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REPORT TO PORT RENFREW UTILITY SERVICES COMMITTEE MEETING OF MONDAY, JUNE 22, 2015

SUBJECT **PORT RENFREW WASTEWATER SYSTEM CAPACITY AND RELIABILITY**

ISSUE

An engineering evaluation of the capacity of the wastewater collection system, treatment plant, and outfall is required for a planned approach to managing the system.

BACKGROUND

The existing wastewater treatment plant (WWTP) was commissioned in the early 1960's as an extended aeration package plant. It was upgraded in 1969 with the addition of a separate sludge clarifier and chlorine contact chamber. The wastewater collection system comprises of 1.8 km of asbestos cement (AC) pipe ranging from 150mm to 200mm diameter constructed in the 1960's. Treated sewage is discharged through a 200mm steel and 150mm polyethylene marine outfall.

The wastewater system was transferred to the Capital Regional District (CRD) in 1989, and Port Renfrew Sewer Local Service Area No.1 was established (see Appendix 1 – Figure 1). It services 84 residential properties, a school, a community center and a fire hall. The sanitary collection system was constructed approximately at the same time as the wastewater treatment plant. Sewer Service Area No.2 is not currently serviced. The location of the wastewater facilities is shown on Figure 1.

In 2006, Three Point Properties Ltd. (TPP) purchased three parcels of land south of Beach Camp from TimberWest with the intent of building a residential development on these properties. TPP had started preliminary design of water and sewer system improvements in 2007, as well as detailed design of the first phase of residential development. At that time, the Port Renfrew water and sewer systems were at capacity, and the developer's consultant had determined that initially expansion of the existing wastewater treatment plant was required and ultimately, a new wastewater treatment plant and marine outfall for the development. These upgrades were identified in the Design Brief of January 2009 and Design Brief of September 2008 both prepared by Worley Parsons Komex on behalf of TPP.

In 2009, the CRD and TPP negotiated a memorandum of understanding (MOU) and adopted servicing and borrowing bylaws (Bylaws 3644, 3645, 3646 & 3647) to fund the extension of sewer and water service to TPP lands (MOU Lands). As a result of the MOU, the CRD had passed two borrowing bylaws, creating new water and sewer service areas (Wastewater Service Area No.2 – refer to Figure 1) and restrictive covenants were placed on the land titles until the developer provided a letter of credit for both a new sewer and water treatment plant. The borrowing bylaws have since expired but the covenants remain in place. The market for the original development plan (i.e. small lot subdivision) has changed since 2009 and there has been not activity regarding this development.

As noted at the last PRUSC meeting of September 23, 2014, there are several developers requesting servicing both within the existing service area and the lands associated with the MOU. The CRD has reviewed the previous engineering reports (refer to summary of references) provided by the developer's engineer and have obtained field information to assess the existing

wastewater system demands and available capacity. Potential reliability issues have also been identified in this report.

Existing System Capacity and Servicing Requirements

The existing Port Renfrew WWTP has a treatment capacity of 50 m³/d Average Dry Weather flow, while the Ministry of Environment (MOE) Discharge Permit No. PE-00312 is for 220 m³/d. The discharge permit requires that the WWTP effluent 5-day Biological Oxygen Demand (BOD₅) and Total Suspended Solids (TSS) to be less than 45 mg/L and 60 mg/L respectively.

In August 2014, the Peak Dry Weather Flow reached 60.9 m³/d exceeding plant's capacity by 20%. With the increased flow through the plant, less treatment occurs and permitted BOD₅ and TSS levels are likely exceeded. In the winter months, high rates of infiltration results in the peak wet weather flow exceeding plant capacity. The WWTP may be in violation of the Environment Discharge Permit in terms of effluent quality when the daily Peak Dry Weather Flow can exceed the WWTP capacity 4 months per year. A summary of the number of over capacity events is presented in Table 1.

Table 1 Monthly Wastewater Overflows

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2009	17	12	19	8	12	1	1	7	0	17	27	15	136
2010	25	13	12	14	10	4	0	7	14	13	23	23	158
2011	22	13	19	16	8	1	5	10	7	8	17	8	134
2012	21	17	23	14	4	7	7	1	0	12	21	25	152
2013	10	13	15	12	7	5	2	2	7	9	21	29	132
2014	16	18	20	16	9	2	3	8	6	22	20	20*	160

*December data is not available yet and is estimated using the average of the previous 5 year Dec data.

It is apparent from a cursory review that the conveyance system capacity is greater than that required by the existing service area. Appendix B is a cursory review.

Under the present zoning for Port Renfrew land use, the remaining potential development resulting from subdivision and undeveloped parcels within existing Service Area is limited to approximately 19 – ¼ acre lots when serviced by community water and sewer. The Port Renfrew Local Sewer Service has a requirement to provide sewer service to full build out of Service Area No.1 in accordance with the current zoning.

A summary of the required sanitary flows is in Table 2.

Table 2 Existing vs Required Capacity

	Existing Capacity	Required Capacity
Conveyance System	4,000 m ³ /d	140 m ³ /d
Wastewater Treatment Plant	50 m ³ /d	140 m ³ /d
Marine Outfall	220 m ³ /d	220 m ³ /d

Existing System Condition

The WWTP plant is 50 years old and at end of its serviceable life. The facility still operates under older Provincial Municipal Wastewater Regulations. Equipment failures are expected to become more frequent; the two air blowers units failed and required repairs in 2014.

As well, the collection system pipe is AC pipe. The high water table significantly shortens the expected life of this type of pipe. Recent video inspection of the collection system pipes has identified breaks, cracks, holes and root intrusion consistent with pipe degradation. These defects also cause groundwater infiltration.

The wastewater system requires major upgrades to avoid steadily increasing Operations and Maintenance (O&M) and emergency repair costs, as well as potential non-compliance issues. While the cost of the proposed capital works, noted later in this report, are significant, a reactive approach will result in higher long term costs to the customers; potential for significant environmental and social impacts; and associated impact from Out of Compliance orders from the MOE.

Capital Improvements

CRD staff has identified both short and long-term wastewater system improvements. These upgrades are required to serve the existing service area and to facilitate any subdivision and/or development of lands within Service Area No.1.

Potential Short Term Upgrades

The CRD has undertaken a cursory review of previous reports and identified some potential short term upgrades which are listed below:

Short Term Upgrades	Proposed Capacity	Comments	Estimated Cost
Supply and construction of new influent pump station, MBR and intake screens with associated pipe works	Up to 100 m ³ /d 19 additional SFEs*	<ul style="list-style-type: none"> This will address existing capacity issues within the service area, while high wet weather flows exceeding the WWTP capacity are not addressed. As the facility is near its design life, in an unfavorable location and is manually controlled a new facility may be the next step. The WWTP is within the tsunami zone, if a new WWTP is required, it will have to be located above the tsunami flood zone. 	\$930,000

Short Term Upgrades	Proposed Capacity	Comments	Estimated Cost
		<ul style="list-style-type: none"> If the WWTP is relocated, the Ministry of Environment will likely require a new outfall, the existing outfall is short and shallow. 	
Additional Identified Work not in MOU: Supply new electrical controls & electrical service		<ul style="list-style-type: none"> The electrical equipment has had little upgrades since construction, if the existing WWTP converted to a MBR than the electrical equipment will need to be upgraded to facilitate operation of the MBR. The existing electrical service is an open delta service, not a proper 3-phase service. Proper 3-phase is required to supply power to the influent pump station. New influent pumps and pump controls are required to increase the capacity of the WWTP. 	Included in above
Sewer system repairs		<ul style="list-style-type: none"> A CCTV pipe inspection was conducted in 2009 outlining several pipe breaks and root intrusions requiring repair. 	\$100,000
		Total	\$1,030,000

*SFE wastewater flow rate for WWTP capacity is Peak Day Dry Weather Flow (PDDWF)/Total SFEs

Short term upgrades may be completed to increase capacity. The upgrades address only the projected wastewater flows within the existing service area. The estimated cost for short term upgrades is \$1,030,000, which includes contingency, engineering and administration costs. For additional information: please refer to Figure 3: Port Renfrew Wastewater Short Term Upgrades and Figure 4: Port Renfrew Wastewater Treatment Plant Upgrades in Appendix C. Details of the cost estimated are presented in the budget spreadsheet in Appendix D - Port Renfrew Sewer Utility Short Term Capital Requirements.

Addition of an attenuation tank has been considered, but deemed impractical and would not realize any additional benefits. Due to factors such as limited space onsite, attenuation required in the order of 50m³/d for PDWF and does not offer operational benefits such as the possibility of sludge thickening to reduce sludge hauling make attenuation impractical. A cursory review of attenuation size based on June to August daily flows for 2013 and 2014 is in Appendix E. If attenuation of wastewater flows is to be pursued then a more detailed analysis is required.

Long Term Upgrades

The proposed future upgrades were identified in the 2009 MOU between the CRD and the Three Point Properties with an estimated cost of \$5,146,756 including contingency, engineering and administration costs. The future upgrades were envisioned to service the MOU Lands as well as the remaining community of Port Renfrew, including the Water Service Area No.2. It was to be scalable, allowing for easy expansion through addition of membrane modules. CRD has

reviewed the construction costs as identified in the MOU and applied an increase for inflation to the year 2015, then added contingency.

Potential long term upgrades are listed below:

Long Term Upgrades	Proposed Capacity	Estimated Cost
Supply and construction of new WWTP with ability to expand capacity by addition of membrane modules*	200 m ³ /d	\$4,150,000
Supply and construct a sanitary line from Beach Camp to the new WWTP near Baird Rd, construct new marine outfall and convert the Beach Camp WWTP to a pump station	200 m ³ /d	\$2,620,000
Total Estimated Cost		\$6,770,000

*Excludes Land Acquisition

The total estimate, also determined on the engineering, administration and operations staff allocation is \$6,770,000. For additional information, please refer to attached Figure 5: Long Term Upgrades and budget spreadsheet in Appendix F – Port Renfrew Water Utility Long Term Upgrades.

Additionally, the existing outfall is shallow and quite short. A new WWTP replacement may trigger the requirement for a new outfall. As well, for development outside the existing sewer service area, the expansion of the WWTP is not possible at the current location. The new WWTP would need to be located above the Provincial/Federal sea level rise elevation and the tsunami flood risk zone. These two factors create issues with implementing the long term upgrades.

As development plans have changed since the 2009 MOU, it would be beneficial to continue to discuss the potential of the short term upgrades, obtain more detailed cost estimates; feasibility analysis; and develop phasing plans with the existing community. Detailed conceptual plans, and cost estimates will allow CRD staff to pursue other possible funding avenues – such as the second intake for the New Building Canada Fund grant.

ALTERNATIVES

1. That the Port Renfrew Utility Services Committee:
 - a. Receive this report for information;
 - b. Utilizing a budget of \$3,500 from Capital Reserves, direct staff to further develop the conceptual plan for the short term upgrades and a Class C cost estimate; and
 - c. Direct staff to search and pursue additional funding opportunities.
2. That the Port Renfrew Utility Services Committee receive this report for information only.

IMPLICATIONS

Alternative 1

CRD staff will discuss potential upgrades with the existing community. The conceptual plan for the short term upgrades will be further developed to produce a Class C cost estimate to better inform the Committee of the cost implications. In an effort to reduce the financial burden on the community, additional funding sources, such as the second intake for the New Building Canada Fund – Small Communities Fund, will be pursued.

Alternative 2

By receiving the report for information, no further action will be taken. Any resolution or planning to address capacity and reliability issues will be deferred. There will still be obligations to provide service to existing customers, which could increase the risk of system deterioration and increase reliability issues. The inclusion of the developable lands outside Service Area No.1 will not be allowed.

CONCLUSION

The Port Renfrew wastewater system is 50 years old and currently has capacity issues. The wastewater treatment plant requires upgrades to ensure that it will continue to meet regulatory requirements. Other short term works such as sewer system repairs are required to reduce the effects of inflow and infiltration on the wastewater system further ensuring that the sewer service area does not exceed the Ministry of Environment's discharge permit.

The current location of the WWTP is not ideal; the site is too small and is located in the tsunami flood zone. A new WWTP will have to be located above the tsunami flood zone and sea level rise elevation, as well as, have sufficient size to address expansion. Additionally, the existing marine outfall is short and shallow, if a new wastewater treatment plant is proposed, the Ministry of Environment will likely require a new marine outfall to current standards.

RECOMMENDATION

That the Port Renfrew Utility Services Committee:

- a. Receive this report for information;
- b. Utilizing a budget of \$3,500 from Capital Reserves, direct staff to further develop the conceptual plan for the short term upgrades and a Class C cost estimate; and
- c. Direct staff to search and pursue additional funding opportunities.

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Attachments:

Appendix A Figures 1 & 2
Appendix B Preliminary Sewer Capacity Calculations
Appendix C Figures 3, 4 & 5
Appendix D Short Term Cost Estimate
Appendix E Port Renfrew Sewer Utility Attenuation Cursory Review
Appendix F Long Term Cost Estimate

References:

1. Design Brief – Preliminary Design Report – Port Renfrew Wastewater Treatment Plant, Sep 2008, Worley Parsons
2. Assessment Report – Port Renfrew Wastewater Treatment Plant Upgrade, May 2007, CRD Environmental Services
3. Design Brief- Plan for Capacity Increase and Operation of the Port Renfrew Wastewater Treatment Plant, Jan 2009, Worley Parsons
4. Memorandum of Understanding (MOU) - CRD and Rtown Holdings ULC, Dec 2009
5. Memorandum –Port Renfrew-Water and Sewer Servicing- Aug 2007, City Spaces
6. Port Renfrew SFE's as of Sept 30, 2014 – CRD Finance Department
7. Port Renfrew 2009-2014 Wastewater Discharge Records – CRD Operations
8. Gulf Islands and Port Renfrew Wastewater and Marine Environment Program 2013 Annual Report – Appendix E – CRD Environmental Services
9. School Based Weather Network – Port Renfrew Elementary School, www.victoriaweather.ca, Dec 2014

APPENDIX A



FIGURE 1
PORT RENFREW SEWER SERVICE AREA NO. 1

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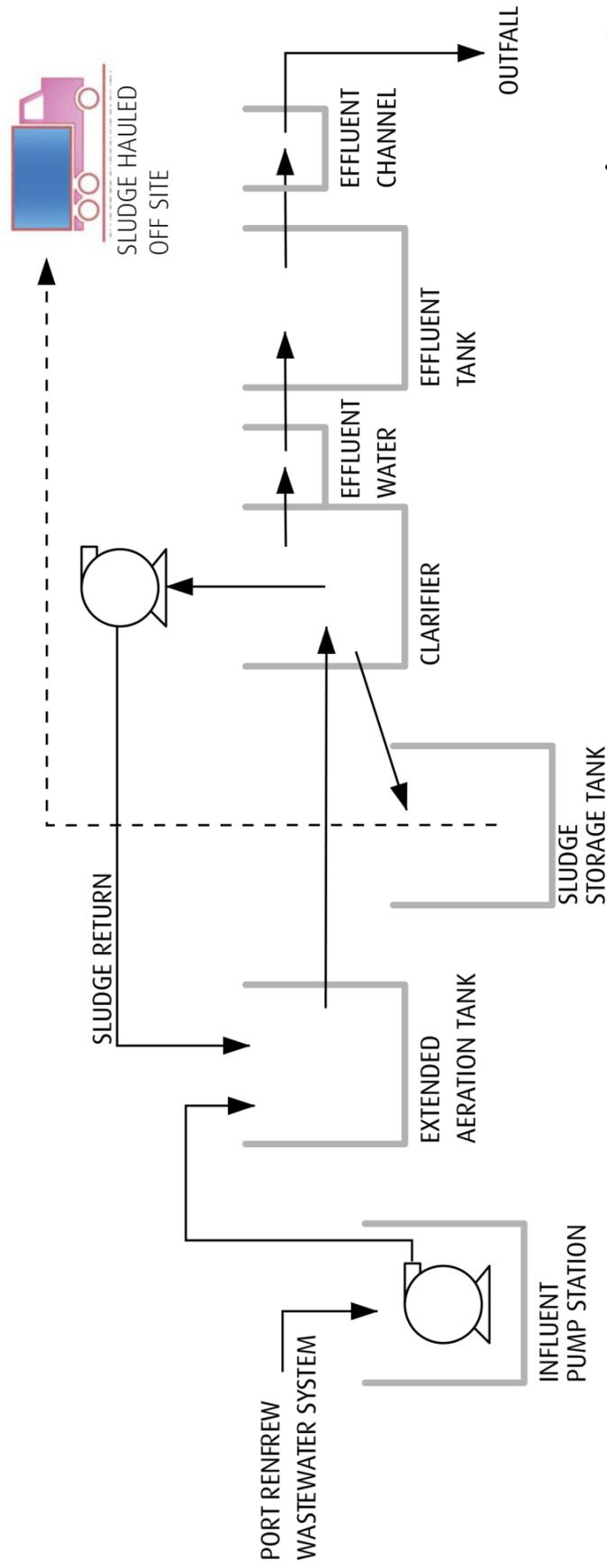


Figure 2:
Existing Wastewater Treatment Plant

APPENDIX B

PORT RENFREW LOCAL SEWER UTILITY

SEWER PIPE CAPACITIES

Upstream Manhole	Downstream Manhole	Existing						Required	
		Pipe Diameter (mm)	Pipe Length (ft)	Pipe Length (m)	Pipe Grade	Pipe Capacity (L/s)	Required Flow (m ³ /d)	Required Flow (L/s)	
12	13	200	230	70.1	0.004	194,360	4.1	0.047	
14	13	200	230	70.1	0.015	100,367	2.7	0.032	
13	9	200	126	38.4	0.04	61,462	9.5	0.110	
10	9	200	320	97.5	0.004	194,360	5.5	0.063	
11	9	200	140	42.7	0.004	194,360	5.5	0.063	
9	8	200	344.5	105.0	0.004	194,360	25.9	0.300	
8	7	200	178	54.3	0.014	103,890	28.6	0.331	
7	6	200	226	68.9	0.052	53,906	28.6	0.331	
16	15	200	227	69.2	0.055	52,415	1.4	0.016	
15	6	200	276	84.1	0.02	86,920	3.3	0.038	
6	5	200	354	107.9	0.077	44,299	37.4	0.432	
5	4	200	109	33.2	0.004	194,360	37.4	0.432	
20	19	200	166	50.6	0.01	122,924	5.5	0.063	
19	18	200	200	61.0	0.064	48,590	9.5	0.110	
18	17	200	128	39.0	0.065	48,215	10.9	0.126	
17	4	200	361	110.0	0.004	194,360	19.1	0.221	
4	3	200	455	138.7	0.004	194,360	72.8	0.843	
28	27	200	245	74.7	0.004	194,360	5.5	0.063	
27	26	200	27.5	8.4	0.004	194,360	5.5	0.063	
29	26	200	316	96.3	0.002	274,866	6.8	0.079	
26	3	200	134	40.8	0.004	194,360	15.0	0.174	
3	2	200	148	45.1	0.004	194,360	89.2	1.032	
25	24	200	224	68.3	0.004	194,360	27.3	0.316	
24	23	200	320	97.5	0.004	194,360	35.4	0.410	
23	22	200	152	46.3	0.004	194,360	40.9	0.473	
22	21	200	261	79.6	0.004	194,360	50.4	0.584	
21	2	200	92	28.0	0.0051	172,128	51.8	0.599	
2	1	200	47	14.3	0.004	194,360	141.0	1.631	

*Manning Equation Used with 60% pipe depth & Manning coefficient = 0.011 for AC pipe

APPENDIX C



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FIGURE 3
PORT RENFREW WASTEWATER SHORT TERM UPGRADES

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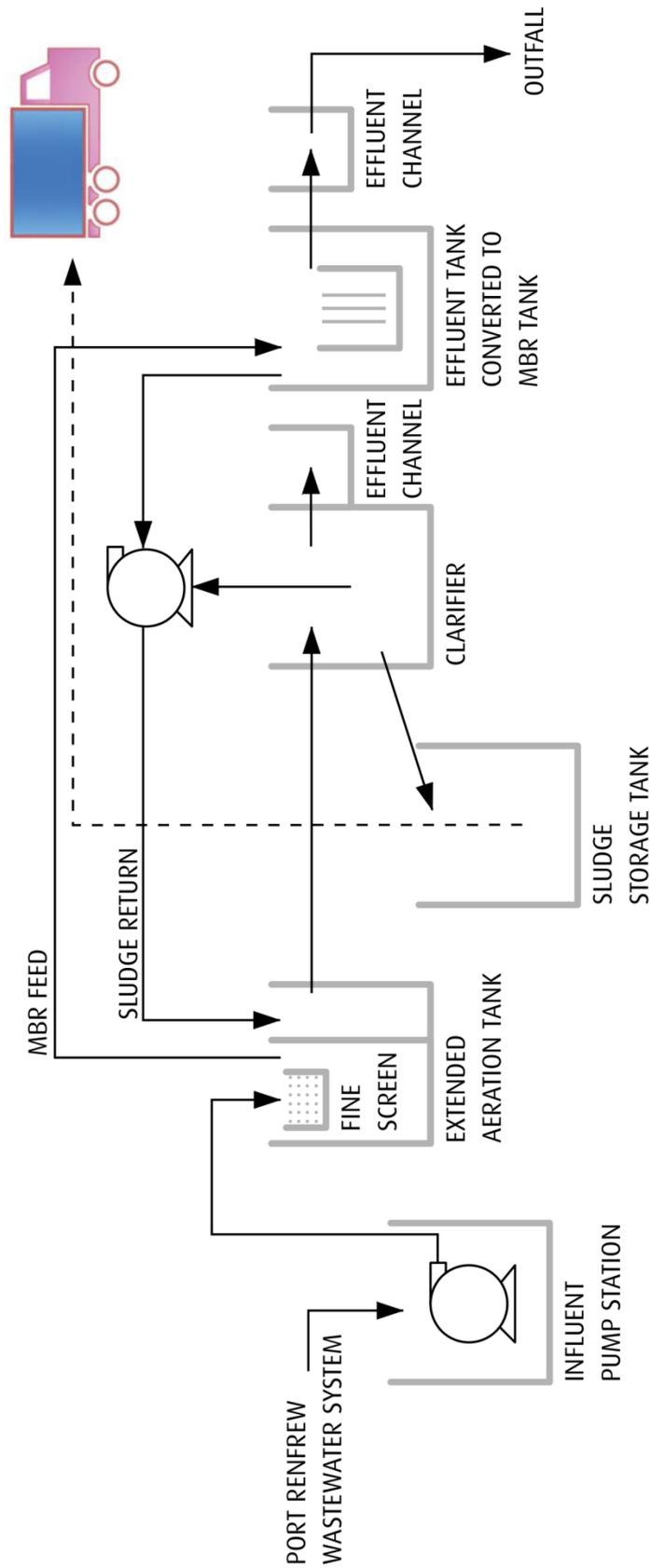
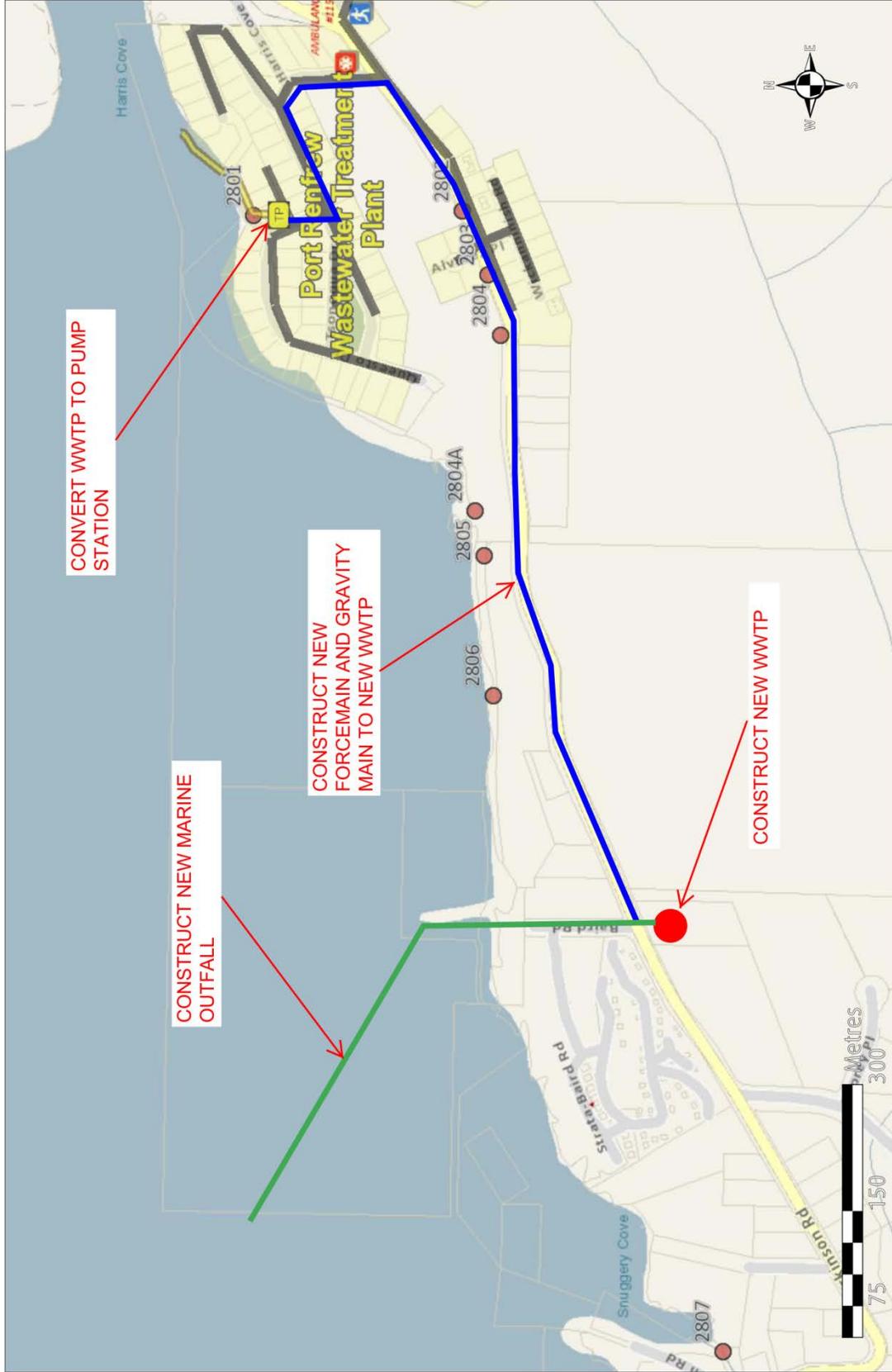


Figure 4:
Wastewater Treatment Plant Upgrades



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FIGURE 5
LONG TERM UPGRADES

APPENDIX D



PORT RENREW SEWER UTILITY CAPITAL REQUIREMENTS

Date: December 17, 2014
Prepared by: Dale Puskas, P.Eng.
Page 1 of 1

Description	Details	Funding Source	Year Required	Cost - Previous Rpt	2015		Estimated Construction	Contingency (%)	Contingency	Subtotal	Engineering (%)	Engineering	Admin (%)	Admin	Operations (%)	Operation Staff	TOTAL
					2013-2018	2014											
WWTP Upgrade from 2009 MoU	Supply and construction of new influent pump station, MBR and intake screens with associated pipe works	Capital	2013-2018	352,591	421,012	40	168,405	590,000	25	150,000	5	30,000	10	60,000	10	60,000	830,000
Electrical upgrades	Supply and install new electrical controls, electrical service, SCADA & RTU	Capital	2014		50,000	40	20,000	70,000	25	18,000	5	4,000	10	7,000	10	7,000	100,000
Sewer System Upgrades CRD, 2010	Pipe replacement and root cutting to fix broken pipes	Capital	2013-2018	42,000	48,690	40	19,476	70,000	25	18,000	5	4,000	10	7,000	10	7,000	100,000
SHORT TERM UPGRADES																	
TOTAL COST OF UPGRADES & REPLACEMENTS																	
1,030,000																	

APPENDIX E

**PORT RENFREW SEWER UTILITY
ATTENUATION CURSORY REVIEW**

Date: December 23, 2014
Prepared by: Dale Puskas, P.Eng.
Page 1 of 1

Day	WWTP Capacity (m ³ /d)	Jun-14		Jul-14		Aug-14		Jun-13		Jul-13		Aug-13	
		Inflow (m ³ /d)	Attenuation (m ³ /d)	Inflow (m ³ /d)	Attenuation (m ³ /d)	Inflow (m ³ /d)	Attenuation (m ³ /d)	Inflow (m ³ /d)	Attenuation (m ³ /d)	Inflow (m ³ /d)	Attenuation (m ³ /d)	Inflow (m ³ /d)	Attenuation (m ³ /d)
1	50	57.6	-7.6	49.3	-0.3	44.9	5.1	61.5	-11.5	58.5	-34.9	36.4	13.6
2	50	33.6	8.8	48.4	1.3	47.6	2.4	54.4	-15.9	46.2	-31.1	39.7	10.3
3	50	40.2	9.8	47.3	2.7	47.7	2.3	40.8	-6.7	38.8	-19.9	35.5	14.5
4	50	38.2	11.8	49.8	0.2	44.9	5.1	38.7	4.6	35.7	-5.6	39.9	10.1
5	50	31.5	18.5	33.7	16.3	52.5	-2.5	40.9	9.1	39.5	4.9	37.6	12.4
6	50	28	22	48.21	1.79	40.3	7.2	30	20	37	13	42.3	7.7
7	50	28.9	21.1	36.45	13.55	39.7	10.3	34.5	15.5	43	7	48	2
8	50	32.3	17.7	37.27	12.73	44.4	5.6	36	14	43.7	6.3	37.9	12.1
9	50	25	25	39.1	10.9	46.6	3.4	32.5	17.5	37.9	12.1	38.3	11.7
10	50	32.5	17.5	52.9	-2.9	33.6	16.4	24.6	25.4	51.2	-1.2	42	8
11	50	26.7	23.3	37.6	9.5	37.4	12.6	34.1	15.9	31.1	17.7	45	5
12	50	33.2	16.8	38.3	11.7	45.7	4.3	40.3	9.7	43.8	6.2	44.6	5.4
13	50	33.9	16.1	38.08	11.92	44.9	5.1	33.3	16.7	32.7	17.3	42.1	7.9
14	50	27.1	22.9	45.88	4.12	46.4	3.6	34.4	15.6	35.7	14.3	38.7	11.3
15	50	26.6	23.4	40.76	9.24	46.5	3.5	34.2	15.8	39.2	10.8	41.1	8.9
16	50	25.1	24.9	45.6	4.4	46.3	3.7	36.3	13.7	35.1	14.9	43.3	6.7
17	50	27	23	41	9	69.4	-19.4	43.8	6.2	31.5	18.5	41.8	8.2
18	50	31	19	44.4	5.6	60.8	-30.2	38.9	11.1	36.4	13.6	38.5	11.5
19	50	32.3	17.7	50.2	-0.2	60.9	-41.1	34.3	15.7	34.5	15.5	38.6	11.4
20	50	32.6	17.4	48.6	1.2	58.6	-49.7	34.7	15.3	34.4	15.6	37.5	12.5
21	50	29.8	20.2	39.7	10.3	53.9	-53.6	29.3	20.7	37.7	12.3	35.1	14.9
22	50	32.8	17.2	53	-3	43.9	-47.5	33.9	16.1	33.6	16.4	34.4	15.6
23	50	33.7	16.3	42.6	4.4	49.1	-46.6	33	17	33.7	16.3	44.6	5.4
24	50	40.7	9.3	44.2	5.8	49.1	-45.7	44.2	5.8	36.9	13.1	36	14
25	50	45.3	4.7	39.7	10.3	50.4	-46.1	45.6	4.4	35.5	14.5	34.7	15.3
26	50	42.6	7.4	36.6	13.4	51.9	-48	47	3	36.5	13.5	35.8	14.2
27	50	44.9	5.1	40.2	9.8	49	-47	57.6	-7.6	47.1	2.9	46.7	3.3
28	50	49.7	0.3	43.4	6.6	37.2	-34.2	65.3	-22.9	39.2	10.8	41.1	8.9
29	50	49.7	0.3	41.4	8.6	42.5	-26.7	55.9	-28.8	33.6	16.4	10.5	39.5
30	50	51	-1	40	10	40.8	-17.5	47.6	-26.4	37.1	12.9	57.7	-7.7
31	50			40.9	9.1	47.7	-15.2			41.7	8.3	54.1	-11.8

Attenuation Required, No Precipitation Recorded
 Day With Precipitation, No Attenuation Required
 Attenuation Required on Day with Precipitation

Note: Inflow flows are measured WWTP effluent flows, rainfall data is from www.victoriaweather.ca from the Port Renfrew Elementary School accessed December 23, 2014

APPENDIX F

**PORT RENFREW SEWER UTILITY
LONG TERM UPGRADES**

Description	Details	Funding Source	Year Required	2009		2015		Contingency (%)	Contingency	Subtotal	Engineering (%)	Engineering	Admin (%)	Admin	Operators (%)	Operation Staff	TOTAL
				Cost - Previous Rpt	Estimated Construction	Estimated Construction	Contingency (%)										
LONG TERM UPGRADES																	
New WWTP from 2008 Consultant Estimate	Supply and construction of new WWTP with ability to expand capacity by addition of membrane modules	Capital		1,890,575	2,185,802	40	874,321	3,060,000	25	770,000	5	160,000	5	160,000	5	160,000	4,150,000
Sewer System Upgrades from 2008 Consultant Estimate	Supply and construct a sanitary line from Beach camp to the new WWTP near Baird Rd. construct new marine outfall and convert the Beach Camp WWTP to a pump station	Capital		1,203,000	1,436,445	40	574,578	2,010,000	15	302,000	5	101,000	5	101,000	10	201,000	2,620,000
TOTAL COST OF UPGRADES & REPLACEMENTS																	6,770,000