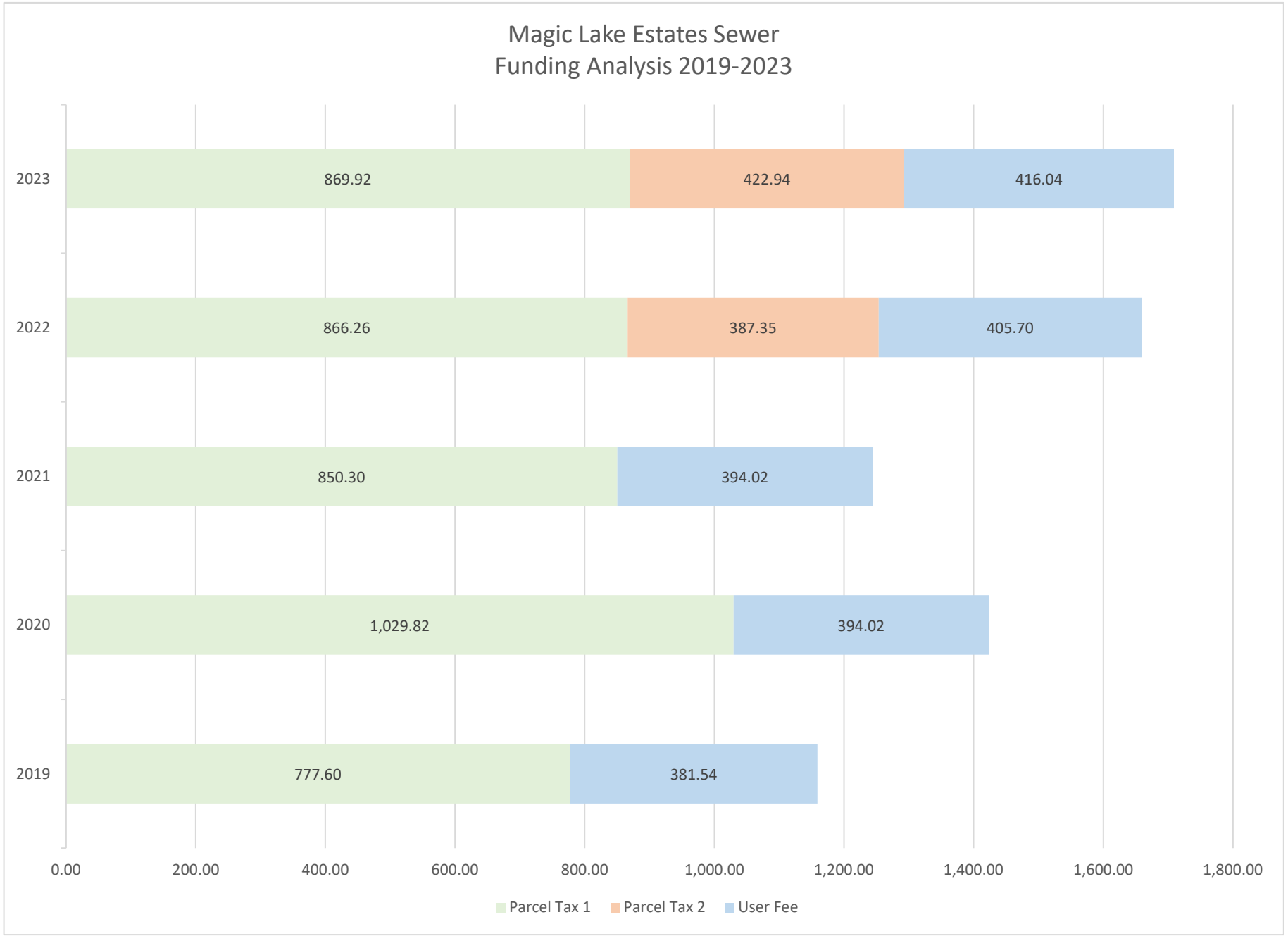
Year	Taxable Folios	Parcel Tax 1 per Folio	Taxable Folios	Parcel Tax 2 per Folio	SFE's	User Charge per SFE	Total Tax(1&2) & Charges	Bylaw
2010	714	$401.28			616	$252.00	**$653.28**	
2011	714	$401.27			617	$272.00	**$673.27**	3778
2012	714	$414.76			617	$272.00	**$686.76**	3823
2013	714	$414.76			621	$272.00	**$686.76**	3892
2014	714	$414.76			620	$272.00	**$686.76**	3924
2015	714	$414.76			621	$272.00	**$686.76**	3987
2016	714	$493.70			623	$271.12	**$764.83**	4074
2017	713	$750.36			623	$271.12	**$1,021.48**	4170
2018	713	$750.37			623	$300.40	**$1,050.77**	4233
2019	713	$777.60			623	$381.54	**$1,159.14**	4274
2020	714	$1,029.82			630	$394.02	**$1,423.83**	4337
2021	714	$850.30	577	$144.49	635	$394.02	**$1,388.81**	4389
2022	712	$866.26	575	$387.35	639	$405.70	**$1,659.31**	4471
2023	709	$869.92	573	$422.94	642	$416.04	**$1,708.90**	
Change from 2022 to 2023		*$3.66*		*$35.59*		*$10.34*	*$49.59*	
		0.42%		*9.19%*		*2.55%*	*2.99%*	

Total Parcel Tax(1) and Charges (lump-sum payment option only)	**$1,285.96**
Change from 2022 to 2023	*$14.00*
	1.10%

38

39

APPENDIX B



39

APPENDIX B

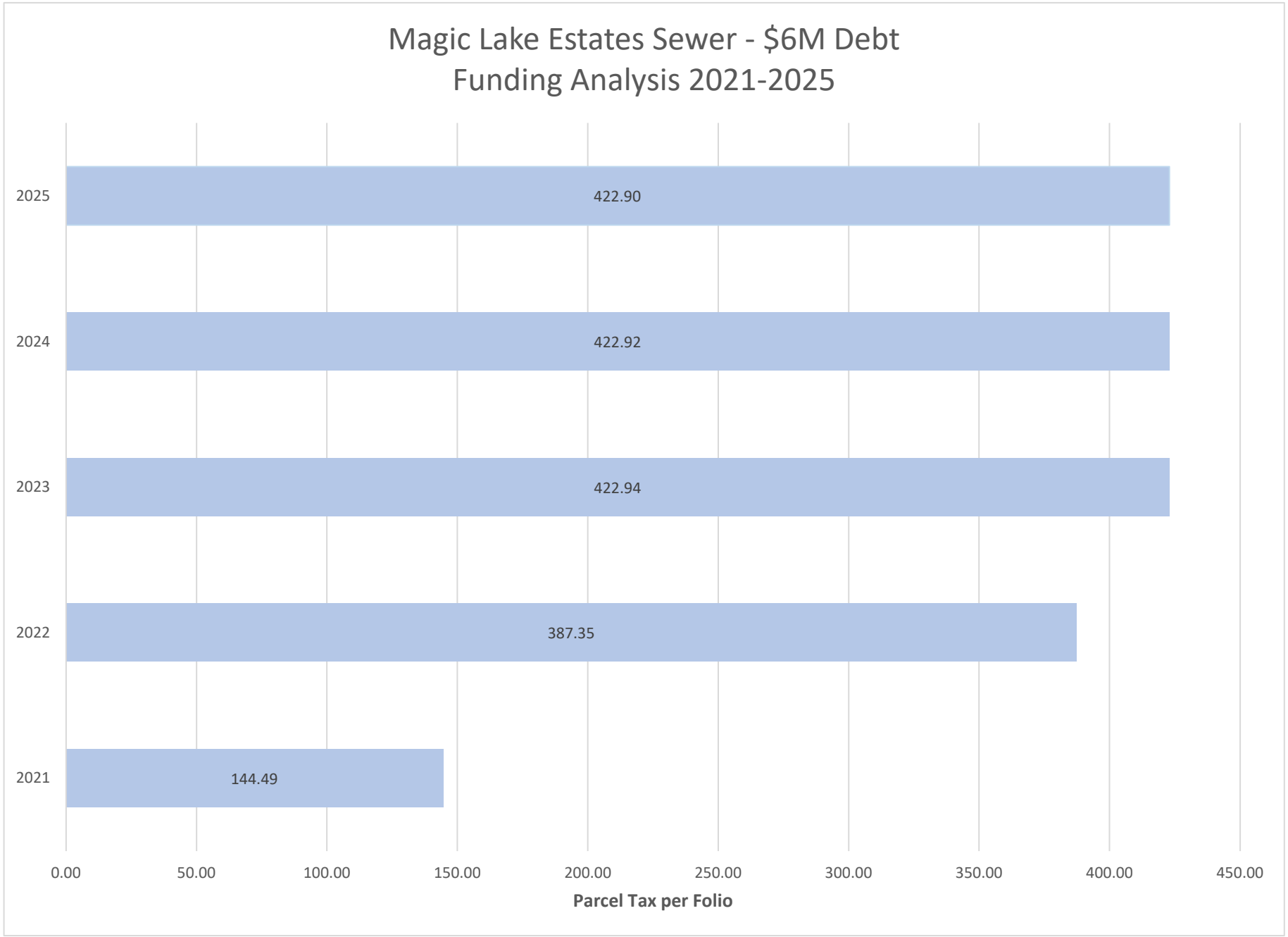
Service:	3.830D	Magic Lake Sewer - Debt Service Only - $6M	Committee: Electoral Area

Total Folios	709	
Folios Paid by One-time Lump Sum	137	*one of the the folios that paid the lump-sum is exempt now*

Year	Taxable Folios	Parcel Tax per Folio
2021	577	$144.49
2022	575	$387.35
2023	573	$422.94
2024	573	$422.92
2025	573	$422.90
2026	573	$422.88
2027	573	$422.90
Change from 2022 to 2023		$35.59
		9.19%

41

APPENDIX B



41

Making a difference...together

REPORT TO MAGIC LAKE ESTATES WATER AND SEWER COMMITTEE
MEETING OF TUESDAY, NOVEMBER 29, 2022

SUBJECT **Magic Lake Estates SCADA Communication Upgrades**

ISSUE SUMMARY

To seek approval to include a Supervisory Control and Data Acquisition (SCADA) Communication Upgrade project to the Magic Lake Estates Water 2023 Capital Plan.

BACKGROUND

The existing Magic Lake Estates Water and Sewer infrastructure is controlled by a SCADA communication system that has been patched together over the years by a variety of systems and equipment. The SCADA system is extremely important as it enables an operator to control equipment and respond to alarms either remotely or in person depending on the severity of the alarm.

The existing communication equipment was installed starting in the 1970's, based on a number of criteria including: available technology, topography, lines of sight from antennas, expansion/upgrades to the water and wastewater systems and available funding. A communication study was conducted in the early 2000's to replace older technology. The study concluded that it was not possible to replace all sites to radio as cellular modems were not yet available. Therefore, the existing communication system has been maintained. The communication system hardware and annual third-party fees are noted in Table 1 below.

Table 1: Existing Communication Infrastructure for Magic Lake Estates Sites

Component	Locations	Function & Limitations	Third Party Fees
Trio Radio Antennas	Magic Lake WTP (w) Frigate Reservoir (w) Captain Reservoir (w) Magic Lake PS (w)	▪ Radio ▪ Logs and displays information ▪ Can change setpoints remotely	No annual fees
Telus Leased Lines	Buck Lake PS (w) Bosun PS (w) Schooner WWTP (s) Cannon PS (s) Galleon PS (s)	▪ 4-20 mA signal ▪ Limited alarm display only ▪ Owned by Telus (so they charge fees and no internal troubleshooting available)	$15,000 per year (w) $17,000 per year (s)
Two-wire Copper	Schooner PS (s) Cutlass PS (s) Capstan PS (s) Masthead PS (s) Buccaneer PS (s)	▪ 4-20 mA signal ▪ Limited alarm display only ▪ No control or data acquisition	No annual fees

(w) = water site
(s) = sewer site

As part of the design of the Magic Lake Estates Wastewater Treatment Plant and Pump Station (PS) Upgrades, the consultant completed an updated radio path survey and technology review to determine communication requirements for the new infrastructure.

Based on their investigation, it was determined that Telus wants to discontinue the leased lines and the two-wire copper components are limited in their functionality. In addition, they confirmed that newer radio and cellular modem options are available that would make the entire system more secure and reliable. Additional benefits of standardizing and modernizing the communication system include consistency, improved remote troubleshooting, better data collection, lower operational fees, and advanced system and alarm monitoring. The proposed communication system and annual third-party fees are noted in Table 2 below. The proposed communication equipment upgrades will result in about $14,000 per year less operational fees for the Water Service.

Table 2: Proposed Communication Infrastructure Upgrades for Water and Sewer Sites

Component	Locations	Function	Third Party Fees
GE MDS Orbit Radio	Magic Lake WTP (w) Captain Reservoir (w) Buck Lake PS (w) Frigate Reservoir (w) Magic Lake PS (w) Galleon PS (s) Schooner PS (s) Capstan PS (s) Masthead PS (s) Buccaneer PS (s)	▪ Modern Radio system ▪ Logs and displays information ▪ Can control setpoints and reset alarms remotely ▪ Some types of troubleshooting can be done remotely	No annual fees
GE MDS Orbit Cellular	Magic Lake WTP (w) Bosun PS (w) Schooner WWTP (s) Cutlass PS (s) Cannon PS (s)	▪ Cellular modem system ▪ Logs and displays information ▪ Can control setpoints and reset alarms remotely ▪ Some types of troubleshooting can be done remotely ▪ Low monthly fees for data usage	~ $720 per year (w) ~ $1080 per year (s)

Note: the site locations underlined above require communication upgrades for the communication system at the wastewater sites to function.

The consultant advised that, in order to complete the wastewater facility upgrades, communication upgrades must also be completed at three water facility sites, (Magic Lake Water Treatment Plant for radio and cellular, Captain Reservoir, and Buck Lake Pump Station) for the upgraded radio system to function properly because of the location and elevation of these sites. These locations will use master radios and ‘store and forward’ technology so that all information can be received back to the Water Treatment Plant where the SCADA server is located.

Although the remaining three water sites, (Bosun PS, Frigate Reservoir, and Magic Lake PS), do not require upgrades for the wastewater communication system to function, there are benefits to changing these sites as well. The benefits include lowering the annual operating fee and eliminating radio interference between the Trio and Orbit systems. Although it may be possible to keep the two radio systems, it will cost more to mitigate potential interference and it is not guaranteed that some interference could occur which can create poor signals, limit data collection, and cause false alarms.

The cost estimate to implement the recommended changes to the water sites are listed in Table 3 below.

Table 3: Cost Estimate for Magic Lake Estates Communication Upgrades

Task	Three Water Sites required for Sewer Upgrades	Three Water Sites for benefit of Water only	Water Sites - Total
Design	$ 8,000	$ 4,000	$12,000
Hardware	$45,000	$15,000	$60,000
Installation	$ 3,000	$ 3,000	$ 6,000
Commissioning	$ 6,000	$ 6,000	$12,000
Total	**$62,000**	**$28,000**	**$90,000**

Note: costs for the sewer sites communication upgrades are not included above (i.e., kiosk, radios and antennas). Those items are included in the wastewater project capital plan.

As noted above, the reduction in annual operating fees from completing the communication upgrades to the Water Sites is about $14,000. Therefore, based on a capital cost of $90,000 the payback period would be approximately seven years.

ALTERNATIVES

Alternative 1
The Magic Lake Estates Water and Sewer Committee recommends the Electoral Areas Committee recommends to the Capital Regional District Board:

That the provisionally approved Magic Lake Estates Water Service 2023-2027 Capital Plan and Budget be amended to include a new Capital Project for 2023 to complete communication improvements at all Magic Lake Estates Water sites with a budget of $90,000 to be funded from the Water Service Capital Reserve Fund.

Alternative 2
The Magic Lake Estates Water and Sewer Committee recommends the Electoral Areas Committee recommends to the Capital Regional District Board:

That the provisionally approved Magic Lake Estates Water Service 2023-2027 Capital Plan and Budget be amended to include a new Capital Project for 2023 to complete communication improvements at three Magic Lake Estates Water sites with a budget of $62,000 to be funded from the Water Service Capital Reserve Fund.

Alternative 3
That this report be referred back to staff for additional information.

IMPLICATIONS

Alternative 1
Upgrading communication systems at all water and wastewater facilities would make the entire system more secure and reliable. In addition, it will standardize the whole system to make it more consistent, improve remote troubleshooting, enable better data collection, and provide advanced monitoring and alarm response.

It will be more cost effective for the system to be designed and upgraded by the same consultant and contractor. Currently the Magic Lake Estates Water Service has $620,328 in its 2023 Capital Reserve Fund. Therefore, there are sufficient funds to include a 2023 capital project with a budget of $90,000. The net annual reduction of third-party fees is about $14,000.

Alternative 2
Upgrading the communications systems at only three water sites just to enable the SCADA system to work for wastewater upgrades could work, but with noted challenges. Bosun PS would retain a Telus leased line along with the high operating costs. Frigate Reservoir and Magic Lake PS would retain a different radio than the rest of the system, which could cause interference with the Orbit radio. Additional design and isolation efforts could be implemented to mitigate potential interference, but it is not guaranteed to work. There are sufficient funds in the Water Service Capital Reserve Fund to include a 2023 capital project with a budget of $62,000. The net annual reduction of third-party fees is about $7,000.

CONCLUSION

The existing Magic Lake Estates Water and Sewer infrastructure is controlled by a SCADA communication system that has been patched together by a variety of systems and equipment. As part of the Magic Lake Estates Wastewater Treatment and Pump Station project, CRD's consultant has completed a SCADA communication review and is recommending upgrades to the entire system to make it more secure and reliable. Upgrading the Telus leased lines to radio or cellular modem sites at the Water locations could also reduce the annual third-party fees by about $14,000.

RECOMMENDATION

The Magic Lake Estates Water and Sewer Committee recommends the Electoral Areas Committee recommends to the Capital Regional District Board:

That the provisionally approved Magic Lake Estates Water Service 2023-2027 Capital Plan and Budget be amended to include a new Capital Project for 2023 to complete communication improvements at all Magic Lake Estates Water sites with a budget of $90,000 to be funded from the Water Service Capital Reserve Fund.

Submitted by:	Martina Bona, P.Eng., Project Engineer, Wastewater Engineering and Planning
Concurrence:	Malcolm Cowley, P.Eng., Manger, Wastewater Engineering and Planning
Concurrence:	Joseph Marr, P.Eng., Acting Senior Manager, Infrastructure Engineering
Concurrence:	Ian Jesney, P. Eng., Acting General Manager, Integrated Water Services
Concurrence:	Ted Robbins, BSc., CTech., Chief Administrative Officer

ATTACHMENT

Appendix A: SCADA Radio Path Analysis – Field Testing Report by Victoria Mobile Radio

APPENDIX A

Capital Regional District

Magic Lake Estates

SCADA Radio Path Analysis

Field Testing

Report By:

Victoria Mobile Radio Ltd.

October, 2022

APPENDIX A

1.0 Introduction

Victoria Mobile Radio (VMR) was hired to do a Desktop Study for a proposed radio system for the Magic Lake Estates SCADA system on Pender Island. Afterwards VMR was asked to do the Field Testing to verify the Desktop Study paths.

2.0 General

Older SCADA systems often used leased lines for communications. The Industry has been switching to SCADA radio for many years now. Mainly due to problems to get proper support for the leased lines. The telephone Carriers want hundreds of calls on a phone line, not one modem talking to one RTU. This support becomes a low priority item for them. Reliability is not the only reason. Newer SCADA radio technology has faster data speeds, powerful networking abilities, and state of the art security.

3.0 Background Information

3.0.1 The Magic Lakes Estates system is predominantly wired. Either a telephone leased line or 2-wire copper between sites. There are also a few Trio SCADA radios in place for three links back to the Water Treatment Plant (WTP).

3.0.2 As part of the WTP upgrade a new SCADA radio system is proposed. The Capital Regional District (CRD) uses the GE MDS TransNet unlicenced radio for many of their other SCADA needs. The original request was to plan for this radio to be used for the new system. This is an older GE MDS radio model, serial only, that has been around for 15+ years. It is still a very popular product due to its reliability and very good performance. However, based on GE MDS notification of the TransNet hardware being end-of-life as of December 2020, VMR used the GE MDS MCR-900 radio for all field testing. Not to put customers in a bad spot GE MDS is going to produce an Orbit radio that is backward compatible to the TransNet radio to make sure existing TransNet systems have the ability to stay in operation. This is not a migration path from TransNets to Orbit, as the radio cards are too different in technologies.

3.0.3 Appendices included in this Report

3.0.3.1 Appendix A – Overview Map
3.0.3.2 Appendix B – Field Testing Spreadsheets
(Note: See multiple tabs at bottom)
3.0.3.3 Appendix C - TransNet Specification Sheet
3.0.3.4 Appendix D - ECR/MCR-900 Specification Sheet
3.0.3.5 Appendix E - LN4 Specification Sheet
3.0.3.6 Appendix F - Budgetary Pricing

APPENDIX A

4.0 System Path Considerations

4.0.1 Even though all Magic Lake Estate's sites are relatively close together the topography is such that it is still challenging for radio. A number of SAF sites will be needed. It was confirmed by the Field Testing that tree obstructions proved to be significant.

4.0.2 The Field Testing followed what the Desktop suggested. Generally speaking, sites were tested from a radio located on the top of the Lively Peak Shaw tower first, and then from a radio at the Frigate Reservoir, then Capstan Pump Station, and finally with a radio at Galleon Pump Station.

4.0.3 With the Desktop work suggesting that the Cannon Pump Station will not have radio coverage for the proposed radio network on the Island there was three alternate tests done. First, to see if the SPWS TransNet Repeater on Bruce Mountain, Saltspring Island, would have coverage. Second, to see if the CRDW Repeater on Mt. McDonald would have coverage, and the third was to measure cellular coverage.

4.0.4 UHF licenced radio is also an option that would roughly produce about 12dB more signal due to higher RF power and better propagation due to the lower 400MHz frequency, as comparted to 900MHz. There was no UHF radio Field Testing done.

5.0 System Equipment Considerations

5.0.1 The GE MDS MCR-900 unlicenced radio was used to qualify radio performance for the Study. The GE MDS Orbit LN9 radio was used to measure signal from Mt. McDonald. The GE MDS Orbit Cell Modem was used to measure cell signal. For any unlicenced measurements a number of parameters were gathered with the MCR-900 radio: RSSI, LQI, and IPERF Data Throughput.

6.0 Radio Path Evaluation

The following tasks were completed to assess radio path performance:
(See Appendix B)

6.0.1 Field Testing to Lively Peak.

6.0.1.1 Path to Capstan Pump Station
6.0.1.2 Path to Masthead Pump Station

6.0.1.3 Path to Galleon Pump Station
6.0.1.4 Path to Buccaneer Pump Station
6.0.1.5 Path to WTP
6.0.1.6 Path to Bosun Pump Station
6.0.1.7 Path to Frigate Reservoir
6.0.1.8 Path to Magic Lake Pump Station

6.0.2 Field Testing to Frigate Reservoir

6.0.2.1 Path to Cutlass Pump Station
6.0.2.2 Path to Masthead Pump Station

6.0.3 Field Testing to Galleon Pump Station

6.0.3.1 Path to Masthead Pump Station
6.0.3.2 Path to Buck Lake Pump Station

6.0.4 Field Testing to Capstan Pump Station

6.0.4.1 Path to Schooner WWTP
6.0.4.2 Path to Schooner Pump Station
6.0.4.3 Path to Buck Lake Pump Station
6.0.4.4 Path to Frigate Reservoir

6.0.5 Field Testing at the Cannon Pump Statio

6.0.5.1 Path Test to Mt. Bruce Using Unlicenced TransNet Radio
6.0.5.2 Path Test to Mt. McDonald Using Licenced LN9 Radio
6.0.5.2 Cellular Test Using Orbit Cellular Modem

7.0 Unlicensed/Licensed System Design

In consideration of the radio path assessment completed in Section 6.0, the following radio system design considerations are submitted:

7.0.1 MDS TransNet unlicensed Radio Specifications:
(See Appendix C)

7.0.1.1 RF Transmit Power: 1 Watt
7.0.1.2 Receive Sensitivity: -108 dBm
7.0.1.3 Maximum Baud Rate: 115 kbps
7.0.1.4 Very powerful SAF functionality (Serial data only radio)

7.0.2 MDS Orbit MCR/ECR-900 unlicenced Radio Specifications

7.0.2.1 RF Power: 1 Watt
7.0.2.2 Receive Sensitivity: -105dBm to -95dBm (Depending on Configuration)
7.0.2.3 Maximum Baud Rate: 1.25Mbps, depending on RF conditions
7.0.2.4 Powerful SAF functionality, but limited with TCP/IP functionality
7.0.2.4 IP radio, but fully capable of serial payload data

7.0.3 MDS Orbit LN4 Licensed Radio Specifications:

7.0.3.1 RF Transmit Power: 10 watts
7.0.3.2 Receive Sensitivity: -115 dBm to -103dBm (Depending on Configuration)
7.0.3.3 Maximum Baud Rate: 64 kbps
7.0.3.4 TCP/IP with built-in Firewall and Router
7.0.3.5 Limited SAF functionality

7.0.4 An Industry accepted radio system design standard for 900MHz SCADA radio is a Fade Margin of 22 dB to obtain a radio path reliability of 99.4%. Depending on level of data "availability" that is needed this number can be reduced or increased. A 99.4% reliability link will suffer outages over a one-year period of 52 hours and 24 minutes. Licensed and unlicensed radios each have their own advantages/disadvantages. Each may be more appropriate depending on system requirements.

8.0 Conclusion

8.0.1 A 400 MHz Licenced radio system could be implemented that would produce improved radio coverage. However, we are recommending using unlicenced 900MHz radios for the following reasons:

8.0.1.1 There would still need to be at least 2 cell modems with a UHF System.
8.0.1.2 Adding three more cell modems to make the 900MHz system work is not a significant cost. Certainly not enough cost to justify using the Bear Mountain frequency pair, as that may limit the use of this licenced frequency pair for larger SCADA uses in the future.
8.0.1.3 There are significant bandwidth limitations with Licenced radio, as compared to Unlicenced.
8.01.4 There is ISED(IC) licencing costs with Licenced radio.

8.0.2 A 900 MHz Unlicenced Radio System upgrade could be implemented as follows:

8.0.2.1 Install a Master Radio (AP) at the Lively Peak (Captain's Reservoir) with the following sites communicating directly to this site.

8.0.2.1.1 WTP
8.0.2.1.2 Capstan Pump Station
8.0.2.1.3 Galleon Pump Station
8.0.2.1.4 Buccaneer Pump Station
8.0.2.1.5 Frigate Reservoir
8.0.2.1.6 Magic Lake Pump Station
8.0.2.1.7 Bosun Pump Station

8.0.2.2 Install a SAF Radio at Galleon Pump Station that will communicate with the following sites:.

8.0.2.2.1 Masthead Pump Station
8.0.2.2.2 Buck Lake Pump Station
8.0.2.2.3 Lively Peak AP

8.0.2.3 Install a SAF Radio at the Capstan Pump Station that will communicate to he following sites:

8.0.2.3.1 Schooner WWTP
8.0.2.3.2 Capstan Pump Station

8.0.2.4 Install a SAF Radio at the Schooner WWTP site that will communicate to the following site:

8.0.2.4.1 Schooner Pump Station
8.0.2.4.2 Capstan Pump Station

8.0.2.5 Install Orbit Cellular Modems at the following sites that testing has shown to have weak radio paths. It should be emphasized that cellular only has a reliability of 95%. Far short of licenced or unlicenced radio that 99.4% is strived for. For example, this is the difference between 52 hours in a year of downtime (99.4%) and 438 hours of downtime (95%). One will go un-noticed by the SCADA system, the other will not.

8.0.2.5.1 Bosun Pump Station
8.0.2.5.2 Schooner WWTP
8.0.2.5.3 Cutlass Pump Station
8.0.2.5.4 Cannon Pump Station

APPENDIX A

9.0 Recommendations

In consideration of the conclusions identified in Section 8.0, it is recommended:

9.0.1 Plan the most reliable system possible based on the data in this report. (See Appendix A)

9.0.2 Install cellular radio at sites that do not have reliable radio path (99.4% Reliability) based on the data in this report. (See Appendix A)

9.0.3 Any site where cellular is implemented, and radio coverage is available but does not meet reliability parameters, should have radio configured as backup.

9.0.4 Implement cellular radio for desired remote access for control and diagnostics. For example, the radio path from Schooner WWTP to Capstan Pump Station is Marginal. So, it would make sense to install a cell modem at Schooner WWTP which would give remote access and fast backhaul functionality. Schooner WWTP would still have a radio for communications to Capstan Pump Station and Schooner Pump Station. Schooner Pump station needs to use Schooner WWTP as a SAF or cell site to get communications out. Perhaps set-up the WTP as the cell Hub if that is where the Host software will be located? Or bring the system back to Macauley and install the cell Hub at that location?

9.0.5 Implement redundant equipment at key sites if uptime is critical. Remove as many single points of failure as possible. For example, install Master radios at the WTP and Captain's Reservoir.

9.0.6 Use directional antennas everywhere possible, as per Industry Canada's directive.

9.0.7 Implement Security measures available with the Orbit radios.

9.0.8 Complete a radio network system design, including Bench Testing, based on feedback to the results of this Report.

53

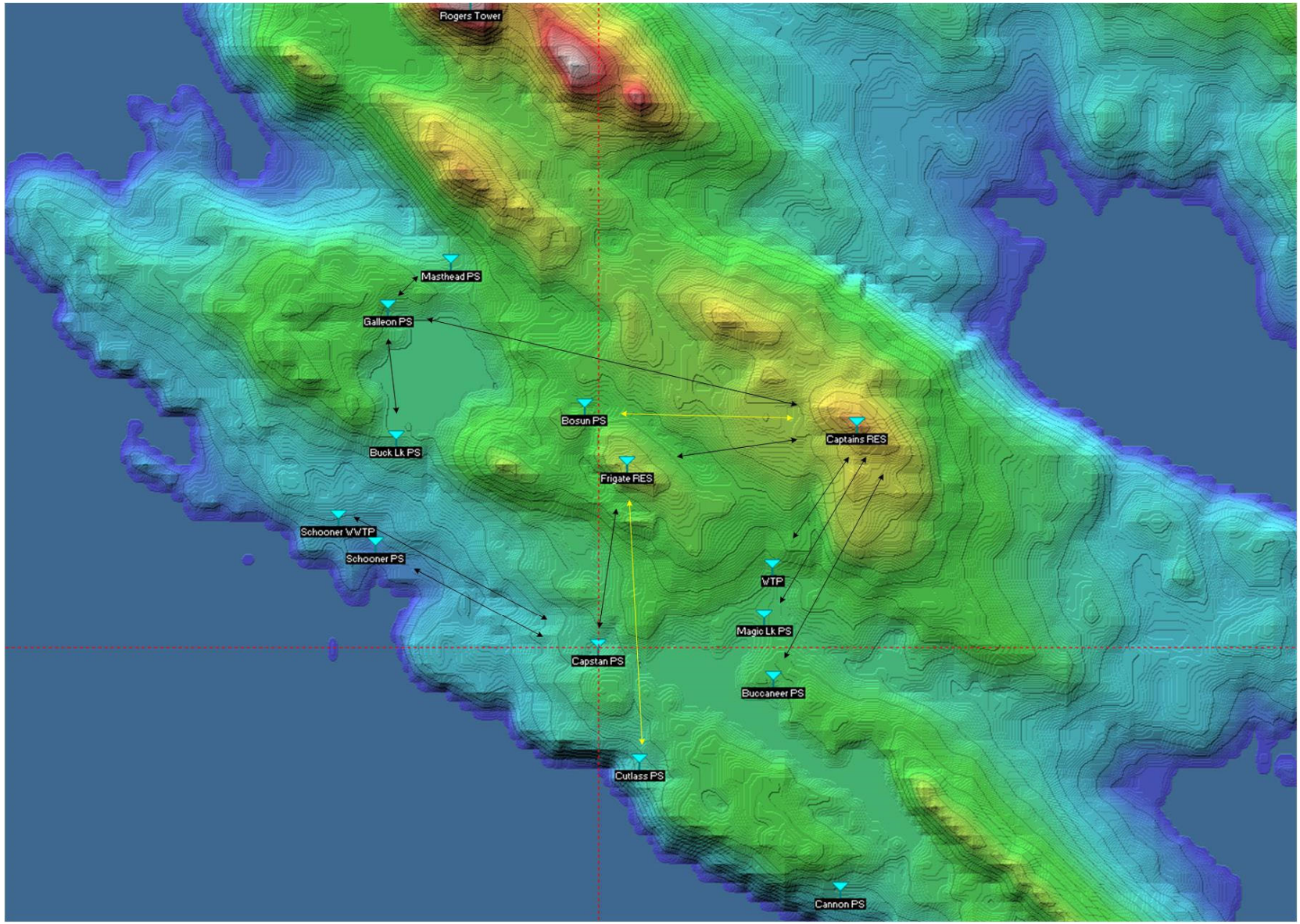
APPENDIX A

Appendices

53

54

APPENDIX A



Appendix A – Overview Map

54

55

CRD Magic Lake Estates Path Analysis

Field Testing - 900MHz (Unlicenced, Licenced & Cellular)

October 6, 2022

	Location	Latitude	Longitude	Bearing to	Path Length	Elevation	AGL	RSSI	Service	Fade Margin	Reliability	Comments
		(North dms)	(West dms)	Cannon PS	(km)	(m)	(FT)	(-dBm)	State			
				(°T)				Measured		(dB)	(%)	
	Paths to Cannon Pump Station											
1	Mt. Bruce (Unlicenced)	48.76667°	-123.5081°	93.4	16.57	691	98	113		-	-	No Good
2	Mt. McDonald (Licenced)	48.44167°	-123.5689°	30.8	40.9	432	98	107		-	-	No Good
3	Cannon Pump Station	48.75758°	-123.2825°	-	-	58.4	30	-	-	-	-	(10dBd Yagi)
	Cellular Testing at Cannon Pump Station											
1	Cell Site Not Known? Rogers Tower?						?	72	LTE-Telus	28	99.9	**Good**
2	Cannon Pump Station	48.75758°	-123.2825°	-	-	58.4	20		-	-	-	(Indoor Rubber Duck)
	Notes:											
	Industry Accepted Reliability is 99.4% or 22dB Fade Margin											
	All Unlicenced Radio Tests Used the 500kbps Modem											
	Additional Radios Used to test from Cannon PS: ECR-4GY(Cell), LN9 & TransNet											

LQI / Modem	125 kbps	250 kbps	500 kbps	1000 kbps	1000W kbps	1250 kbps
Pristine	0 - 8	0 - 16	0 - 8	0 - 4	0 - 1	0 - 1
Usable	9 - 14	17 - 21	9 - 14	5 - 6	2 - 3	2 - 3
Sensitivity (dBm) based on $1x10^{-6}$ @ XXX kbps	-105	-103	-99	-95	-95	-95

Good: ≥22 dB of Fade Margin

Marginal: <22dB, ≥18 dBd of Fade Margin

Poor: <18 dB, ≥10 dB of Fade Margin

No Good: < 10 dB of Fade Margin

Appendix B
CRD SCADA
Magic Lake Estates
Field Tests
Paths to Cannon PS
Spreadsheet 1 of 5

55

CRD Magic Lake Estates Path Analysis

Field Testing - 900MHz (unlicenced)

October 6, 2022

	Location	Latitude	Longitude	Bearing to	Path Length	Elevation	AGL	RSSI	LQI	IPERF	Fade Margin	Fade Margin	Reliability	Comments
		(North dms)	(West dms)	Capstan PS	(km)	(m)	(FT)	(-dBm)	(Signal	Data	500 Modem	250 Modem	500/250	
								Measured	Quality)	Speed	(dB)	(dB)	(%)	
	Paths to Capstan Pump Station									(kbps)				
1	Schooner WWTP	48.76844°	-123.3047°	116.5	0.85	29.6	20	80	6	225	19	23	99.1	Marginal/Good
2	Schooner Pump Station	48.76767°	-123.3031°	114.7	0.8	15.4	25	89	12	195	10	14	92/95	Poor/Poor
3	Buck Lake Pump Station	48.77078°	-123.3022°	135.9	0.95	69	20/30	98/94	14/12	178	5	9	75/91	No Good
4	Frigate Reservoir	48.77003°	-123.29200°	188.7	0.61	130.4	42	77	7	315				**Good** (Top or RES)
5	Capstan Pump Station	48.76467°	-123.2932°	-	-	61.2	30	-	-	-	-		-	-

Notes:

All Unlicenced Radio Tests Used the 500kbps Modem

Acceptable Fade Margin Based on Reliabilty of 99.4% or 22dB.

LQI / Modem	125 kbps	250 kbps	500 kbps	1000 kbps	1000W kbps	1250 kbps
Pristine	0 - 8	0 - 16	0 - 8	0 - 4	0 - 1	0 - 1
Usable	9 - 14	17 - 21	9 - 14	5 - 6	2 - 3	2 - 3
Sensitivity (dBm) based on $1x10^{-6}$ @ XXX kbps	-105	-103	-99	-95	-95	-95

Good: ≥22 dB of Fade Margin

Marginal: <22dB, ≥18 dBd of Fade Margin

Poor: <18 dB, ≥10 dB of Fade Margin

No Good: < 10 dB of Fade Margin

Appendix B
CRD SCADA
Magic Lake Estates
Paths to Capstan PS
Field Tests
Spreadsheet 2 of 5

57

CRD Magic Lake Estates Path Analysis

Field Tesitng - 900MHz (unlicenced)

October 6, 2022

	Location	Latitude	Longitude	Bearing to	Path Length	Elevation	AGL	RSSI	LQI	IPERF	Fade Margin	Fade Margin	Reliability	Comments
		(North dms)	(West dms)	Galleon PS	(km)	(m)	(FT)	(-dBm)	(Signal	Data	500 Modem	250 Modem	500/250	
								Mesured	Quality)	Speed	(dB)	(dB)	(%)	
	Paths to Galleon Pump Station									(kbps)				
1	Masthead Pump Station	48.77592°	-123.2998°	234.0	0.25	71.5	10	77	8	349	22	26	99.4/99.7	**Good**
2	Buck Lake Pump Station	48.77078°	-123.3022°	356.4	0.42	68.9	10	49	5	380	50	54	99.999/99.999	**Good**
3	Galleon Pump Station	48.77458°	-123.3026°	-	-	77.2	30	-	-		-		-	-

Notes:

LQI / Modem	125 kbps	250 kbps	500 kbps	1000 kbps	1000W kbps	1250 kbps
Pristine	0 - 8	0 - 16	0 - 8	0 - 4	0 - 1	0 - 1
Usable	9 - 14	17 - 21	9 - 14	5 - 6	2 - 3	2 - 3
Sensitivity (dBm) based on $1x10^{-6}$ @ XXX kbps	-105	-103	-99	-95	-95	-95

Acceptable Fade Margin Based on Reliabilty of 99.4% or 22dB.

All Unlicenced Radio Tests Used the 500kbps Modem

Good: ≥22 dB of Fade Margin

Marginal: <22dB, ≥18 dBd of Fade Margin

Poor: <18 dB, ≥10 dB of Fade Margin

No Good: < 10 dB of Fade Margin

Appendix B
CRD SCADA
Magic Lake Estates
Field Tests
Paths to Galleon PS
Spreadsheet 3 of 5

57

58

CRD Magic Lake Estates Path Analysis

Field Tesitng - 900MHz (unlicenced)

October 6, 2022

	Location	Latitude	Longitude	Bearing to	Path Length	Elevation	AGL	RSSI	LQI	IPERF	Fade Margin	Fade Margin	Reliability	Comments
		(North dms)	(West dms)	Frigate RES	(km)	(m)	(FT)	(-dBm)	(Signal	Data	500 Modem	250 Modem	500/250	
								Measured	Quality)	Speed	(dB)	(dB)	(%)	
	Paths to Frigate Reservoir									(kbps)				
1	Cutlass Pump Station	48.76131°	-123.2914°	357.5	0.97	55.4	10/20/30/40	97/99/92/89	14/17/17/14	12	10	14	92/95	Poor
2	Masthead Pump Station	48.77592°	-123.2998°	138.9	0.87	71.5	30/40	98/94	19/18	?	5	9	75/91	No Good
3	Frigate Reservoir	48.77003°	-123.29200°	-	-	130.4	42	-	-		-		-	-

Notes:

LQI / Modem	125 kbps	250 kbps	500 kbps	1000 kbps	1000W kbps	1250 kbps
Pristine	0 - 8	0 - 16	0 - 8	0 - 4	0 - 1	0 - 1
Usable	9 - 14	17 - 21	9 - 14	5 - 6	2 - 3	2 - 3
Sensitivity (dBm) based on $1x10^{-6}$ @ XXX kbps	-105	-103	-99	-95	-95	-95

Acceptable Fade Margin Based on Reliabilty of 99.4% or 22dB.

All Unlicenced Radio Tests Used the 500kbps Modem

Good: ≥22 dB of Fade Margin

Marginal: <22dB, ≥18 dBd of Fade Margin

Poor: <18 dB, ≥10 dB of Fade Margin

No Good: < 10 dB of Fade Margin

Appendix B
CRD SCADA
Magic Lake Estates
Field Tests
Paths to Frigate Reservoir
Spreadsheet 4 of 5

58

CRD Magic Lake Estates Path Analysis

Field Testing - 900MHz (unlicenced)

October 5, 2022

	Location	Latitude	Longitude	Bearing to	Path Length	Elevation	AGL	RSSI	LQI	IPERF	Fade	Fade	Reliability	Comments
		(North dms)	(West dms)	Lively Peak	(km)	(m)	(FT)	(-dBm)	(Signal	Data	Margin	Margin	500/250	
							(Bucket Truck)	Measured	Quality)	Speed	500 Modem	250 Modem	(%)	
	Paths to Lively Peak (Shaw Tower)									(kbps)	(dB)	(dB)		
1	Capstan Pump Station	48.76467°	-123.2932°	51.7	1.11	61.2	10/20/30/40/50	88/85/78/78/77	8/8/9/8/8	83@30'	22	26	99.4/99.7	**Good @ 30'**
2	Masthead Pump Station	48.77592°	-123.2998°	138.6	1.54	71.5	10/20/30/40/50	122/99/99/98/?	?/16/16/16/?	19@30'	1	5	55/75	No Good
3	Galleon Pump Station	48.77458°	-123.3026°	105.0	1.61	77.2	10/20/30/40/50	89/90/76/77/?	7/8/8/8/?	198@30'	22	26	99.4/99.7	**Good @ 30'**
4	Buccaneer Pump Station	48.76372°	-123.8254°	20.6	0.85	78.2	10/20/30/40/50	72/72/73/?/?	5/5/6/?/?	251@30'	27	31	99.8/99.23	**Good @ 10'**
5	Water Treatment Plant	48.76700°	-123.2855°	35.2	0.53	83.4	10/20/30/40/50	85/85/76/74/?	8/8/8/8/?	132@30'	25	29	99.6/99.91	**Good @ 30'**
6	Bosun Pump Station	48.77169°	-123.2938°	69.0	0.92	102.2	10/20/30/40/50	?/87/?/?/?	?/6/?/?/?	44@20'	12	16	94/97	Poor
7	Frigate Reservoir	48.77003°	-123.29200°	83.4	0.78	130.4	10/20/30/40/50	67/67/65/?/?	5/5/5/?/?	329@30'	34	38	99.95/99.99	**Good @ 10'**
8	Magic Lake Pump Station	48.76553°	-123.2859°	29.2	0.68	76.9	10/20/30/40/50	82/82/72/?/?	8/13/12/?/?	279@30'	27	31	99.8/99.23	**Good @ 30'**
9	Lively Peak	48.77083°	-123.2814°	-	-	167.9	-	-	-	-	-	-	-	-

Notes:

Acceptable Fade Margin Based on Reliabilty of 99.4% or 22dB.

All Unlicenced Radio Tests Used the 500kbps Modem Setting

LQI / Modem	125 kbps	250 kbps	500 kbps	1000 kbps	1000W kbps	1250 kbps
Pristine	0 - 8	0 - 16	0 - 8	0 - 4	0 - 1	0 - 1
Usable	9 - 14	17 - 21	9 - 14	5 - 6	2 - 3	2 - 3
Sensitivity (dBm) based on $1x10^{-6}$ @ XXX kbps	-105	-103	-99	-95	-95	-95

Good: ≥22 dB of Fade Margin

Marginal: <22dB, ≥18 dBd of Fade Margin

Poor: <18 dB, ≥10 dB of Fade Margin

No Good: < 10 dB of Fade Margin

Appendix B
CRD SCADA
Magic Lake Estates
Field Tests
Paths to Licely Peak
Spreadsheet 5 of 5

GE Energy
Digital Energy

TransNET

Long Range, High Speed Serial Communications

Data Acquisition | Compact and Unlicensed

Today's SCADA and Telemetry systems transport large amounts of data at ever-increasing speeds. Additionally, the need for greater packaging flexibility has redefined the "ideal" wireless platform. The MDS TransNET™ utilizes FHSS (Frequency Hopping Spread Spectrum) to provide reliable long range data transportation at up to 115.2 kbps. The TransNET provides transparent data communications for nearly all SCADA, Telemetry, and EFM protocols including Modbus.

Any MDS TransNET may be configured as a repeater to extend the operating range of the network. Multiple repeaters may exist at any level of the network preventing a single radio failure from disabling the entire network.

Key Benefits

- Digital signal processing (DSP) technology with self-equalization, automatic CRC/ARQ and powerful forward error correction
- Quick return on investment with plug-and-play installation
- Unlicensed radio design
- Communicate with any asynchronous protocol without extra software or additional programming
- Excellent performance in the face of interference or difficult signal paths
- Network-wide diagnostics software simplifies tasks and reduces costs

Application Specific Wireless Solution

Oil & Gas

- Remote monitoring of pipeline flow and status signals
- Monitor and transmit wellhead pressure and tank levels collected by RTUs

Energy

- Remote control of IED and PLC at distribution substations
- Condition monitoring for pole-top circuit breakers and capacitor banks

Water & Wastewater

- Monitor lift stations across multiple sites from control room

Heavy Industrial

- Activation of perimeter gates based on detection of vehicle
- Monitor and control remote pumps and compressors

imagination at work

Industrially Hardened

- Operational temperature range from –40°C to 70°C
- CSA Class I, Div. 2 groups A, B, C, D for hazardous locations

Application Flexibility

- Low power consumption sleep mode for solar powered applications
- Long range wireless communication, up to 30 miles
- High speed throughput to 115.2 Kbps

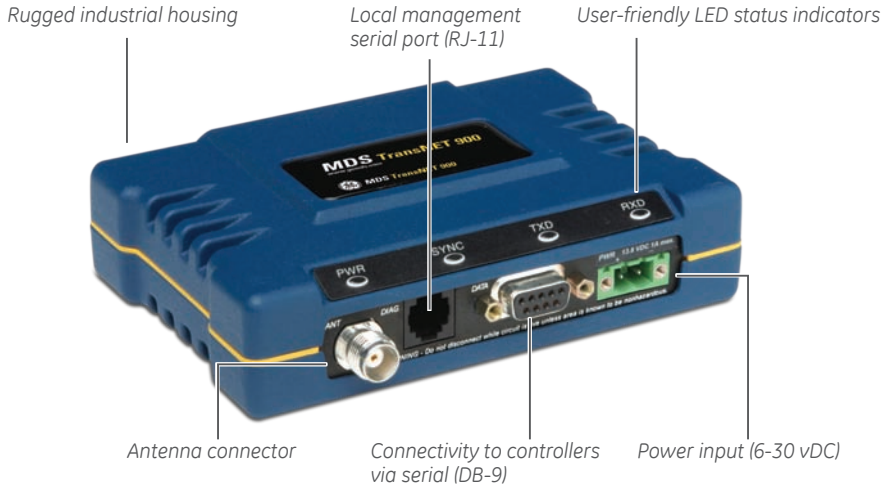
Reliable & Scalable

- Point-to-Multipoint, 2-way communication
- High receive sensitivity for noisy environments and long distances
- Compatible with multiple industry protocols including Modbus and DNP3
- Unparalleled robustness with forward error correction and CRC/ARQ multiple re-sends
- Store and forward to extend network range cost-effectively

Secure

- Proprietary hopping algorithm among 128 channels

Remote & Access Point



Specifications

GENERAL

Frequency Band	902-928 MHz ISM band
Dimensions	8.9 D x 12.7 W x 2.5 H cm. (3.5 D x 5 W x 1 H in.)
Input Power	6 to 30 Vdc
Current Drain for AP and Remote	

Mode	30 Vdc	13.8 Vdc	6 Vdc
Transmit	236 mA	510 mA	1.18 A
Receive	51 mA	100 mA	155 mA

Sleep Mode	4 mA typical
Temperature	-40° C to +70° C
Range	Up to 30 miles
Humidity	< 95% RH (Non-Condensing)

TRANSMITTER

Power Output	1 Watt (30 dBm) at 6 Vdc to 30 Vdc, user selectable down to 100 mw (+20 dBm)
Modulation	CPFSK

RECEIVER

Sensitivity	-105 dBm (1 x 10-6 BER) typical
Error Detection	CRC16; Resend on Error
Interference Avoidance	

- 64,000 hop patterns selected automatically via network address
- FEC, CRC/ARQ and/or Multiple Packet Transmits
- Excellent Strong Signal (interference) Characteristics
- Band Segmentation for Friendly Coexistence with other services such as LMS

DATA

Interface	RS-232/RS-485 (User Selectable)
Usable Throughput	115.2 kbps
Port Speeds	1.2 to 115.2 kbps

CONNECTORS

Power, User, NMS	2 Pin Phoenix, DB-9, RJ11
RF	TNC

OPERATING MODES

Point-to-Multipoint

- Master
- Remote
- Repeater Extension (store and forward) – Unlimited repeaters, self healing networks

NETWORK MANAGEMENT

- Diagnostics
- Centralized network control eliminates site visits
- Create store and forward configurations
- Compatible with other MDS Products
- MDS InSite

AGENCY APPROVALS

FCC	Part 15 Approved
UL/CSA	Class 1 Div. 2 approved (UL 508, UL 1604)
IC	Approved

Ordering

TransNET Remote and Access Point

EL805-MD	*	X	*	A	*	C	*	*	*	N	
Frequency	9										MDS 900-928 MHz long range (up to 30 miles), FCC and IC approved
	2										MDS 2.4 GHz long range (up to 15 miles), not FCC/IC/ETSI approved
Interface							0				RS-232
							1				RS-485
Diagnostics									N		None
									W		Network-wide

Order Code Example

EL805-MD**9**X1AFCS**0W**N

- Chassis-enclosed radio
- 902-928 MHz band
- RS-232 interface
- Include network diagnostics

Accessories for the TransNET

Fixed Remote Kit with Yagi	KFR-N09-D1
Power Supply (AC Input)	01-3682A02

View Accessories catalog at www.gemds.com

Visit www.GEMDS.com/TransNET to:

- Buy TransNET through the online store
- Download guideform specifications
- Download user documentation
- Read application notes and white papers

GE
Grid Solutions

DESIGNED • DEVELOPED
ASSEMBLED IN THE
USA

MDS Orbit Unlicensed Solutions

900MHz and 2.4/5 GHz Routers for Cost-Effective Industrial Deployments

Orbit's industry-leading networking and security capability as well as its support for a variety of wireless technologies and topologies position it as a single box, OPEX-saving platform for industrial networks.

GE's unlicensed wireless solutions provide exceptional performance with 900MHz or Wi-Fi to extend secure connectivity across industrial networks.

Key Benefits

- Extend industrial networks into rural and Field Area Networks using Orbit's 900MHz Unlicensed, Wi-Fi, and cellular connectivity
- High performance interference avoidance and very low latency 900MHz technologies along with advanced Quality of Service enable determinism for critical and industrial applications
- Orbit's integrated routing, switching, Quality of Service (QoS) and comprehensive security provide for flexible integration into modern networks
- A holistic cyber security framework protects the users, the network and assets and allows operators to meet stringent government and corporate cyber security requirements
- Rugged durable design, wide temperature range and low power consumption provide deployment life extension in the harshest of environments while protecting CAPEX investment

Applications

Oil & Gas

- Well head and production pad automation
- Pipeline monitoring and control
- WiFi for field operations

Water & Wastewater

- Level, pressure and flow monitoring
- Pipeline monitoring and control

Utility

- DA & AMI convergence
- Renewables protection and control with IEC® 61850
- Substation device monitoring and video surveillance

Heavy Industrial

- Heavy machinery monitoring
- Excavation machine control
- Facility-wide network extension to offsite areas

What's New

- New SFP fiber interface
- New alarm input with optional alarm sensor kit
- Configurable automatic over-the-air radio firmware upgrades
- VRF and Open VPN
- EMP hardened per MIL-STD-461G, RS105

Comprehensive Security

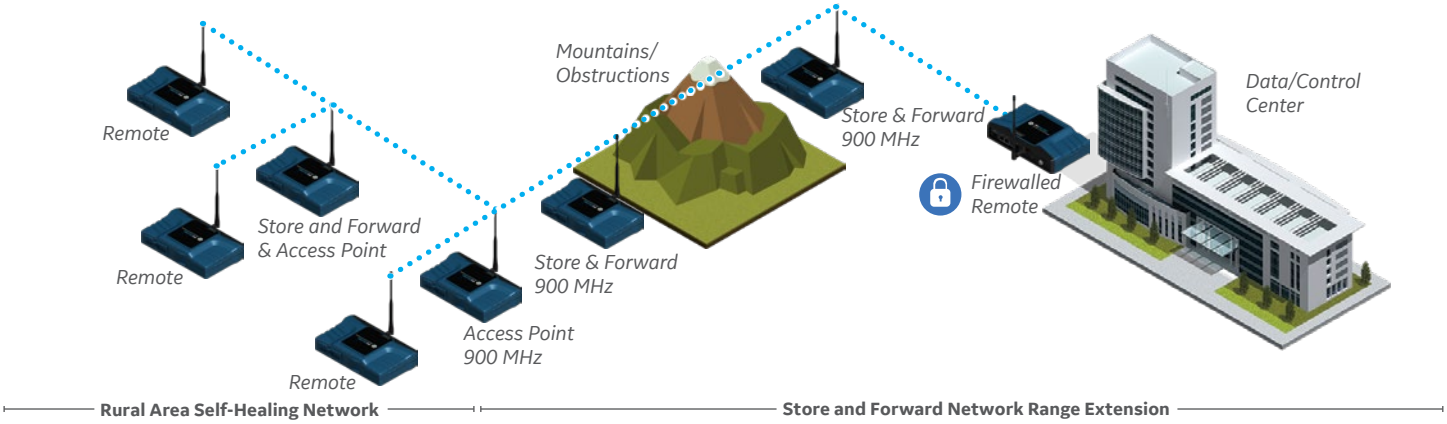
- Advanced firewall protects users and network assets against intrusion
- IPSec VPN enables secure enterprise-class encrypted communication
- Secure boot protects integrity of firmware
- Extensive X.509 digital certificate management simplifies provisioning
- Integration with enterprise systems via RADIUS, AAA, SCEP, SNMPv3 and Syslog
- FIPS 140-2 (Level 2) certified*

Deterministic Performance

- High performing 900MHz unlicensed FHSS and dual-band Wi-Fi routers
- Low latency for critical and demanding protection applications
- Advanced Quality of Service ensures deterministic application performance
- Designed to endure harsh environments:
  - Enhanced ESD protection
  - Extended temperature (-40 to +70 C)
  - Class 1/Div 2 & IEEE® 1613 compliance

The MDS Orbit Platform Models & Radio Support

MDS Orbit as Enabler for Classic Multipoint Communication with Coverage Extension Into Rural Areas



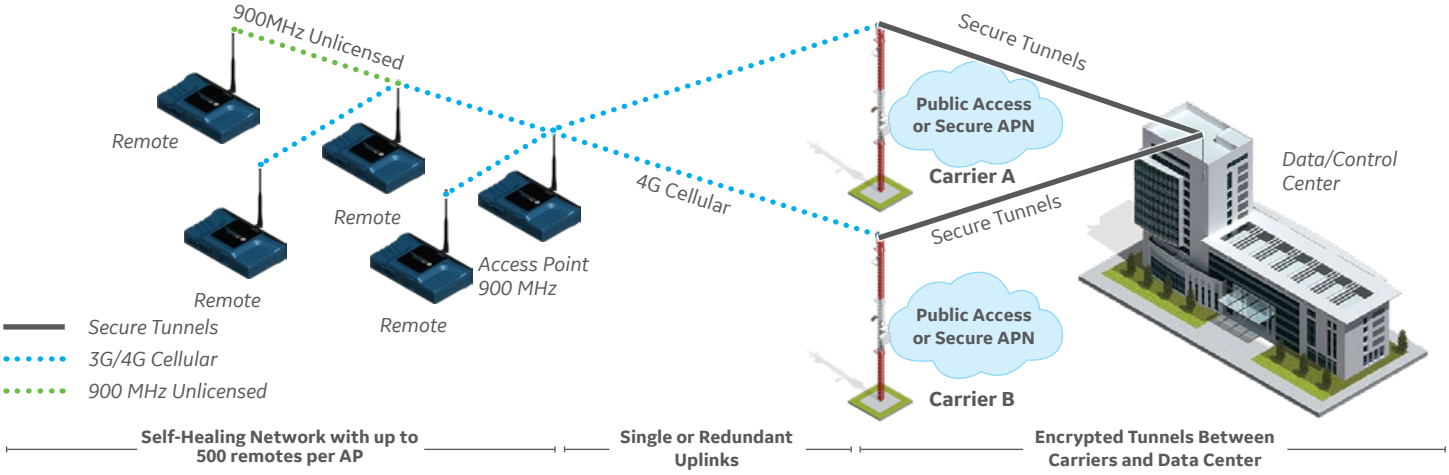
Features

- MDS Orbit's flexible 900MHz unlicensed deployment architectures as well as support of > 30 miles per segment with effective FHSS interference avoidance make it an ideal enabler for the expansion of network coverage into remote and rural areas
- A large scalability of remotes per Access Point expands network coverage into massive footprints
- High performance Store and Forward technology allows repeaters to be daisy chained for up to 8 hops in series to extend network range through mountainous or rugged terrain
- Stateful firewalling as well as RF and IPSec encryption ensure protection of data, users and network assets from intrusion

Application Examples

- Oil & gas production fields, oil pipeline monitoring & control, Distribution Automation Field Area Networks, water & waste water, municipalities

MDS Orbit as 900MHz Unlicensed Gateway with Multiple Encrypted Uplinks Through Public Carriers



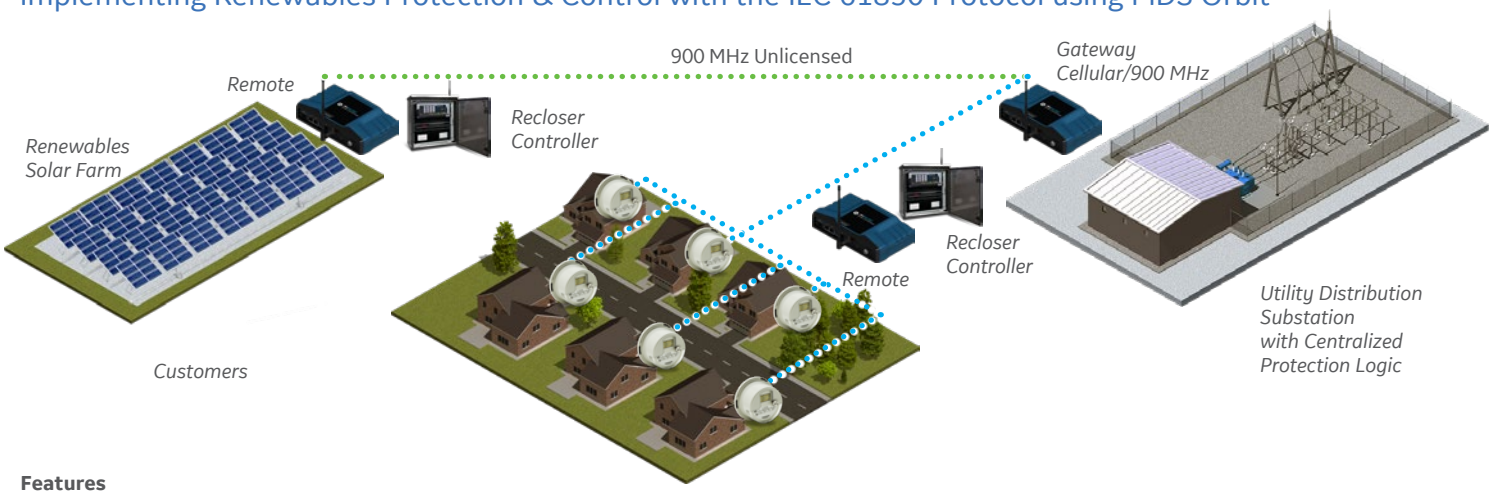
Features

- MDS Orbit MCR-900 supports a second wireless card which could be 4G LTE with 3G fallback.
- The large scalability of MDS Orbit unlicensed 900MHz remotes allows for cost effective expansion of network coverage to allows to cost-effectively expand network coverage to hundreds of sites with a single cellular uplink thus saving on OPEX by eliminating recurring per-site cellular subscription fees
- Stateful firewalling as well IPSec encryption can be applied on 900MHz or Cellular links to augment network security for critical applications and protect against intrusions

Application Examples

- Advanced Metering Infrastructure (AMI) gateways, Distribution Automation Field Area Networks, water & waste water, municipalities, oil & gas production fields

Implementing Renewables Protection & Control with the IEC 61850 Protocol using MDS Orbit



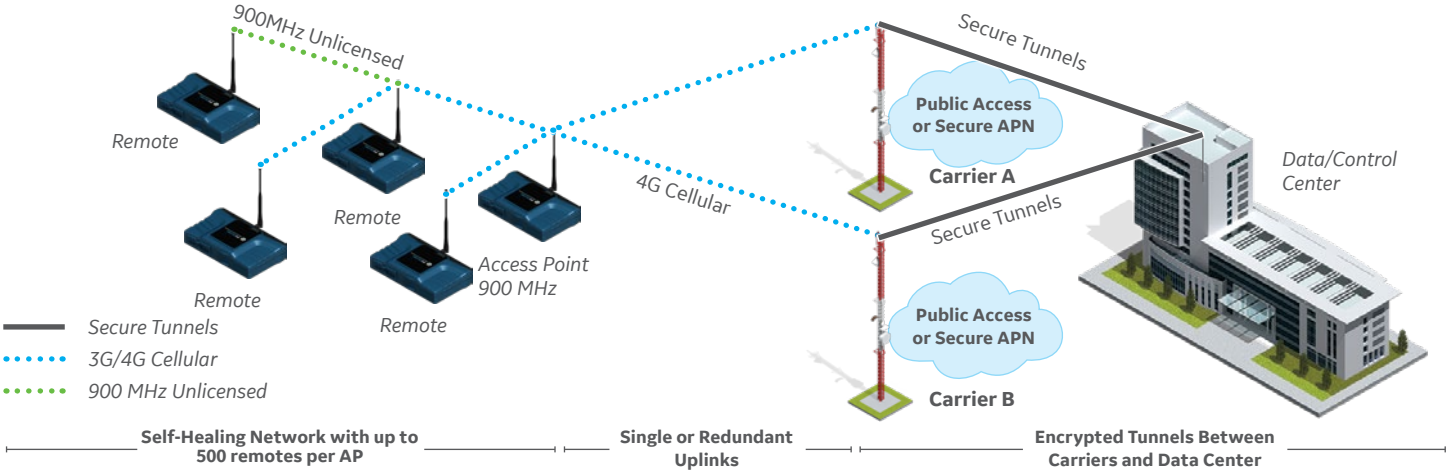
Features

- MDS Orbit's high performance 900MHz unlicensed technology can transport IEC 61850 GOOSE Ethernet frames natively. It allows for data rates of up to 1.25Mbps with a latency tunable to as low as 5msec. This along with advanced Quality of Service facilitate advanced Distribution Automation applications such as Renewables/Distributed generation Protection & Control which demand low latency and network determinism
- A large scalability of remote enables cost-effective coverage of large customer and asset footprints
- Stateful firewalling as well as RF and IPSec encryption enable network operators to meet NERC® CIP / EPCIP and other stringent cyber security requirements by encrypting communication links and protecting network assets and users against intrusion

Application Examples

- Distributed Generation/Renewables Protection & Control, Distribution Automation, critical infrastructure control, other protection applications

MDS Orbit as a Network Convergence Enabler for Multiple Simultaneous Applications



Features

- MDS Orbit supports advanced QoS functionality which allow it to prioritize egress traffic based on Layer 2- Layer 4 classifications. In this fashion, critical applications are assigned to the priority queue and are switched first to meet application requirements.
- Orbit is capable of up to 5 site-to-site IPSec VPN tunnels per device which give it flexibility to secure critical application paths as needed. Furthermore, Orbit supports a stateful firewall to protect the network and assets against intrusion.
- Orbit's support of multiple wireless and networking technologies make it an ideal network convergence platform.

Application Examples

- Converged Distribution Automation (Protection, Control, SCADA, Metering, AMI etc..), Oil & Gas production fields (SCADA, control, Workforce, Video Monitoring)

MDS Orbit Unlicensed Specifications

900 MHZ UNLICENSED

- Operating Modes: Access Point, Remote, Store & Forward
- Technology: Point-to-Point, Point-to-multipoint,
- Data Rates/Sensitivity:
  - 125 Kbps/-105 dBm
  - 250 Kbps/-103 dBm
  - 500 Kbps/-99 dBm
  - 1.0 Mbps/-95 dBm
  - 1.25 Mbps/-95 dBm
- Latency: tunable to <5 msec one-way
- Output Impedance: 50 Ohms
- Frequency: 902-928 MHz
- Frequency Masks: 16 masks, up to 5 channels per mask
- Spreading method: FHSS, DTS
- Occupied Bandwidth 152 to 1320 kHz, up to 80 channels
- Modulation 2, 4-level GFSK, Dwell Time 10-300 msec
- Carrier Power 100 mW – 1W, Range > 30 miles
- Media Access: Patent pending proprietary design, advanced interference avoidance, error detection, retransmission, auto repeat guaranteed collision free data, and dynamic fragmentation
- Input Voltage 10 to 60 VDC
- Typical Power Consumption:

	AP	REMOTE
Idle	4.0W	3.2W
50% Duty Cycle	5.3W	5.0W

WI-FI OPTIONS

IEEE 802.11 b/g/n 2.4 GHz option:

- 1x1 SISO (single antenna/radio chain)
- Scalability up to 2 SSIDs, up to 7 clients/stations
- Max transmit power (adjustable): up to 20dBm
- Operating modes: Access Point (AP), Station, Station bridging
- Security: WPA/WPA2 PSK, Enterprise
- Applications:
  - Local configuration and management using Wi-Fi devices
  - Station/client connecting to a 2.4GHz AP in outdoor LOS environment
  - Small-scale 2.4GHz AP operating in outdoor LOS environment

IEEE 802.11 a/b/g/n Dual-Band 2.4/5 GHz option:

- 2x2 MIMO (dual antenna/radio chain)
- Scalability up to 2 SSIDs, up to 32+ clients/stations
- Max transmit power (adjustable): up to 26dBm (23dBm per antenna/chain) for 2.4GHz and 23dBm (20dBm per antenna/ chain) for 5GHz
- 5GHz (U-NII-1 and U-NII-3 bands supported)
- Operating modes: Access Point, Station, Station bridging, Access-Point-Station (simultaneous AP and Station operation)
- Security: WPA/WPA2 PSK, Enterprise
- Applications:
  - Local configuration and management using Wi-Fi devices
  - Station/client connecting to a 2.4Ghz/5Ghz AP in indoor/outdoor LOS/NLOS environment
  - Large-scale AP operating in indoor/outdoor LOS/NLOS environment

CELLULAR OPTIONS

- Includes dual SIM, GSMA eSIM, GPS, and 3G fallback
- 4GY: 4G LTE-A NAM/EMEA/LATAM - Anterix™ 900 MHz, AT&T, Verizon, US Cellular*, Bell, Telus, Rogers*, Vodafone, FCC, PTCRB, CE, GCF
- 4GB: 4G LTE-A Pro - US - FirstNet Ready™, CBRS - AT&T, Verizon, FCC, IC, PTCRB
- 4GA: 4G LTE-A Pro Brazil/Australia - Telstra, GCF, Anatel, RCM/ACMA
- 4GD: 4G LTE with 2G/3G fallback - EMEA/LATAM - CE, GCF, Anatel
- See MDS Orbit Cellular brochure for more details

CYBER SECURITY

- Tunneling: IPSec VPN compatible with Enterprise VPN concentrators
- Firewall: Stateful Packet Inspection Layer 2-4, Access Control Lists, NAT
- 900 unlicensed Encryption: AES-CCM 128/256 bit with auto key rotation
- Authentication: RADIUS, PSK, EAP/TLS, PKI
- Certificates: X.509, SCEP, PEM, DER
- Boot Security: Digitally signed firmware
- FIPS 140-2 (Level 2) certified*

NETWORKING TECHNOLOGIES

- Full IEEE 802.3 Layer 2 switching with Spanning Tree, VLANs, IGMP
- Layer 3 static routing
- Routing and Bridging from/to any interface (as applicable)
- Advanced L2-L4 Quality of Service
- Protocols: NAT, DHCP, ICMP, UDP, TCP, ARP, NTP, FTP, SFTP, TFTP, DNS
- Serial: TCP server, Modbus/TCP, Modbus RTU, TCP client, UDP Unicast and Multicast, BSAP, and DNP3
- VRF and Open VPN

MANAGEMENT

- HTTP, HTTPS, SSH, NETCONF, local console
- SNMPv1/v2/v3, MIB-II, Enterprise MIB
- Syslog and Syslog-over-TLS, MDS PulseNET compatible

ENVIRONMENTAL & AGENCY APPROVALS

- EMP: MIL-STD-461G, RS105 Electro Magnetic Pulse
- Operating Temperature: -40° to 70° C (-40° to 158° F) 900 MHz modem
- Humidity: 95% at 60° C (140° F) non-condensing
- Case: Die Cast Aluminum
- Dimensions: (1.75 H x 8.0 W x 4.8 D in.) | Weight: 2 lbs
- Mounting Options: Integrated DIN Rail mount, Standard bracket
- FCC Part 15, IC, ETSI / CE (3G and WiFi models)
- CSA Class 1, Div. 2, CSA C22.2 No. 142-M1987 & 213-M1987
- IEEE 1613**, IEC 61850-3
- UL as it is in process and will be complete by time of publication also required for GE2GE opportunities

* Check with local sales representative for availability.

** Requires an external DC to DC converter having floating DC inputs (neither side grounded)

GE

175 Science Parkway
Rochester, NY 14620
Tel: +1-844-379-9630

GEGridSolutions.com/Communications

GEA-12812A(E)
English
210409

APPENDIX A

GE
Grid Solutions

MDS Orbit Licensed Solutions

High Speed, Long Range, Exceptional Performance for Licensed Wireless Networks

The constant evolution of industrial SCADA applications coupled with the ever increasing scale of asset deployment cause significant challenges on underlying licensed narrowband networks. Such networks need to offer an always-on connectivity to maximize application availability. They must provide a comprehensive framework of security in order to guard against the intensified waves of cyber attacks. Finally, the wireless networks must enable advanced performance in order to scale and support modern TCP/IP applications.

The GE MDS Orbit is an industrial-strength wireless router platform that helps overcome the challenges of deploying modern industrial automation applications. In addition to enabling high performance communication over the 900Mhz, 700Mhz, 400 MHz, 200MHz* and 100 MHz* licensed narrowband spectrum, the Orbit platform offers a diverse range of integrated secondary radio options including cellular, Unlicensed 900MHz ISM as well as Wi-Fi.

Key Benefits

- Repurpose narrowband spectrum for more bandwidth-intensive IP applications using QAM modulation
- Provide backward compatibility with GE MDS SD Series or legacy GE MDS x710 radios to seamlessly expand or migrate networks
- Minimize network downtime with dual radio uplinks and other redundancy features
- Protect network and assets against intrusion with powerful cyber security capabilities
- Simplify operations, reduce learning curves and reduce cost by unifying the deployment of multiple wireless technologies on a single platform

Applications

Oil & Gas
- Well Head and Production Pad Controllers & Metering Automation
- Remote Field Office Connectivity

Water & Wastewater
- Monitoring and Control
- Maintenance Workforce Mobility

Emergency & Utility Vehicles
- Law enforcement connectivity
- Utility Workforce Mobility

Electric Utilities
- Field Area Network
- AMI Backhaul
- Workforce Mobility

Smart Cities & Municipalities
- Traffic Signals Control
- Video Security
- Weather Monitoring Stations

Heavy Industrial
- Train Control and Machinery Monitoring
- Excavation Machine Control

Exceptional Network Performance

- Up to 64QAM of modulation enables newer applications in narrowband networks
- Bi-directional per-packet, per-remote Adaptive Modulation maximizes network throughput in uplink and downlink directions
- IP Header and Payload compression improve efficiency by up to 30%

Advanced Security and Networking

- Enterprise-class cyber security including VPNs, key rotation, firewalling and centralized authentication for advanced protection
- FIPS 140-2 (Level 2) certification*
- Rich Quality of Service allows for various modes of traffic prioritization in addition to per-application bandwidth allocation

Platform Flexibility

- Backward-compatibility with GE MDS SD Series and x710 networks for a seamless migration path
- Variety of form factors with single or dual radio configurations

Industry Leading Reliability

- A patented Media Access Control guarantees message delivery and eliminates collision at the Access Point
- Various uplink redundancy options, including cellular backup to improve network availability
- 3rd party Certified for IEEE1613, IEC61850-3, ATEX and Class 1 Div 2 for deployment in harsh environments

66

Exceptional Network Performance

Improved productivity, optimization, preventive maintenance, quality control, regulatory compliance, safety and security are just a few of the requirements that drive the need to for high performance networks to support multiple applications and deliver actionable data collected from remote, geographically dispersed assets.

The GE MDS Orbit Licensed radio solutions bring new levels of networking performance to users operating narrowband licensed networks in 6.26, 12.5, 25, and 50* kHz channels.

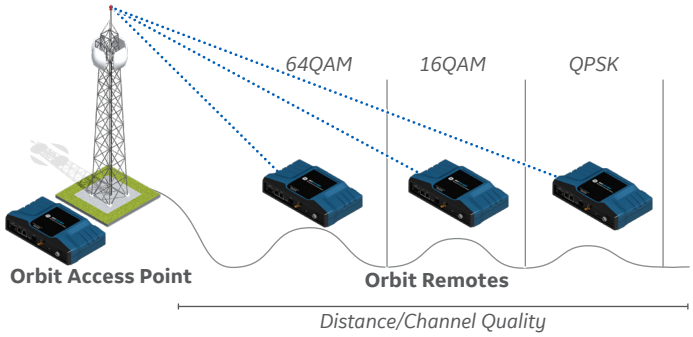
Enhanced QAM Modulations

The GE MDS Orbit platform implements QAM modulation to achieve raw data rates up to 6 times faster than traditional FSK modulations variants typically utilized in legacy narrowband networks. With QAM modulation significant improvements in gross data rates can be achieved and can be improved even further with Orbits real-time compression on application data and underlying transport protocols such as IP.

CHANNEL SIZE	LEGACY SPEED	QPSK	16QAM	32QAM	64QAM	ORBIT ADVANCED MAC MODE THROUGHPUT [1]
6.25 kHz	4.8 kbps	9.6 kbps	19.2 kbps	24 kbps	28.8 kbps	174 kbps
12.5 kHz	9.6 kbps	20 kbps	40 kbps	50 kbps	60 kbp	400 kbps
25.0 kHz	19.2 kbps	40 kbps	80 kbps	100 kbps	120 kbps	758 kbps
50.0 kHz	38.4 kbps	80 kbps	160 kbps	200 kbps	240 kbps	1.37 Mbps

[1] Maximum TCP Throughput measured with Orbit configured for Advanced MAC Mode with Adaptive FEC, Adaptive Coded Modulation, Ethernet Header Compression, RHOC TCP, UDP, IP Compression, LZO Data Compression, Packet Concatenation, Iperf TCP Server.

Bi-Directional Adaptive Modulation



Bi-Directional Adaptive modulation maximizes throughput in both upstream and downstream directions for each remote independently. It enables Access Points and Remotes to transmit data at the highest possible modulation in real time, on a per-packet basis. The outcome is a network that does not sacrifice its overall performance for the least common denominator link.

IP Header and Payload Compression

Orbit's IP Header and Payload compression improves network throughput efficiency by up to 30%. It is especially beneficial when using TCP based applications that tend to have a lot of handshaking, thus overhead.

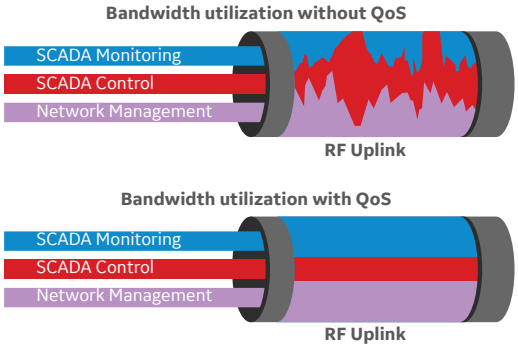
Advanced Security & Networking

Enterprise Class Security

The MDS Orbit platform is built on a comprehensive cyber security framework to enable the deployment of highly secure industrial applications. It offers standards-based IPSec VPN and DMVPN capabilities to ensure end-to-end IP encryption between remotes and headend regardless of the underlying backhaul. As an added layer of security, Orbit supports the encryption of licensed radio links at the RF layer with secure key rotation algorithms. Centralized RADIUS authentication and 802.1x enable only authorized users and machines to access the network at the intended entry points and times. Orbit's stateful firewall and MAC-filtering block unwanted traffic from flowing through the network. Orbit also employs secure device practices such as Secure Firmware and Secure Boot to protects against the tampering with its hardware and software.

Dynamic Routing and Quality of Service

Orbit's support for dynamic and static routing as well as managed switch capabilities facilitate the deployment in a multitude of network architectures. Orbit's advanced QoS functionality enable the transport of multiple application streams in the same network without compromising the performance of critical traffic. With fair and priority queuing, and traffic shaping, Orbit offers choices to engineer traffic priorities and carve dedicated bandwidth on a per-application basis in order to maximize application performance and adhere to Service Level Agreements (SLAs).



Platform Flexibility

Variety of Form Factors

To help extend communications to a variety of enclosure systems, Orbit is offered in compact (ECR) and standard (MCR) form factors. They can be factory-configured with different interface and radio combinations.

Diverse Radio Technologies

In addition to being offered in licensed spectrum, the Orbit platform supports communication in unlicensed 900Mhz, cellular technology as well as WiFi. Orbit can be factory-configured with single or dual-radios. This allows customers to deploy various radio technologies on the same platform, firmware and user experience thus standardizing operations, reducing cost and learning curves.

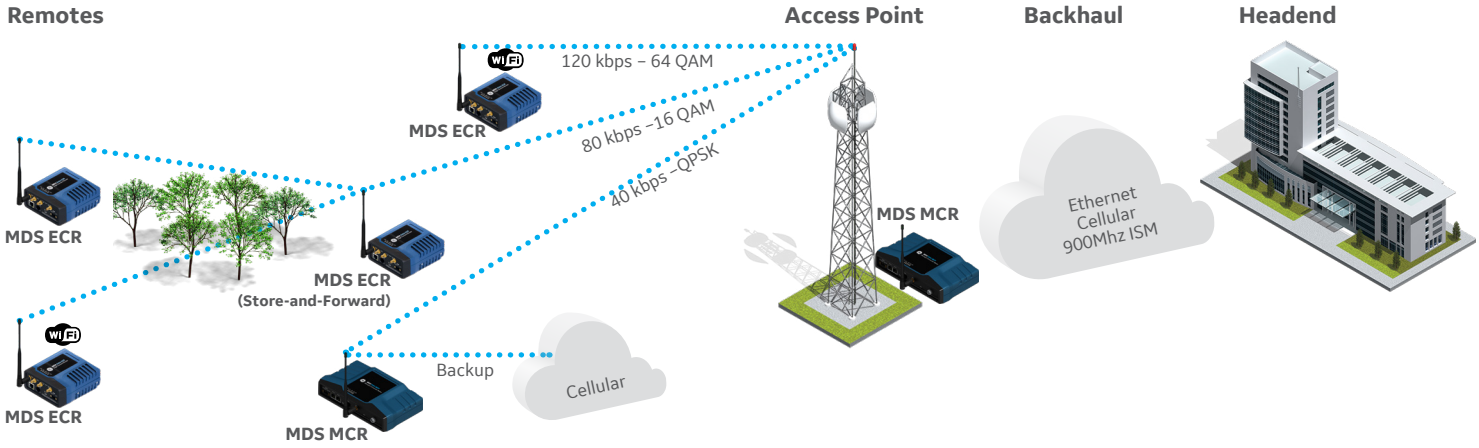
Backward Compatibility with MDS SD and x710

The MDS Orbit licensed narrowband radio can operate in a CPFSK Digital A backward compatible modulation to interface with existing MDS SD Series or x710 Access Points. Supporting Transparent (serial streaming) as well as Packet-with-Mac (IP) modes, this capability enables customers to seamlessly expand or migrate brownfield networks with minimum disruption.

Integration with MDS Master Station

Orbit's Licensed Narrowband radio technology integrates seamlessly with the MDS Master Station. The Master Station is a fully redundant solution for licensed communications, offering dual power supplies, dual radios, an integrated duplexer and with no cooling fans or moving parts.

Application Example



Access Interfaces

- Connect multiple RTU and Controller types to a single remote radio
- Access interfaces include Ethernet, Serial, and an optional WiFi

Performance

- Use QoS to prioritize critical SCADA over lower priority traffic
- Adaptive modulation automatically adjusts optimum speed in both directions
- A patented MAC enables network scalability with minimized impact on performance

Security

- Firewalling and MAC filtering block unwanted traffic at the network perimeter
- RF and IPSec VPN encryptions provide options for end to end communication security
- 802.1x at remote locations allow network access to only authorized users and machines

Industry Leading Reliability

A Patented Media Access Control

Media Access Control (MAC) is a mechanism that orchestrates and manages how devices access a network to transmit data. Orbit's patented MAC maintains optimal throughput as more devices and applications are added to the network. It further guarantees the delivery of data packets to intended destinations and eliminates data collision at the Access Point.

Network High Availability

To achieve maximum application uptime, Orbit supports a variety of High Availability mechanisms to enable multiple uplink paths. The Orbit platform supports dual radio configurations, such as Licensed Narrowband and Cellular, interface bonding, Spanning Tree, Layer 3 failover, VRRP as well as latency and packet-loss based failover. GRE tunneling coupled with IPSec VPNs and DMVPN further enable the establishment of secure Virtual Private Networks (VPN) across any wireless technology.

Ease of Use and Management

Intuitive User Interface

An easy-to-use Graphical User Interface (GUI) allows for the quick provisioning and maintenance from a web browser. Orbit supports HTTP, HTTPS, and SSH. Orbit's wizards speed up the configuration of complex network functionality by breaking down processes into simple, concise and automated steps.

Network Management

The Orbit platform supports standards based management using SNMPv1/2c/3, MIN-II and Enterprise MIB. NETCONF is also supported. The GE MDS PulseNET NMS fully integrates with Orbit to offer advanced network as well as device management capabilities. PulseNet enables auto-provisioning to simplify network deployment and reduce operation expenses.

Orbit ECR and MCR Licensed Spectrum Models Comparison

FORM FACTOR	PRIMARY LICENSED RADIO OPTIONS	SECONDARY RADIO OPTIONS	COMMUNICATION PORTS	MOUNTING
MCR 	150-174 MHz*, 216-235 MHz* 330-406 MHz, 406-470 MHz, 450-520 MHz*, 757-758 & 787-788 MHz, 896-960 MHz	WiFi, 2G/3G/4G LTE 2G/3G GSM World Unlicensed 900 MHz (some combinations not supported)	Option A: 2 Ethernet, 1 Serial, 1 USB Option B: 1 Ethernet, 2 Serial, 1 USBOption C: 4 Ethernet, 2 Serial, 1 USB	Surface Mount DIN Mount Option
ECR 	150-174 MHz*, 216-235 MHz*, 330-406 MHz, 406-470 MHz, 450-520 MHz*, 757-758 & 787-788 MHz, 896-960 MHz	WiFi	1 Ethernet, 1 Serial, 1 USB	Surface Mount DIN Mount Option

69

APPENDIX A

Specifications

ORBIT LICENSED NARROWBAND TECHNOLOGY

Module Configuration	Single
Frequency	Configurable
Duplex Modes	Half duplex
Modulation	CPFSK, QPSK, 16QAM, 64QAM
Adaptive Modulation	Per-packet, per-remote, bi-directional
Dynamic FEC: Compression	Convolutional, Reed Solomon IP Header and Payload with up to 30% efficiency improvement
Media Access Control	High performance MAC

ORBIT LICENSED NARROWBAND FREQUENCY BANDS

- 150-174 MHz*
- 216-235 MHz*
- 330 - 406 MHz
- 406.1 MHz – 470 MHz
- 450 MHz – 520 MHz*
- 757-758 and 787-788 MHz
- 896 – 960 MHz

GROSS DATA RATES (ALL FREQUENCIES)

Channel	32QAM	64QAM	Orbit Advanced MAC Mode [2]
6.25 kHz	24 kbps	28.8 kbps	174 kbps
12.5 kHz	50 kbps	60 kbps	400 kbps
25 kHz	100 kbps	120 kbps	758 kbps
50 kHz	200 kbps	240 kbps	1.37 Mbps

[2] Maximum TCP throughput measured with Orbit configured for Advanced MAC Mode with Adaptive FEC, Adaptive Coded Modulation, Ethernet Header Compression, RHOC TCP, UDP, IP Compression, LZO Data Compression, Packet Concatenation, Iperf TCP Server.

TRANSMITTER CHARACTERISTICS

Frequency Stability	+/- 0.5 ppm
Peak Carrier Power	+40 dBm 330-470 MHz +39.5 dBm 896-9160 MHz
Average Power (Programmable)	QPSK: +36 dBm 16QAM: +33 dBm 64QAM: +33 dBm
Power Range	+20dBm to +40dBm
Carrier Power Accuracy	(+/- 1.5 dB typical)
Adjacent Channel Power	< -60 dB
Output Impedance	50 Ohms

RECEIVER CHARACTERISTICS

Type	Direct Conversion
Adjacent Channel Rejection	60 dB nominal
Sensitivity (Actual)	@ 1x10-6 BER, No FEC

Channel	QPSK	16QAM	64QAM
12.5 kHz	-112 dBm	-102 dBm	-95 dBm
25 kHz	-109 dBm	-99 dBm	-92 dBm

Sensitivity (Actual) @ 1x10-6 BER, No FEC

Channel	QPSK	16QAM	64QAM
12.5 kHz	-115 dBm	-109 dBm	-102 dBm
25 kHz	-112 dBm	-106 dBm	-99 dBm

AGENCY APPROVALS / STANDARDS

- FCC Part 15 and IC
- ETSI / CE
- PTCRB, GCF
- IEEE 1613**, IEC61850-3
- CSA Class 1, Div. 2, UL 508, UL 1604
- ATEX approval for EU on MCR
- EN 60079-0:2012, EN60079-15:2010
- Shock: MIL-STD-810F Method 516.5
- Vibration: MIL-STD-810F Method 514.5
- Shock and Vibration: EIA RS374A
- Storage Temp: Mil-Std 810F Section 501.4 with 1 week soak test
- IP 40/41 per IEC 60529 for Vertical Falling Water and Pollution 3 for Dust

** Planned future release. Roadmap items subject to change.*

*** Requires an external DC to DC converter having floating DC inputs (neither side grounded)*

NETWORKING

- IPv4 Routing OSPF, EBGP, RIPv2 with performance-based route failover
- IPv6 Routing*
- Full managed switch capability, IEEE 802.3, 802.1Q/VLANs, 64 VLANs, STP
- Concurrent Bridging & Routing
- GRE Tunneling with Layer 2 (Ethernet) and Layer 3 support
- Route/path failover between any two wireless/Ethernet interfaces based on link loss, latency degradation or packet loss thresholds
- Quality of Service 16 egress queues, Priority Queuing, Fair Queuing, Traffic Shaping, Classification based on DSCP, 802.1p and Layer 2-4 classifiers
- IP Protocols TCP, UDP, ARP, DHCP, ICMP, NTP, FTP, SFTP, TFTP, DNS, configurable HTPP and HTTPS, SSH
- Serial TCP server, Modbus/TCP, Modbus RTU, TCP client, UDP Unicast and Multicast, BSAP, and DNP3

SECURITY

- IPSec VPN Server (responder) and Client (initiator) with DMVPN
- Authentication Public Key, EAPTLS, Pre-Shared, Ike 1-2
- Encryption : 3DES, AES 128/192/256, CBC, CTR, CCM, GCM, SHA 256/384/512 HMAC
- Firewalling: Stateful Layer 3-4 Firewall with MAC Filtering, NAT, Source NAT (Masquerading), Static NAT, Port Forwarding
- Device Security : Secure Boot, Secure Firmware, Digitally Signed Hardware and Software, Magnetometer Tamper Detection
- Certificate Management: X.509, SCEP, PEM, DER, RSA
- User Authentication: Local RBAC, AAA/RADIUS, 802.1x
- FIPS 140-2 (Level 2) certification in progress

MANAGEMENT

- GE MDS PulseNET NMS Support with device management and auto-provisioning
- GUI configuration Wizards to simplify operation
- Secure device management via an intuitive web-based GUI and/or CLI
- Event logging, Syslog-over-TSL, SSH, Console
- Iperf throughput diagnostic, NETCONF
- SNMP v1/2c/3, MIB-II, Enterprise MIB

MECHANICAL

Case	Rugged die-cast aluminum
Dimensions MCR	1.75 H x 8.0 W x 4.8 D in. 4.45 H x 20.32 W x 12.19 D cm
Weight MCR	2 lbs., .91 kg
Dimensions ECR	2.1 H x 4.3 W x 4.6 D in. 5.33 H x 10.92 W x 11.68 D cm
Weight ECR	1.45 lbs., .65 kg

ENVIRONMENTAL

- Operating Temp -40° to +70° C (-40° 158°F)
- Storage Temp -40° to +85° C (-40° 185°F)
- Humidity 95% at 60° C (140° F) non-condensing

WARRANTY

- 5-year standard manufacturer warranty on all Orbit MCR/ECR models

SECONDARY RADIO OPTIONS

Unlicensed 900Mhz ISM

- Frequency Bands: 902-928 MHz FHSS
- Bandwidth 152 to 1320 kHz, up to 80 channels
- Modulation: 2, 4-level GFSK, Adaptive
- Raw Data Rates: 125kbps, 250kbps, 500 kbps, 1000 kbps, 1250 kbps
- Latency of < 5 msec
- TX Power: 1 watt, configurable

Cellular

- 2G/3G GSM World (AT&T, GSM, world coverage)
- 2G/3G/4G LTE North America with GPS:. Verizon, AT&T, T-Mobile, Bell Canada, Rogers, Telus. Modem allows switching between carriers by upgrading to corresponding carrier profile firmware.
- 2G/3G/4G LTE EMEA & APAC with GPS
- 2G/3G/4G LTE Australia Telstra with GPS
- LTE Private Band 26

Wi-Fi

- 802.11 b/g/n operating at 2.4 GHz
- Up to 52 Mbps of throughput
- Operating Modes: AP, Client/Station

ORBIT MODEL INTERFACES

MCR Option A	(2) 10/100 Ethernet, RJ45 (1) RS232/485 Serial, RJ45 (1) mini USB 2.0
MCR Option B	(1) 10/100 Ethernet, RJ45 (2) RS232/485 Serial, RJ45 (1) mini USB 2.0
MCR Option C	(4) 10/100 Ethernet, RJ45 (2) RS232/485 Serial, RJ45 (1) mini USB 2.0
ECR	(1) 10/100 Ethernet, RJ45 (1) RS232/485 Serial, RJ45 (1) mini USB 2.0
Antenna Connectors	Licensed NB:TNC 900Mhz Unlic: TNC Wi-Fi: RP-SMA Cellular: SMA GPS: SMA female

ELECTRICAL & POWER CONSUMPTION

- Input Voltage 10 to 60 VDC
- Power Consumption Calculations with nominal 25C at 13.8V

With 3G GSM World	Power	13.8V
Connected (Idle)	2.5W	182mA
Typical download	3.2W	235mA
With 4G LTE	**Power**	**13.8V**
Connected (Idle)	4.0W	292mA
Typical download	4.3W	310mA
With 4G LTE + Wi-Fi	**Power**	**13.8V**
Connected (Idle)	4.8W	350mA
Typical download	5.5W	400mA
With 900Mhz ISM	**Power**	**13.8V**
Typical	3.2 W	232mA
Maximum	5.3 W	385mA
With Licensed NB	**AP**	**Remote**
Idle	910 mA	350 mA
50% Duty Cycle	950 mA	780 mA

** check with sales for availability*

69

70

APPENDIX A

GE

175 Science Parkway
Rochester, NY 14620
Tel: +1-585-242-9600

GEGridSolutions.com/Communications

GEA-12931D(E)
English
220325

Making a difference...together

REPORT TO MAGIC LAKE ESTATES WATER AND SEWER COMMITTEE
MEETING OF TUESDAY, NOVEMBER 29, 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 October 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 Section.

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.
- Design was completed.
- Tendering closed on June 29, 2022 but no bids were received. .
- CRD had discussions with potential bidders who may be interested in providing quotations for this scope, only PIM was interested in bidding.
- Recommendation to Award to PIM was signed off on November 4, 2022. Contract to follow.

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
Original Tender Closing (no bids)	June 29, 2022
Subsequent bid and Recommendation to Award to PIM	November 4, 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. This was reviewed during the 2022 annual inspection and a scope for warning signage is being proposed to be installed in 2023.
- 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. A draft report was submitted on July 14, 2022 and CRD has returned comments. Final report and recommendations are expected by the end of 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
Draft Dam Breach Analysis Complete and Comments returned	July 14, 2022

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 Capstan Crescent, Schooner Way and Privateers, Rum Road, Schooner Way and Ketch Road, Bosun Way, and 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 has completed three of the six valves and determined two of the sites no longer require replacement due to increased corrective maintenance. The last remaining valve will be replaced in early 2023.

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 Waterand 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 Service.

Project Update and Milestones:

- Project delivery is currently being planned with CRD Facilities and Operations.
- This project is now anticipated to be delivered in late 2023 to align with anticipated delivery time of electric vehicles.

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

OPERATIONAL UPDATE

This is an operational update report for June to October 2022.

- SCADA server corrective maintenance/improvement to address poor remote monitoring conditions.
- Water Treatment Plant:
  - emergency lighting corrective maintenance
  - treatment train 1 skimmer gear box replacement
  - backwash water magnetic flow meter corrective maintenance
  - backwash water pump 1 corrective maintenance
  - Pump alignment corrective maintenance required on several pumps identified during preventative maintenance.
- Completion of the Magic Lake Estates Water Treatment Plant fire safety plan.
- Completion of 80% of the fire hydrant preventative maintenance program.
- Watermain leak repairs:
  - Frigate Road
- Service line leak repairs:
  - Bosun Way
  - Galleon Way
  - Privateers
- Captains Reservoir water level transducer corrective maintenance
- Captains Reservoir roof structural assessment.
- Paving completed at Schooner Way from a watermain leak repair in 2021.
- Frigate Reservoir danger tree removal.
  Operational adjustments undertaken due to a significant raw water quality cyanobacterial algae bloom event for both Buck Lake and Magic Lake. Adjustments included not using Magic Lake raw water supply for a period and turning off the Buck Lake potassium permanganate peroxidation treatment process in order to address the risks associated with the algae bloom.

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. See September 13, 2022 Progress Report for reference on estimated funds that could be available depending on tender results.

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:

- Refer to the previous September 13, 2022 Progress Report for reference.
- McElhanney has completed the 80% detailed design drawings and are finalizing the technical specifications.
- The Standby Generator pre-purchase tender has closed and four tenders were received. The lowest tender, by Total Power Ltd., was $146,590 (plus GST) for 2 gensets (Schooner WWTP and Galleon PS). The tender amount is under the recent preliminary design budget estimate prepared by McElhanney.
- The other two pre-purchase tenders (membrane bioreactor and screening/aeration) have been issued and will close in late November.
- The tender for construction of the WWTP and pump station upgrades will be issued in January, 2023.
- As part of the permitting process with the Ministry of Environmental, we have been informed that the Schooner WWTP site is considered a wetland and we are required to prepare an Environmental Impact Assessment and obtain approval from the Ministry prior to disturbing the land. This was not anticipated in the original project scope and could cost in the order of $30-40,000 to complete which will be funded from the project contingency allowance.
- Overall, the project schedule has slipped a bit but the project is still anticipated to be substantially complete by the end of 2023.

Milestone	Completion Date
Preliminary Design (30%)	August 31, 2022
Detailed Design (80%)	November 15, 2022
Tender Period	January 31, 2023
Construction (Substantial Completion)	December 31, 2023
Warranty Period	December 31, 2025

OPERATIONAL UPDATE

This is an operational update report for June to October 2022.

- Chart Drive pump station check valve corrective maintenance and pump replacement
- Chart Drive pump station level control adjustments to address wastewater odours within the downstream wastewater collection system.
- Sewer lateral repairs at:
  - Pirates Road
  - Galley Crescent
- Environmental Incident Reporting (EIR) issued for Schooner Wastewater Treatment Plant non-compliance effluent quality.

Table 1: Operating Permit Regulatory Non-compliance reporting for June to October 2022

Facility	October Reports Issued	Reports YTD 2022	Total Reports 2021	Cause
Schooner WWTP	3	11	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	6	52	Exceeding maximum daily flows due to storm water entering through I&I. However other non-compliances can be • Permit exceedance: total suspended solids (TSS) (<60mg/l) and carbonaceous biochemical oxygen demand (CBOD) (<45mg/l) • Toxicity testing

RECOMMENDATION

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

Submitted by:	Jared Kelly, P.Eng., Manager, Capital Projects
Submitted by:	Malcolm Cowley, P.Eng., Manager, Wastewater Engineering and Planning
Submitted by:	Dan Robson, A.Sc.T., Manager, Saanich Peninsula and Gulf Islands Operations
Concurrence:	Joseph Marr, P.Eng., Acting Senior Manager, Infrastructure Engineering
Concurrence:	Jason Dales, B.Sc., WD IV., Acting Senior Manager, Wastewater Infrastructure Operations
Concurrence:	Ian Jesney, P.Eng., Acting General Manager, Integrated Water Services

CORRESPONDENCE

Making a difference...together

Integrated Water Services
479 Island Highway
Victoria, BC, Canada V9B 1H7

T: 250.474.9600
F: 250.474.4012
www.crd.bc.ca

October 11, 2022

File: 0360-20
Magic Lake Estates Water and Sewer Committee – Correspondence

Tim Frick
Chair, Pender Islands Community Parks and Recreation Commission
Parks and Environmental Services
Capital Regional District

Dear Chair Frick:

RE: DOG PARK PROPOSAL FOR KETCH ROAD

Thank you for the letter of August 15, 2022. It was tabled for consideration at the meeting of the Magic Lake Estates Water and Sewer Committee of September 13, 2022.

As a dog owner myself, I am very aware of the benefit to the community that a dog park would bring.

The main topic of our discussion was whether the site needed too much excavation and improvement to mitigate the obvious issues including the rocky and uneven terrain, exposed water pipe, road access and steep drop offs. There is also a significant concrete structure that would need to be dealt with. In the main, it would boil down to financial and liability concerns.

In any case, we are happy to continue the discussion and look forward to more detailed information on how this site could be made to work.

Sincerely,

Michael Fössl
Chair, Magic Lake Estates Water and Sewer Committee