Comox Valley REGIONAL DISTRICT

Staff report

DATE: August 3, 2017

FILE: 5340-03

TO: Chair and Directors
Electoral Areas Services Committee

FROM: Ann MacDonald
Acting Chief Administrative Officer

RE: King Coho Wastewater Treatment Plant Update

Purpose
The purpose of this report is to provide an update to the Electoral Areas Services Committee (EASC) on the results of a study to assess the viability of establishing a local service area to manage and operate the King Coho wastewater treatment plant (WWTP).

Policy Analysis
Bylaw No. 2422, being the "Regional District of Comox-Strathcona Liquid Waste Management Planning Service Bylaw No. 2422, 2002" provides planning services to the rural areas with regards to liquid waste management.

At its November 9, 2015 meeting the EASC passed the following resolutions:

THAT subject to approval of 50 per cent funding by participating strata, that the 2016 - 2020 financial plan commit $10,000 of community works funds for half of the anticipated condition assessment and asset management plan costs;

AND FURTHER THAT the 2016-2020 financial plan for Electoral Area 'B' feasibility study service 152 include $5,000 for a feasibility study to be conducted to assess the viability of establishing a local service area to manage and operate the King Coho WWTP;

AND FINALLY THAT a staff report be presented to the EASC with the findings of the feasibility study by April 2016.

At a subsequent meeting on January 11, 2016 the EASC passed the following resolutions:

THAT the board approve submission of an application to the infrastructure planning grant program for planning work related to possible establishment of a local service area to manage the King Coho WWTP;

AND FINALLY THAT should the application to the infrastructure planning grant program be successful the funds will be split equally between the Comox Valley Regional District and King Coho component of the planning work.

Executive Summary
The King Coho WWTP is a domestic sewage treatment facility servicing three freehold strata corporations with a combined total of 37 units. The WWTP operates under a provincial waste management permit for the on-site treatment and marine discharge of wastewater.

The facility has faced some management challenges relating to the complexities of a system servicing three separate strata. In the past, disputes among the participating strata occurred concerning annual operating fees that involved some legal action. In May 2015, the Comox Valley Regional District (CVRD) received a letter from King Coho Strata VIS6599, requesting the CVRD explore the feasibility of taking over ownership, operation and management of the King Coho WWTP.

A condition assessment was completed by McElhanney Consulting Services Ltd. (McElhanney) in February 2017 which found that the King Coho WWTP is not functioning efficiently and is out of compliance with several conditions of its operating permit. The cost of providing the necessary upgrades to bring the system back within permit parameters is estimated to be $129,500 ($3,500 per unit).

Staff have developed a preliminary asset management plan for the system to ensure long term capital replacement costs are included in annual operating expense estimates. The estimated annual operating expenses for a King Coho wastewater service, including contribution to capital works reserves, are $49,364 ($1,334 per unit).

A public meeting has been arranged for August 24, 2017 to present the findings of the McElhanney study and anticipated CVRD service costs. If strata owners are supportive of a CVRD service, steps will be taken towards the creation of a new wastewater local service area. Staff are recommending a petition process be followed to obtain elector consent for service establishment.

The legislative approval process will proceed promptly following the public meeting in order to meet financial planning deadlines for 2018. If there is adequate public support, CVRD staff will be seeking approval from the EASC to present a service bylaw to the CVRD Board in September.

Recommendation from the Acting Chief Administrative Officer:
This report is provided for information only.

Respectfully:

A. MacDonald

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Ann MacDonald
Acting Chief Administrative Officer

Background/Current Situation
The King Coho WWTP is a domestic sewage treatment facility servicing three freehold condominium strata corporations located near the Little River ferry terminal. There are a total of 37 units connected to the system including 13 strata lots in Strata VIS6599, 17 strata lots in Strata VIS4843, and 7 strata lots in Strata EPS828. The WWTP operates under provincial waste management permit PE-13155 issued in February 1998 for the on-site treatment and marine discharge of wastewater.

The King Coho wastewater treatment system was assembled and commissioned over a period of several years. The existing Rotating Biological Contactor (RBC) system and marine outfall were installed in 2008 during construction of phase five of the development. Prior to installation of the RBC system, various septic tanks and batch treatment facilities were used along with in-ground wastewater disposal systems.

Strata VIS6599 is responsible for the ongoing operations and maintenance of the sewage treatment system providing service to Strata VIS4843 and Strata EPS828. Strata VIS6599 ended up managing the system by default and has faced some challenges relating to the complexities of a system servicing three different strata. Strata VIS6599 retains a waste management firm to operate and maintain the system on its behalf. Governance and cost recovery obligations for each respective strata are covered through a waste management agreement.

In May 2015 the CVRD received a letter from Strata VIS6599 requesting the CVRD explore the option of taking over ownership, operation and management of the King Coho WWTP. Staff recommended that the CVRD conduct a condition assessment study of the system to evaluate the feasibility of transferring ownership and management to the CVRD.

At its November 2015 meeting, the EASC supported a recommendation to commit up to $10,000 of Community Works Funds to conduct a condition assessment subject to approval of 50 per cent funding by the participating three strata's. The CVRD was also successful in receiving a $10,000 grant for the project under the Infrastructure Planning Grant Program.

In February 2017, McElhanney completed a condition assessment of the WWTP (Appendix A). The report included:

- An assessment of overall system condition
- A listing of required repairs and upgrades necessary to meet permit obligations including estimated capital upgrade costs
- Anticipated annual operation and maintenance costs
- A listing of typical major component replacement requirements within a 40 year horizon
- Recommendations for operations and management of the system

The study found that the wastewater system at King Coho is not functioning efficiently and is out of compliance with several conditions of its operating permit. An operational review determined that a number of infrastructure and process upgrades can increase the quality of the wastewater discharge likely bringing it back within permit parameters. These repairs should be completed if the CVRD is to consider taking over ownership and operation of the system. Short term capital upgrade costs are summarized in Table No. 1 below.

Table No. 1 – McElhanney Capital Upgrade/Repair Estimates (2017)

Controls Upgrades	$77,000
Process Upgrades	$30,000
Collection and Conveyance Upgrades	$12,500
Confined Space Access/Development of Safe Work Procedures	$10,000
Total	**$129,500**
Total per unit	*$3,500*

The McElhanney study provides a listing of typical major component replacement requirements within a 40 year horizon. Building on this work, Liquid Waste Planning staff developed a preliminary asset management plan to ensure long term capital replacement costs were included in annual operating expense estimates. Table No. 2 below summarizes annual capital replacement contributions through to 2033 when McElhanney estimates a complete RBC internal replacement would be required.

Table No. 2 – Summary of Estimated Long Term Capital Replacement Costs

Year	Capital Cost	Reserve Contribution	Reserve Balance
2018		$15,400	$15,400
2023		$17,003	$99,549
2028	$16,164	$18,773	$196,667
2033	$289,658	$20,726	$291,330

Anticipated annual operation and maintenance costs were provided in McElhanney's report. These costs were based on information provided by King Coho and adjusted to account for recommended operational improvements. Liquid Waste Planning staff have completed further work to refine these costs based on the operating expenses of similar CVRD services. Table No. 3 below provides an estimate of annual operating expenses for King Coho in 2017 dollars, including a contribution to capital works reserves.

Table No. 3 – King Coho Estimated Operating Expenses

Description	Amount
SUPPORT SERVICES	$1,500
SALARIES & WAGES	$ 8,499
BENEFITS	$2,465
WCB	$110
TELEPHONE & ALARM LINES	$870
ADVERTISING	$200
INSURANCE LIABILITY/PROPERTY	$650
LAB ANALYSIS	$4,420
HYDRO	$2,400
CARBON OFFSET	$50
CONTRACT SVCS EQUIP/MACH	$8,950
REPAIRS/MTCE MACH/EQUIP	$2,000
MINOR CAPITAL	$1,000
CONTR TO CAPITAL WORKS RESERVE	$15,400
TRANSFER TO OTHER FUNCTIONS	$850
Total	**$49,364**
Total per unit	*$1,334*

For cost comparison, McElhanney obtained a quote from the current King Coho WWTP operator which included allowances for recommended operational improvements. The estimate, exclusive of telephone and alarm lines, electricity and insurance liability charges totaled approximately $51,000 annually. 2015-2016 King Coho operating expenses were approximately $33,500.

Reserve contributions to cover long term capital replacement costs have not been included in either total. Strata VIS6599 has indicated they do not currently have a wastewater reserve fund. This is due in part to the challenges of operating a system which services three separate strata where Strata VIS6599 would be collecting reserve fund contributions from all three strata.

Wastewater Service Establishment

Staff have met with representatives from King Coho Strata VIS6599 and Strata VIS4843 to discuss the findings of the McElhanney study. Strata representatives were generally positive about the outcomes of the study and supportive of proceeding with a public meeting to gauge interest in converting to a CVRD service.

A public meeting has been arranged for August 24, 2017 where the findings of the McElhanney report and anticipated CVRD service costs will be presented. If strata owners are supportive of transferring ownership, operation and management of the King Coho WWTP to the CVRD, steps will be taken towards the creation of a new wastewater local service area.

Staff are recommending a petition process be followed to obtain elector consent for service establishment. A flowchart has been developed which provides an overview of the legislative process for establishing a wastewater service at King Coho and is attached as Appendix B. A preliminary schedule has also been developed to help guide this process and is presented in Table No. 4 below.

Table No. 4 – King Coho Service Establishment Schedule

	August		September					October				November	
	Wk 14-18	Wk 21-25	Wk 28-1	Wk 4-8	Wk 11-15	Wk 18-22	Wk 25-29	Wk 2-6	Wk 9-13	Wk 16-20	Wk 23-27	Wk 30-3	Wk 6-10
Public meeting													
Distribute petitions													
Petition response													
EASC meeting													
Three readings service bylaw													
Package to inspector													
Inspector review													
Inspector approval													
Final reading service bylaw													

Options
This report is presented for information only.

Financial Factor
If a CVRD wastewater service is established, King Coho residents will be required to pay a proportionate share of the capital costs required to bring the system back within permit compliance. Staff are recommending that this one-time capital upgrade charge be collected from each of the three participating strata (as opposed to each individual strata unit owner) using the existing proprtionate share formula which attributes costs based on the number of units in each strata being:

- 13/37 for VIS6599
- 17/37 for VIS4843
- 7/37 for EPS828

Following adoption of a service establishment bylaw, a financial plan will be developed for the 2018-2022 fiscal cycle. As it is unlikely approval will be obtained prior to the October 1st deadline for inclusion in BC Assessment's annual assessment roll, staff are recommending that annual operating costs be collected through a fees and charges bylaw for 2018 with the opportunity to convert this charge to an annual parcel tax starting in 2019. Asset management planning will form an integral part of the service's long term fiscal management to ensure sustainable service delivery.

Legal Factors
In the past, disputes among the participating strata occurred concerning annual operating fees that involved some legal action. It is understood that no outstanding disputes or legal issues currently exist regarding the King Coho WWTP.

Provincial permit PE-13155 for the marine discharge of effluent from the King Coho WWTP, may be transferred to the CVRD through an express transaction process under the *Environmental Management Act*. Ministry of Environment staff have advised that the target for processing applications through this process is four to eight weeks.

CVRD staff are currently seeking legal advice on requirements for the transfer of capital assets. It is recommended that blanket Statutory Rights-of-Way be registered over all parcels containing sewage infrastructure.

Regional Growth Strategy Implications
This project will be developed to align with the goals and objectives of the Comox Valley Regional Growth Strategy to "provide affordable, effective and efficient services and infrastructure that conserves land, water and energy resources."

Intergovernmental Factors
Staff will continue to seek advice from Ministry of Municipal Affairs and Housing and Ministry of Environment staff as applicable throughout project development.

Interdepartmental Involvement
Liquid Waste Planning staff have been working on this project in coordination with Legislative and Financial Services staff.

Citizen/Public Relations
A public meeting with residents of the participating three strata's has been scheduled for August 24, 2017. If the CVRD receives a positive response from residents at this meeting a petition process will be used to seek elector consent for the establishment of a new wastewater service at King Coho.

Prepared by:	Concurrence:
D. Monteith	***K. La Rose***
Darry Monteith Engineering Analyst	Kris La Rose, P. Eng Acting General Manager of Engineering Services

Attachments: Appendix A – "King Coho Wastewater Treatment Plant Feasibility Study, McElhanney Consulting Services Ltd., dated February 3 2017"
Appendix B – "Steps to Establishing a Wastewater Management Service for King Coho Strata Development"

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McElhanney

DESIGN MEMORANDUM

	Comox Valley Regional District King Coho Wastewater Treatment Plant Feasibility Study – Rev.1
Date:	**December 1, 2016 – Updated February 3, 2017**
Our Reference:	**2211-47442-0**

To: **Comox Valley Regional District**
Attn: Kris La Rose, Sr. Manager of Water & Wastewater

cc: **CVRD, Zoe Berkey, EIT**

Prepared By: **Matt Sanderson, AScT**

Reviewed By: **Bob Hudson, P.Eng.**

1 INTRODUCTION

The Comox Valley Regional District (CVRD) has retained McElhanney Consulting Services Ltd. (MCSL) to review the operation and function of the King Coho Wastewater treatment facility ("the treatment system") in Lazo, BC. The facility serves a combined total of 37 units in three stratas and operates under Permit PE-13155 ("the Permit") issued Feb 1998 under the provincial Waste Management Act for the on-site treatment and marine discharge of wastewater. A copy of the operating permit is attached as **Appendix A**. We gather the CVRD is considering taking over the treatment system, funding all costs associated with the provision of service through a Local Service Area, or similar mechanism.

This report was prepared based on the scope of work identified in MCSL's May 18, 2016 proposal, a copy of which is appended to this document. Generally, this document:

- Assesses overall system condition,
- Develops a listing of required repairs or upgrades necessary to meet permitted discharge obligations.
- Develops an asset listing and replacement plan for major system components.
- Includes recommendations for ongoing operation and maintenance.
- Includes anticipated annual operations costs.

- Reviews strata bylaws and disclosure statements for consistency with operational and maintenance needs.

- Develops a draft agreement framework for periodic re-evaluation of operation and maintenance costs, replacement funding, etc, and adjustment of annual fees charged to users.

1.1 RBC Technology Overview

The King Coho treatment system was assembled and commissioned over a period of several years:

- During construction of Strata Phases 1, 2 and 3 [VIS4843] in 2001-2002, various septic tanks and batch treatment facilities along with in-ground wastewater disposal systems were installed.

- Through 2007-2008, development of Strata Phase 5 [VIS6599] necessitated installation of the current Rotating Biological Contactor (RBC) system and marine outfall, together with modifications to collect Phase 1 through 3 effluent. At this time, existing, obsolete, sewerage treatment infrastructure was either decommissioned or abandoned in place.

- Development of Phase 4 [EPS828] in 2012 completed the ultimate sewerage catchment buildout.

Effluent process diagrams (original design and current process) and RBC general arrangement drawing, are included in **Appendix B.**

The RBC process consists of large circular flat plastic disks partially submerged in wastewater mounted on a horizontal rotating shaft. Bacteria colonies on the disks are alternately exposed to the organics in the wastewater and oxygen from the air. In small- to medium-scale wastewater treatment plants (WWTPs), primary treatment is provided in the form of an integral septic tank typically located below the RBC drum. Alternatively, primary treatment can be provided via a separate up-front equalization tank. In the case of the latter, primary treatment option, the septic tank requires periodic pump out to remove accumulated primary solids from the system.

An RBC is a continuous-flow, single-pass process. A biological film (biomass) grows on the surface of disks mounted on a shaft and placed in the bioreactor. The disks rotate slowly while approximately 30% to 50% immersed in the wastewater being treated. The rotation rate is typically 2 to 4 RPM. The rotation of the disk brings the attached biomass into contact with the wastewater promoting biofilm formation for removal of the organics, effectively using oxygen supplied from the atmosphere. Excess biomass generated in the treatment process is periodically sloughed off the disks by shear forces, and settled out in a final clarifier following the RBC bioreactor.

An inherent limitation of the RBC technology is the lack of operational flexibility. Once the plant is designed and installed, little can be done to alter its operation. On the other hand, the RBC's

lack of flexibility gives the process simplicity and relative stability, subject to adequate design and consistent operating conditions. Reliable process performance is expected under equalized flow/load conditions. Provided the disk media keep rotating and the hydraulic/organic loadings remain within the design capacity, the RBC will normally function properly, producing final effluent quality of TSS/BOD ≤ 30/30 mg/L or better.

Final clarifiers are provided to remove solids that slough off the plastic disks from the treated effluent. The suspended solids' concentration in the flow to the final clarifier is typically less than 300 mg/L. As fixed-growth bacteria tend to have better settling characteristics than bacteria from suspended growth systems, simple hopper type or rectangular clarifiers are frequently used for solids/liquid separation, particularly in smaller package plants.

In terms of process control, RBCs are very simple to operate; the only system variables are shaft rotational speed, waste sludge and scum pumping rates. The shaft drive system and sludge and scum pumps are the only mechanical components. However, RBC is very sensitive to sudden hydraulic shocks due to its short hydraulic retention time, typically ranging from 0.7 to 1.5 hours. This condition can be mitigated with the installation of an equalization tank ahead of the RBC bioreactor with a minimum hydraulic retention time anywhere between 8 and 12 hours. The addition of an up-front, adequately sized equalization tank will help to provide stable RBC performance throughout the entire range of anticipated operational flows, solids and organic loading conditions.

2 PRESENT DAY SYSTEM CONDITION

Site assessments were conducted on August 9, 2016 by MCSL staff, with assistance from C. Bayley, Cowichan WastewaterPlus, site operator. Refer to **MCSL drawing S-1**, attached, for component locations and context.

2.1 Conveyance Assessment

Effluent from Phase 1 and 5 buildings is conveyed via gravity pipe to MH 22. Phase 2, 3 & 4 building effluent is collected via gravity pipe into a pump station, PS-B, then pumped to MH 22 across Little River. The 50mm diameter forcemain and along with a station fault communications conduit, crosses Little River on the log string bridge buried in the footpath gravel topping.

No current operational issues were noted. Controls for PS-B were replaced in 2014.

2.2 Operations Assessment

Key findings from the Operations Assessment include:

- The system Operator believes plant discharge quality has been manageable through regular servicing.
- Weekly site visits generally last 2 hours and include effluent sampling and delivery to lab, system operation review and minor maintenance.

- Attempts to restore plant controls through the supplier have not resolved the issues with alarms and data monitoring. Several issues exist between the PLC, operating software and communications hardware. The plant currently operates semi-manually without off-site notification of upsets.
- Semi-annual maintenance (pump out of the RBC sludge and replacement of sand filter media) is critical to maintain effluent quality.
- Modifications made to the effluent process since original construction include:
    - Relocated UV chamber to improve bulb access/changeout.
    - Backwash tank bypassed. Sand filter discharges directly to outfall pump station wet well. Clear tap water is used for backwashing by manually filling tank with a garden hose when required from on-site water source on garage building.

Several components were found to be defective, missing, or bypassed since commissioning as shown in **Table 1**, (see page 7).

2.3 Conveyance and WWTP Process Assessment

Updated **sanitary design calculations** are attached as **Table 2,** (following page 7).

- Historical flow data, flow variations and trends are not available for the King Coho WWTP due to a faulty operations control system. Hence, the realistic flow dynamics through the wastewater treatment facility reflecting the current operational conditions could not be established. Characteristic flow rates required for the system assessment were developed based on the combination of the system design data and realistic assumptions.
- The system was not supplied with an up-front equalization tank for flow balancing and continuous feed to the system at a steady rate. A 100 m^3 emergency storage tank (EST) is provided up-front for emergency storage of excessive flows; however, this tank does not provide effective flow equalization. Hydraulic retention time (HRT) in this tank is estimated at approximately 1 day at peak wet weather flows (PWWF).
- Random TSS effluent quality data ranging up to 100,000 mg/L (i.e., 10% dry solids) point toward potential issues related to hydraulic overload of the treatment components resulting in solids carryover through the system and into the treated effluent. The majority of the TSS data points are in the 100 mg/L to 10,000 mg/L range. For comparison, TSS in raw sewage is typically between 250 mg/L and 300 mg/L. Dry solids concentration in wasted sludge from final clarifiers following activated sludge bioreactors is typically between 0.5% (5,000 mg/L) and 0.8% (8,000 mg/L). This sludge is further processed in a sludge treatment train.
- Based on historical data, treatment performance related to BOD removal is more stable, indicating adequate design in terms of organic loading on the system. However, it was observed that effluent TSS and BOD data do not show any correlation. For example, one would expect that extremely high effluent TSS would result in high BOD as well, as the total BOD consists of soluble and particulate BOD. Reasons for this discrepancy are unknown. It is also unknown whether the effluent BOD data are reported as total BOD,

or soluble BOD that may have been analyzed on filtered samples, i.e., excluding particulate BOD.

- Process calculations indicate that the WWTP currently operates at approximately 50% of the system design flow at average operating conditions.
- Hydraulic loadings, i.e., surface loading rates (aka overflow rates), and HRTs in the primary clarifier appear to be adequate over the anticipated range of operational (hydraulic) conditions. According to the RBC supplier data, design sludge depth is 0.6 m, or approximately 35% of the total tank volume. Process calculations, taking into account the RBC manufacturer design data, and current average hydraulic and solid loadings, indicate that sludge removal frequency from the primary clarifier should be approximately once every 6 weeks. During this period, sludge depth in the clarifier is expected to reach 0.6 m under current operating conditions at average flow. On-going monitoring of sludge blanket buildup should be in place for adjustment of the sludge removal frequency, as the WWTP continuously operates at fluctuating hydraulic and solid loading conditions. Redirection of filter backwash in the future can also have an impact on the sludge buildup in the primary clarifier. Effluent TSS data suggest that the current sludge removal frequency, ranging anywhere between once every 4 months to once every 9 months, may not be adequate.
- Process calculations indicate that surface loading rates in the final clarifier are too high, specifically as the system flow rate increases above average operating conditions. As the existing system does not have an equalization tank in place, these operating conditions can occur temporarily on a daily basis during normal morning and evening flow discharges, or at any time during wet weather operations due to inflow and infiltration contribution (note: there were no specific concerns voiced regarding excessive inflow and infiltration). Many literature references indicate that RBC performance, in general, has historically suffered from poor clarifier design specifically due to the use of shallow clarifiers. At high overflow rates occurring during hydraulic peaks, a solid blanket in a shallow clarifier can rise too high, resulting in solids carryover from the system. These high flows can be pronounced in a relatively small development such as King Coho.
- Required HRT in the final clarifier also becomes marginal as the system flow rate increases above average operating conditions. Short circuiting in shallow clarifiers is a regular occurrence that further reduces the theoretical HRT. Provided process calculations do not take into account short circuiting (refer to the attached **Table 2).**
- Post-RBC polishing filters provide optimum performance if the RBC effluent solids concentration is below 50 mg/L. The RBC design data indicate that the RBC process had been originally designed to generate effluent with less than 30 mg/L of TSS. A sand filter was supposed to further reduce it down to 10 mg/L. RBC effluent TSS concentration above 50 mg/L diminishes filter performance, which seems to be a regular occurrence.
- Based on the filter technical specifications, it was noted that the filter always operates at the same maximum hydraulic loading ("forward filter rate"), regardless of the hydraulic loadings affecting the rest of the plant. In other words, the front end of the system can

operate under fluctuating flow conditions, for example, between minimum and maximum flows, but the pump located in the filter feed tank forwards wastewater to the filter at a continuous rate. This rate is too high for a shallow sand filter and corresponds to the maximum filter capacity noted by the manufacturer. This is problematic, as the filter provides optimum performance at average, not maximum, flow rate. An existing HRT of 5 min is estimated in the filter under maximum hydraulic loading conditions assuming a filter media layer thickness up to 0.9 m.

- No specific collection or conveyance issues were observed during the inspection, or were noted by the operator. Given the lack of wet well storage at PS-B, it would be prudent to install a manual transfer switch and backup power (generator).
- The Flygt control panel and floats for the Outfall Pump Station were replaced in January of 2017. During a weekly inspection, it was discovered the outfall pump station wet well was full. The operator determined that the pump station could be run in manual mode, and following a period of troubleshooting, it was found that the station's floats and PLC control modules were faulty. The total cost of parts and labour to rectify was $6,832.75.

TABLE 1 – Plant Deficiencies

No	TYPE	Issue	Consequence
1	Controls – Alarms	Plant alarms not logged	Date/time of alarm condition useful to assess process failure, particularly during multiple alarm conditions.
2	Controls – Alarms	Plant alarms not providing off-site notification; requires tenants to call operator	Reliant on untrained personnel recognizing upset condition. Risk to major components, loss of plant operation, potential for effluent discharges to exceed permit limits.
3	Controls – Remote Dial-In	No off-site access to plant controls	Allows operators to diagnose issues remotely, assessing if site visit is required, pending on nature of alarm and remote report generation.
5	Controls – Monitoring	No discharge volume logging	Permit requires daily discharge reports to be submitted quarterly.
6	Controls – Turbidity Meter	Broken	Real time effluent quality monitoring used to maintain permit quality parameters, monitor plant operation and signal alarm if medium / high levels exist.
7	Equipment – Air Compressor	Air compressor overloaded, long history of repairs	Impaired function for sand filter back wash valves / actuators & UV lens wiper function.
8	Equipment – UV disinfection	Ultra violet (UV) disinfection panel bulb status incorrect	Requires operator to manually verify bulb operation; exposes operator to high strength UV light (safety risk).
9	Equipment – UV disinfection	UV bulbs operate full-time	Higher operating costs (electricity, premature bulb replacement).
10	Equipment – Sand Filter	Back wash cycle needs to be manually operated (no "auto" function)	Reduces filtering capacity of media, increases risk of operating with clogged media and leaving backwash cycle accidentally.
11	Controls – Alarms	Low level alarm missing from Emergency Storage Tank	Tank normally empty. Any effluent entering tank indicates plant upset from normal operation.
12	Controls – Alarms	High level alarm missing from Emergency Storage Tank	Alerts operator backup storage full and requires immediate attention.
13	Equipment – Anti-odour	Anti-odour dosing pump not being controlled by PLC.	Optional feature to reduce nuisance smell complaints.
	Violation of Permit Requirement		

TABLE 2

Parameter	Symbol	Units	Design Conditions	Current Conditions	Operating Range	Typical	Comment/Reference
Unit Count		homes	55	37			MELP, 1998; McElhanney, 2016
Home Occupancy		persons/home	3.0	2.4			PJ Hannah, 2015; McElhanney, 2016
Per Capita Hydraulic Loading at ADWF	Lcd	L/capita/day	285	250			PJ Hannah, 2015; McElhanney, 2016
BOD_5	grcd	gr/capita/day	68.5	75			PJ Hannah, 2015; McElhanney, 2016; INAC, 2008
TSS	grcd	gr/capita/day	68.5	75			PJ Hannah, 2015; McElhanney, 2016; INAC, 2008

Table x: Design Loading Criteria

Parameter	Symbol	Units	Value Design Conditions	Value Curent Conditions			Comment/Reference
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Population							
Home Count		homes	55	37			MELP, 1998; McElhanney, 2016
Estimated Population	P	people	165	89			
Hydraulic Loads (Flows)							
Average Day (Dry Weather) Flow	ADWF	m^3/day	47.0	22.3			PJ Hannah, 2015; McElhanney, 2016
Per Capita Hydraulic Loading at ADWF (ADWF/P)	Lcd	L/capita/day	285	250			PJ Hannah, 2015; McElhanney, 2016
Maximum Day Flow (f_{MDF}xADWF)	MDF	m^3/day	61.7	36.9			Based on 0.17 L/sec/ha over 1 ha
Maximum Day Flow Factor due to I/I	f_{MDF}	-	1.3	1.7			Based on 0.17 L/sec/ha over 1 ha
Peak Wet Weather Flow	PWWF	m^3/day	141.1	89.0			PJ Hannah, 2015; McElhanney, 2016
Peak Day Flow Factor	f_{PWWF}	-	3.0	4.0			PJ Hannah, 2015; McElhanney, 2016
Organic Loads - Biochemical Oxygen Demand (BOD_5)							
Average Day (Dry Weather) per Capita Loading	grcd	gr/capita/day	68.5	75			PJ Hannah, 2015; McElhanney, 2016; INAC, 2008
Average Day (Dry Weather) Loading (Pxgrcd)	ADWL	kg/day	11.3	6.7			PJ Hannah, 2015; McElhanney
Average Day (Dry Weather) Concentration (ADWL/ADWF)	C_{ADWF}	mg/L	240	300			PJ Hannah, 2015; McElhanney
Max. Day Loading Factor	f_{MDL}	-	1.5	1.5			Assumed
Max. Day Loading (f_{MDL}xADWL)	MDL	kg/day	17.0	10.0			Calculated
Max. Day Flow Concentration (MDL/MDF)	C_{MDF}	mg/L	275	271			Calculated
Solid Loads - Total Suspended Solids (TSS)							
Average Day (Dry Weather) per Capita Loading	grcd	gr/capita/day	68.5	75			PJ Hannah, 2015; McElhanney, 2016; INAC, 2008
Average Day (Dry Weather) Loading (Pxgrcd)	ADWL	kg/day	11.3	6.7			PJ Hannah, 2015; McElhanney
Average Day (Dry Weather) Concentration (ADWL/ADWF)	C_{ADWF}	mg/L	240	300			PJ Hannah, 2015; McElhanney
Max. Day Loading Factor	f_{MDL}	-	1.5	1.5			Assumed
Max. Day Loading (f_{MDL}xADWL)	MDL	kg/day	17.0	10.0			Calculated
Max. Day Flow Concentration (MDL/MDF)	C_{MDF}	mg/L	275	271			Calculated
Primary Clarifier							
Total Volume (m^3)			21.93	21.93			PJ Hannah, 2015
Sludge Storage (m^3)			8	8			PJ Hannah, 2015
Sludge Storage to Total Volume Ratio			0.36	0.36			PJ Hannah, 2015
Max. Sludge Depth (m)			0.7	0.7			
Sludge Storage Capacity (days)			30	51			PJ Hannah, 2015
Surface Area (m^2)			12	12			PJ Hannah, 2015
Hydraulic Loads							
Surface Loading Rate at ADWF (m^3/m^2/day)			3.9	1.9	30-50	40	Calculated
Surface Loading Rate at MDF (m^3/m^2/day)			5.1	3.1			Calculated
Surface Loading Rate at PWWF (m^3/m^2/day)			11.8	7.4	80-120	100	Calculated
Hydraulic Retention Time at ADWF (hrs)			11.2	23.7	1.5 - 2.5	2.0	Calculated
Hydraulic Retention Time at MDF (hrs)			8.5	14.2	1.5 - 2.5	2.0	Calculated
Hydraulic Retention Time at PWWF (hrs)			3.7	5.9	1.5 - 2.5	2.0	Calculated
RBC							
Primary Clarifier BOD Removal Efficiency (%)			30%	20%			PJ Hannah, 2015; and Assumed
Diameter (m)			1.85	1.85			PJ Hannah, 2015
RBC Media Surface Area (m^2)			1,098	1,098			PJ Hannah, 2015
Hydraulic Loads							
RBC Media Hydraulic Load at ADWF (m^3/m^2/day)			0.043	0.020	0.08-0.16		Calculated
RBC Media Hydraulic Load at MDF (m^3/m^2/day)			0.056	0.034	0.08-0.16		Calculated
RBC Media Hydraulic Load at PWWF (m^3/m^2/day)			0.128	0.081	0.08-0.16		Calculated
Organic Loads							
RBC Media Load at Average Day Loading Conditions (gr SBOD/m^2/day)			7.2	4.9	4-10		Based on SBOD
RBC Media Load at Max. Day Loading Conditions (gr SBOD/m^2/day)			10.8	7.3	4-10		Based on SBOD
Secondary Clarifier							
Total Volume (m^3)			5	5			PJ Hannah, 2015
Sludge Storage (m^3)			1	1			Assumed
Sludge Storage to Total Volume Ratio			0.20	0.20			
Max. Sludge Depth (m)			0.3	0.3			
Surface Area (m^2)			3.04	3.04			PJ Hannah, 2015
Hydraulic Loads							
Surface Loading Rate at ADWF (m^3/m^2/day)			15.5	7.3	8.4-9.6		Calculated
Surface Loading Rate at MDF (m^3/m^2/day)			20.3	12.2			Calculated
Surface Loading Rate at PWWF (m^3/m^2/day)			46.4	29.3	16.8-19.2		Calculated
Hydraulic Retention Time at ADWF (hrs)			2.6	5.4	1.5 - 2.5	2.0	Calculated
Hydraulic Retention Time at MDF (hrs)			1.9	3.2	1.5 - 2.5	2.0	Calculated
Hydraulic Retention Time at PWWF (hrs)			0.9	1.3	1.5 - 2.5	2.0	Calculated
Solid Loads							
Surface Loading Rate at Average Day Loading Conditions (kg TSS/m^2/day)			3.7	2.2			Based on TSS
Surface Loading Rate at Max. Day Loading Conditions (kg TSS/m^2/day)			5.6	3.3			Based on TSS
Sand Filter							
Surface Area (m^2)			0.29	0.29			PJ Hannah, 2015
Filter Volume (m^3)			0.26	0.26			PJ Hannah, 2015; based on 0.9 m media depth
Filter Rating at ADWF (m^3/day)			41.6	41.6			Filter supplier data
Filter Rating at PWWF (m^3/day)			85.6	85.6			Filter supplier data
Design Filter Rate (m^3/day)			41.6	41.6			Filter supplier data
Surface Loading Rate at Design Filter Rate (m^3/m^2/day)			143	143	115-345	172	Calculated; for shallow filters lower values apply
Forward Filter Rate (m^3/day)			85.0	85.0			Filter supplier data
Surface Loading Rate at Forward Filter Rate (m^3/m^2/day)			293	293	115-345	172	Calculated; for shallow filters lower values apply
Hydraulic Loads							
Surface Loading Rate at ADWF (m^3/m^2/day)			162	77	115-345	172	Calculated; for shallow filters lower values apply
Surface Loading Rate at MDF (m^3/m^2/day)			213	127	115-345	172	Calculated; for shallow filters lower values apply
Surface Loading Rate at PWWF (m^3/m^2/day)			486	307	115-345	172	Calculated; for shallow filters lower values apply
Hydraulic Retention Time at ADWF (min)			8	17			Calculated
Hydraulic Retention Time at MDF (min)			6	10			Calculated
Hydraulic Retention Time at PWWF (min)			3	4			Calculated

2.4 Permit PE-13155 Compliance

The operator supplied sampling data since 2013 for review, compiled in **Appendix C**.

Parameter	Value	Status	Issue
Daily Discharge	70 cu.m. / day		Volume logging not functioning
Effluent Quality (Maximum Daily)	30mg/L BOD5		High levels exceeding permit values
	30mg/L TSS		High levels exceeding permit values
	1000 CFU/100mL		High levels exceeding permit values
Effluent Storage			Emergency Storage Tank currently being used to collect Backwash Discharge, reducing standby capacity.
Outfall & Diffuser			Outfall operating per design with no deficiencies
Continuous monitoring of plant operation			Alarms not functioning
Continuous monitoring of effluent clarity			Turbidity meter not functioning
Plant upset alarms			No alarm logging; no off-site alarm notification

Violation of Permit
Impaired function
In compliance

3 RECOMMENDED UPGRADES

It is recommended that existing plant controls be decommissioned and replaced with new hardware/software. This will be the most cost-efficient means of restoring automated function. In addition, we recommend improvements to the treatment process to restore plant operational compliance with Permit requirements. Further details follow.

3.1 Plant Controls – Alarms, Data Recording & Remote Access

MCSL, through discussion with CVRD staff, has engaged Livewire Automation Inc. to provide an estimated cost for upgrading King Coho electrical controls. Appended to this document as **Appendix D** is Livewire's brief assessment of existing controls, and estimated costs to modify/replace as necessary.

Specific recommendations include:

- Reconfigure existing Flygt panel to operate the outfall pumps only. Decommission surplus equipment used for plant controls.
- Decommission existing sand filter / RBC controls.
- Correct faulty UV lamp status indicators.

access. Controls to be compliant with CVRD guidelines and integrate into existing regional systems.

- Retain and service existing sand filter valves (preferred), replace with new air valves if existing valves cannot be serviced (Option 1 - Livewire pg 4). Alternately, replace with electric valves if excessive air use continues (Option 2 – Livewire pg 4).
- Install Solitax turbidity sensor (low range model).
- Retain existing Hach sc100 turbidity controller.
- Install electromagnetic flow meter.
- Supply and install industrial air compressor.
- CVRD review comment: Replace specified PC with HP Elite Desk mini 800 series c/w SDD drive.

3.2 Plant Process

The following process changes are recommended to improve system performance, based on process/system analysis:

1. **Add Equalization Tank**
   - Convert the existing 100 m^3 emergency storage tank (EST) into an equalization tank to buffer peak inflows. In its present condition the EST will provide HRT of 4 days at current average operating conditions and 1 day at PWWFs. Post conversion, the tank will provide 2 days at average operating conditions.
   - Redirect gravity and pressurized sanitary sewer feed lines from the diversion manhole (MH22) located ahead of the RBC package unit to the new equalization tank.
   - Install perforated screen basket on tank inlet to capture course debris.
   - Install a duplex grinder pump to feed the RBC from the equalization tank at a steady flow rate. Each pump should be rated for 47 m^3/day (design average day flow). Pump controls are to be included in Section 3.1 Plant Controls upgrades.
2. **Filter Feed Pump**
   - Confirm filter feed pump rate is equal to design flow of 47 m^3/day (design average day flow). The installation of an orifice plate can be used to restrict feed rate. Alternately, feed pumps can be replaced with new units, sized to pump at the appropriate rate.
3. **Backwash Routing**
   - Redirect filter backwash to primary clarifier, as per the original design. This internal flow recycle should not impact RBC effluent quality, provided that sludge buildup in the primary clarifier does not exceed 0.6 m in depth.

- Continue to monitor system performance and process efficiency after implementation of these changes. Make additional adjustments, as may be necessary, to further optimize process performance.(adjustments to RBC drum/shaft rotational speed, waste sludge and scum pumping rates, filter backwash frequency, etc).
- Should additional troubleshooting be required, establish sampling points before and after each process component to verify efficacy.

4. **Repair Air System**
   - Investigate air system leaks & repair; upgrade to industrial air compressor (optionally replace air valves (preferred) or install electric actuators (alternate)).
5. **UV Circulation**
   - Add circulating pump to feed UV chamber with treated effluent from outfall tank between filter feed cycles.
6. **Odour Control**
   - The odour suppression fluid pump is on-site, however it is inactive due to faulty integration in the existing PLC. This is an optional feature available for use if neighbours/residents complain of odours. It is intended to operate for a short duration at the end of each Outfall PS draw-down cycle, applying a layer of fluid within the Outfall wet well. Note this system will not address odours originating from any other part of the treatment chain. The proposed control upgrades will rectify and restore pump operation.

A routine maintenance summary is included in **Appendix E** for reference.

3.3 Collection and Conveyance Piping, Pump Station and Outfall

- Addition of a manual transfer switch and a backup (portable) generator to power Pump Station B in the event of a power outage.
- Structural assessment of existing pedestrian bridge across Little River (carries Pump Station B forcemain).
- Note a condition assessment of the existing outfall forcemain and discharge structure was not undertaken as part of this analysis.

3.4 Safe Work Procedures

- Worksafe BC requires confined space assessments to be completed and the implementation of safe work procedures to ensure worker safety.

4 ANNUAL OPERATION & MAINTENANCE COSTS

4.1 Typical Annual Operation and Maintenance Costs

Provided below are anticipated annual operation and maintenance costs (in 2017 dollars), for the CVRD to operate this wastewater treatment system. These costs have been based on historical information provided by King Coho and adjusted to account for additional recommended operations, inclusive of efficiencies gained through upgrades. These costs are based on personnel costs provided by the CVRD and do not include contingency.

Annual Costs - Operation and Maintenance			**Unit Cost**	**Cost**
Weekly operator site visits	1.5	hrs/week	$75.00	$4,500.00
Lab sample collection/handling	0.5	hrs/week	$75.00	$1,950.00
Lab fees	1	per week	$85.00	$4,420.00
Monthly maintenance	16	hrs/month	$75.00	$14,400.00
CVRD Administrative Services	4	hrs/quarter	$250.00	$4,000.00
Vehicle Use & Depreciation	1	per year	$4,000.00	$4,000.00
Septic truck pump out	9	calls/year	$900.00	$8,100.00
Septic truck coordination	3	hrs/call	$60.00	$1,620.00
Outfall inspection	1	every two years	$850.00	$850.00
*Telephone	12	months/yr	$200.00	$2,400.00
*Electricity	12	months/yr	$200.00	$2,400.00
*Alarm system	12	months/yr	$45.00	$540.00
*Foreshore liability	1	per year	$650.00	$650.00
Consumable materials & minor repairs (UV bulbs, sand filter media, odor suppression fluid)				$2,000.00
* Note utility costs.			**Total Yearly Costs**	**$51,830.00**
			Yearly/unit	*$1,400.81*
			monthly/unit	*$116.73*

4.2 Third Party Operation

For operational cost comparison, the current WWTP operator, Cowichan WastewaterPlus, provided maintenance proposal, see **Appendix F**. The quote assumed increased sludge pump-outs costs and the recommended process / controls improvements were implemented. The estimate indicates a, third party operator would charge approximately $51,000 annually ($1378/unit) to operate and manage the wastewater treatment system. Note that the estimate provided by Cowichan Wastewater Plus is exclusive of the following costs: telephone; alarm system; electrical; and foreshore liability.

5 ASSET MANAGEMENT PLAN

5.1 Short Term Capital Recovery

Based on existing system operation and condition, several upgrades are required to the treatment system to produce effluent meeting permit obligations.

Capital Upgrades / Repairs	Cost	Engineering / Project Management	Contingency	Total
Section 3.1 - Controls Upgrades	$62,000	$5,000	$10,000	$77,000
Section 3.2 - Process Upgrades	$20,000	$5,000	$5,000	$30,000
Section 3.3 - Collection and Conveyance Piping, Pump Station and Outfall Upgrades	$7,500	$2,500	$2,500	$12,500
Section 3.4 - Confined Space Access / Development of Safe Work Procedures	$10,000			$10,000
			Total	$129,500
			Divided / 37 units	$3,500

5.2 Long Term Capital Replacement Recovery

Typical major component replacement requirements are described below. Please note, we have limited the listing to those elements likely to require replacement within the 40 year horizon. Conveyance piping has been excluded based on its expected service life (75 to 100 yrs for PVC).

Consideration was given for the replacement of major components within the RBC chamber. Conversion of the RBC to alternate treatment processes is possible, and may be desirable, dependent upon operator preference. Two possible conversion options are listed below. Note in order to convert to an alternate treatment method, the existing RBC tank would need to be retained, but all inner workings are removed and replaced. This approach may offer additional benefits in the future including higher quality of discharge effluent and/or reduced maintenance / operation costs.

Component	Average Lifecycle	Replacement Cost (2017 $)
RBC disks (separate) [1]	20 – 25 years	$35,000
RBC rotation motor	20 - 25 years	$3,000
RBC sludge pump	20 - 25 years	$3,000
RBC shaft, disks & internal hardware [2]	20 - 25 years	$100,000
MBR Conversion [3]	20 - 25 years	$175,000
USBF Conversion [4]	20 - 25 years	$140,000

Component	Average Lifecycle	Replacement Cost (2017 $)
Controls – PLC [5]	20 - 40 years	$30,000
Flow meter [6]	30+ years	$3,500
Sand filter backwash valves [7]	10+ years	$1,500
Turbidity sensor [8]	10+ years	$10,000
Pump station PS-B [9]	20 - 25 years	$75,000
Outfall pumps	20 - 25 years	$20,000
Site Computer	5 years	$1,500
UV system	20 - 25 years	$10,000

Notes:

1. *Biomass disk replacement may be warranted due to end of material life failure or to restore operations should debris cause damage to existing disks.*
2. *Complete RBC internal replacement costs maintain current treatment process.*
3. *Membrane Bioreactor (MBR) is an alternate treatment method potentially delivering better final discharge effluent quality. The conversion pre-treats sewage with a fine screen headworks and bagger system. The sand filter is not required and would be decommissioned.*
4. *Upflow Sludge Blanket Filtration (USBF) generally offers lower operations and maintenance demands. The process also improves effluent quality by removing nitrogen and phosphorous. These parameters, however, are not required by, and beyond, the Permit requirements.*
5. *Included for reference.*
6. *Included for reference.*
7. *Included for reference.*
8. *Included for reference.*
9. *Replace with duplex pumps, associated fittings/valves, controls, integration with plant, installed on-site backup power and wet well to current standards.*

6 RECOMMENDED USER AGREEMENTS

6.1 Access Agreements

To ensure that CVRD staff have complete access to all sewerage assets transferred to their ownership, it is recommended that blanket Statutory Rights-of-Way be registered over all parcels containing sewerage infrastructure. It is further recommended that the CVRD work with the Strata to develop land use plans (parking, landscaping, etc.) for those areas immediately adjacent to critical sewerage system components (treatment plant, pump station, outfall, etc.), to ensure that they are accessible at all times.

6.2 Level of Service

Prior to assuming ownership of the King Coho sewage treatment system, the CVRD and Strata will need to formalize the expected level of service, and the projected costs of providing this

service. It is anticipated that the same level of service, and operational standard of care, would be provided in this instance, as is applied to other Local Service Areas within the CVRD.

Strata members should be aware that the CVRD has a minimum required standard of care that must be applied to the management of any infrastructure, regardless of cost recovery strategy or mechanism. That is to say, the CVRD, in accepting responsibility and liability for the King Coho treatment system, will be compelled to ensure that they are adequately managing the risk of operating the system, with no additional expense to existing CVRD residents.

Costs associated with the day-to-day operation of the plant may benefit from the specific expertise of CVRD staff and economies of scale in service. However, based on existing operational records, and the results of this assessment, the costs of sewerage treatment at King Coho, (inclusive of short and long term system improvements/upgrades and renewals costs), will increase.

6.3 Per Capita User & "Takeover" Fee Structure

The costs of operation and minor system maintenance of the King Coho treatment plant are relatively well understood, via historic cost records. Short term system improvement, as required to bring plant operation within permitted requirements, to suit CVRD operator preference, and to provide adequate mitigation of overall risk, are also reasonably well understood. These costs are relatively modest, and are considered to be reasonable for the service provided.

The CVRD will need to establish a mechanism to finance system replacement (due to expiration of service life), and to fund unforeseen (major) system failures. Many small treatment system operators establish a sinking fund to finance system renewals, to forego borrowing funds/financing. Given the CVRD's financial strength, it may be reasonable to assume that borrowing through the Municipal Finance Authority (MFA) is a more appropriate method of financing treatment system replacement. Notwithstanding, there are benefits to utilizing a sinking fund, or other method of up-front cost recovery, including:

- Capital can accrue with interest, vs. paying interest on borrowed money.
- If correctly set up, a sinking fund will ensure that sufficient funds are immediately available when needed (no delay in procuring funds).
- Repayment of funds borrowed through the MFA will potentially occur over a shorter period of time than a sinking fund would require to reach maturity.

We defer recommendation of long-term replacement financing to the CVRD's accounting experts.

User Cost Summary

Section 3 - Initial System Improvement Charges, Total Cost (Ex. Contingency) = $129,500

Section 3 - Initial System Improvement Charges, Per Unit (Ex. Contingency) = $3,500

Section 4 - Annual Operating Costs (2017 $) Ex. Contingency, Total = $51,380

Section 4 - Annual Operating Costs (2017 $) Ex. Contingency, Per Unit = $1,401

Option - Annual Operating Costs (2017) Third Party Operator = $ 50,694

It is recommended that the CVRD evaluate annual user fees yearly, based on previous year (actual) costs, with allowance for anticipated (minor) maintenance items, and appropriate contingencies.

8 REVIEW OF STRATA BYLAWS AND DISCLOSURE STATEMENTS

A number of legal documents and agreements have been provided by King Coho representatives for review. It is not clear if these documents are the most current versions, nor if the package of documents is complete. Notwithstanding, the following documents have been reviewed for specific reference to sanitary sewerage collection and treatment system obligations:

- Waste Management Agreement dated July 28, 1999 and dated November 01, 2013 (between the owners of Strata Plan VIS6599, Strata Plan VIS4843 and Strata Plan EPS828)
- Disclosure statement dated January 15, 2008 (the Shores at King Coho)
- Strata Property Act Form V – Schedule of Unit Entitlement (specific strata not confirmed, unsigned and undated document)
- Strata Management Agreement – Exhibit J (specific strata not confirmed, unsigned and undated document)
- Strata Property Act – Form Y, Owner Developers' Notice of Different Bylaws, Exhibit H (specific strata not confirmed, unsigned and undated document)
- Strata Property Act – Form V, Schedule of Unit Entitlement, Exhibit F (specific strata not confirmed, unsigned and undated document)

November 01, 2013 Waste Management Agreement

Governance and cost recover obligations of each respective strata are detailed in the current Waste Management Agreement. This document supersedes past agreements, and clearly describes the infrastructure to which the agreement applies, and the obligation of each Strata to fund the ongoing operation and maintenance of the wastewater collection, treatment and disposal systems. The allocation of yearly costs to operate the system are based on the number of dwelling units in each Strata.

A number specific references to wastewater collection and treatment obligations were noted in the provided disclosure statement, and Strata Property Act documents, as follows:

January 15, 2008 Disclosure Statement

- Notes that the Strata is subject to the Waste Management Agreement (November 01, 2013 is most recent version of the agreement).
- Notes an obligation for individual Strata members to contribute a proportionate share of the operating costs of the system.
- Confirms that the wastewater treatment system is located on common property.

- Requires that all Strata units connect to the wastewater treatment system.
- NOTE: this disclosure statement is likely no longer applicable. We understand that all Strata units have been sold by the developer, and that Strata bylaws now govern.

Strata Property Act – Form Y – Owner Developers' Notice of Different Bylaws

- Within Bylaw 37 - Sewage Disposal, the following requirements are listed:
  - No disposal of restricted items into the sewage disposal system.
  - That the Strata enter into an agreement with VIS4843 and 774237BC Ltd to fund the operation and maintenance of the wastewater treatment system, pro rata.
- An initial annual operating budget of $9,600 was established.

Strata Property Act - Form V – Schedule of Unit Entitlement for PID 027-550-680

- Within Section 37 - Sewage Disposal, the following requirements are listed:
  - No disposal of restricted items into the sewage disposal system.
  - That the Strata enter into an agreement with VIS4843 and 774237BC Ltd to fund the operation and maintenance of the wastewater treatment system, pro rata.

Strata Property Act - Form A – Strata Bylaws for VIS6599

- Within Section 37 - Sewage Disposal, the following requirements are listed:
  - No disposal of restricted items into the sewage disposal system.
  - That the Strata enter into an agreement with VIS4843 and 774237BC Ltd to fund the operation and maintenance of the wastewater treatment system, pro rata.

Based on available information, it appears that obligations to fund the ongoing operation and maintenance of the wastewater treatment system are clearly defined. Moving forward, it will be necessary for each strata to amend their bylaws, to remove reference to operation and finance obligations of the Strata, which would presumably be superseded by the newly created Local Service Area. We do not recommend removal of strata bylaws governing the disposal of restricted items into the wastewater treatment system.

7 CONCLUSIONS

- In its current state, the wastewater treatment system at King Coho is not functioning efficiently, and is out of compliance with several conditions of operating permit Permit PE-13155 (Feb 1998, issued under the Waste Management Act)
- An operational review has determined that a number of infrastructure and process upgrades can increase the quality if wastewater discharge, likely bringing effluent quality back within Permit requirements.
- The costs of providing necessary upgrades to the wastewater treatment system to bring it back within permit compliance are preliminarily estimated to be $130,000.
- The annual cost of operation and maintenance of the wastewater treatment system by CVRD forces, is estimated to be $51,000, exclusive of contingencies, or future

replacement funding. The cost of utilizing a third party operator (Cowichan Wastewater Plus), is similar.

- Most major system components should not require replacing due to service life expiration for approximately 20 years. Exceptions include sand filter backwash valves (10 years), and turbidity monitor (10 years).
- VIS6599, VIS4843, EPS828 are all party to a Waste Management Agreement that governs the operation, maintenance, and funding of the wastewater collection, treatment, and disposal system.

8 CLOSURE

This report has been prepared, based on the scope of work described, for the use of the Comox Valley Regional District, and includes the operators of the King Coho Wastewater Treatment System

Conclusions presented herein are based on information provided, in part, by others. The assessment has been carried out in accordance with generally accepted professional practice.

We trust this report satisfies your present requirements. Should you have any questions of comments, please contact our office at your convenience.

Yours truly,

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Enclosures:
Appendix A Permit PE-13155
Appendix B KC Process
Appendix C KC WWTP Lab History
Appendix D Livewire Assessment – Q219 Comox King Coho Control System
Appendix E WTTP Maintenance Summary
Appendix F Cowichan Wastewater Plus Proposal
MCSL drawing 47442, S-1, Rev.0

REVISION HISTORY

Date	Status	Revision	Author
February 3, 2017	Final	Rev.1	MS
December 1, 2016	Draft	Rev. 0	MS

LIMITATION

This report has been prepared for the exclusive use of the Comox Valley Regional District. The material in it reflects the best judgement of the Consultant in light of the information available to the Consultant at the time of preparation. As such, McElhanney, its employees, sub-consultants and agents will not be liable for any losses or other consequences resulting from the use or reliance on the report by any third party.

APPENDIX A

PERMIT PE-13155

BRITISH COLUMBIA

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

Vancouver Island Region
Pollution Prevention
2080-A Labieux Road
Nanaimo, British Columbia
V9T 6J9
Telephone: (250) 751-3100
Fax: (250) 751-3103

PERMIT
PE-13155

Under the Provisions of the Waste Management Act

King Cohoe Resort Ltd.

201 - 467 Cumberland Rd

Comox, British Columbia

V9N 2C5

is authorised to discharge effluent to the water from a resort condominium located near Comox, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

1. AUTHORIZED DISCHARGES

1.1 The discharge of effluent to which this Subsection is applicable is from a 55-unit resort condominium development as shown on the attached Site Plan A. The BC Environment reference number (S.E.A.M. site number) for this discharge is E222939.

1.1.1 The maximum rate at which effluent may be discharged is 70 m^3/d.

1.1.2 The characteristics of the discharge shall not exceed:

5-day biochemical oxygen demand	- 30 mg/L
total suspended solids	- 30 mg/L
fecal coliform	- 1000 CFU/100 mL

1.1.3 The works authorized are a secondary treatment plant, a grease trap to remove kitchen oils and grease, disinfection facilities, effluent storage facilities for upsets and maintenance, a 400 m long outfall with multiport diffuser extending to a depth of 30 m below mean low water, continuous on-line facilities to monitor plant operation and effluent clarity, plant upset alarms, and related appurtenances approximately located as shown on the attached Site Plan A.

J. O. Finnie, P.Eng.
Assistant Regional Waste Manager

Date Issued:
Date Amended: FEB 0 2 1998
(most recent)

1.1.4 The works authorized must be complete and in operation when discharge commences.

1.1.5 The location of the facilities from which the discharge originates is Lot A, Plan 39433, District Lot 224, Comox District.

1.1.6 The location of the point of discharge is the Strait of Georgia.

2. GENERAL REQUIREMENTS

2.1 Maintenance of Works and Emergency Procedures

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

2.2 Bypasses

The discharge of effluent which has bypassed the designated treatment works is prohibited unless the approval of the Regional Waste Manager is obtained and confirmed in writing.

2.3 Process Modifications

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

2.4 Plans - New Works

Plans and specifications of the works authorized in Section 1.1.3 shall be submitted to the Regional Waste Manager for review before construction commences. The works shall be constructed in accordance with such plans.

2.5 Posting of Outfall

The Permittee shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the approval of the Regional Waste Manager.

J. O. Finnie, P.Eng.
Assistant Regional Waste Manager

2.6 Sludge Wasting and Disposal

Sludge wasted from the treatment plant shall be disposed of to a site and in a manner approved by the Regional Waste Manager.

2.7 Sewer Connection

The discharge authorized by Subsection 1.1 of this Permit is subject to connection to a municipal sewerage system when such facilities become available.

2.8 Effluent Upgrading

Based on receiving environment monitoring data and/or other information obtained in connection with this discharge, the Permittee may be required to provide additional treatment facilities.

2.9 Outfall Inspection

The Permittee shall inspect the outfall line (by diver survey or inspect by another method approved by the Regional Waste Manager) every two years or as may otherwise be required by the Regional Waste Manager. During the outfall inspection, the Permittee shall inspect the area around the point of discharge to assess sediment accumulation and impact on the benthic community.

2.10 Facility Classification and Operator Certification

The permittee shall have the works authorized by this permit classified (and the classification shall be maintained) by the "Environmental Operators Certification Program Society" (Society). The works shall be operated and maintained by persons certified within and according to the program provided by the Society. Certification must be completed to the satisfaction of the Regional Waste Manager. In addition, the Regional Waste Manager shall be notified of the classification level of the facility and certification level of the operators, and changes of operators and/or operator certification levels within 30 days of any change.

Alternatively, the works authorized by this permit shall be operated and maintained by persons who the permittee can demonstrate to the satisfaction of the Director, are qualified in the safe and proper operation of the facility for the protection of the environment.

J. O. Finnie, P.Eng.
Assistant Regional Waste Manager

2.11 Liquid Waste Management Plan

The Comox-Strathcona Regional District is developing a Liquid Waste Management Plan for this area. Notwithstanding the terms and conditions of this permit, the authorized discharge is subject to the provisions of the Liquid Waste Management Plan once approved by the Minister.

2.12 Plant Operation

The plant shall be operated such that the characteristics of the discharge do not exceed the following median values:

5-day biochemical oxygen demand	-10 mg/L
total suspended solids	- 10 mg/L
fecal coliform	- 10 CFU/100 mL

The monitoring data for the previous year must be used to calculate the median. Prior to accumulating the first year's data, all available data points must be used.

2.13 Water Saving Devices

The Permittee shall install water saving devices in each unit of the development.

2.14 Public Education

The permittee shall prepare a report with information on the following:

(a) The environmentally sensitive nature of the discharge location;

(b) The requirements of this permit;

(c) Why water conserving devices are required;

(d) A source control program which includes description of the deleterious effects of household hazardous waste (hhw) on the treatment works and the receiving environment, what alternatives are available for use in place of hhw, and recommended methods of hhw management.

The report shall be submitted to the Regional Waste Manager before discharge commences, for review, and a copy of the report shall be provided to each member of the development.

J. O. Finnie, P.Eng.
Assistant Regional Waste Manager

2.15 Odours

Should objectionable odours, attributable to the operation of the sewage treatment plant, occur beyond the property boundary, as determined by the Regional Waste Manager, measures or additional works will be required to reduce the odour to acceptable levels.

2.16 Posting of Security

The permittee shall post security in the amount of $1,000 per constructed unit in a manner or form acceptable to the Regional Waste Manager. The security may be posted in stages as the development is completed. The total security upon completion of the development will be $55,000. The security may be applied at the discretion of the Regional Waste Manager under the provisions of the Waste Management Act to correct any inadequacy of the works as it relates to their construction, operation and maintenance.

The permittee may request the return of security after the property in the works has been transferred to a municipal authority, strata corporation or equivalent continuing body representative of all persons served by the works. Granting of the request is at the discretion of the Regional Waste Manager under the provisions of the Waste Management Act.

3. MONITORING AND REPORTING REQUIREMENTS

3.1 Effluent Sampling and Analysis

The Permittee shall install a suitable sampling facility and obtain a grab sample of the effluent once each week.

Obtain analyses of the sample for the following:

5-day biochemical oxygen demand
total suspended solids
fecal coliform bacteria

3.2 Flow Measurement

Provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over a 24-hour period.

J. O. Finnie, P.Eng.
Assistant Regional Waste Manager

3.3 Baseline Monitoring Program

The permittee shall complete a baseline monitoring program study of the coliform levels in shellfish on the beach and at the proposed outfall location, prior to any effluent discharge.

3.4 Sampling and Analytical Procedures

Flow Measurement shall be carried out in accordance with the procedures described in "Field Criteria for Sampling Effluents and Receiving Waters", April 1989, or by suitable alternative procedures as authorised by the Regional Waste Manager.

Copies of the above manual are available from the Pollution Prevention Division, Ministry of Environment, Lands and Parks, P.O. Box 9342, Stn. Prov. Govt, Victoria, British Columbia V8W 9M1. The manual is also available for review at all Pollution Prevention Offices.

Sampling shall be carried out in accordance with the procedures described in the latest version of "British Columbia Field Sampling Manual for Continuous Monitoring Plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. 1996 Edition (Permittee)", or by suitable alternative procedures as authorised by the Regional Waste Manager.

Analyses are to be carried out in accordance with procedures described in the latest version of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials (March 1994 Permittee Edition)", or by suitable alternative procedures as authorised by the Regional Waste Manager.

Copies of the above manuals may be purchased from Queen's Printer Publications Centre, P. O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409), and are also available for inspection at all Pollution Prevention offices.

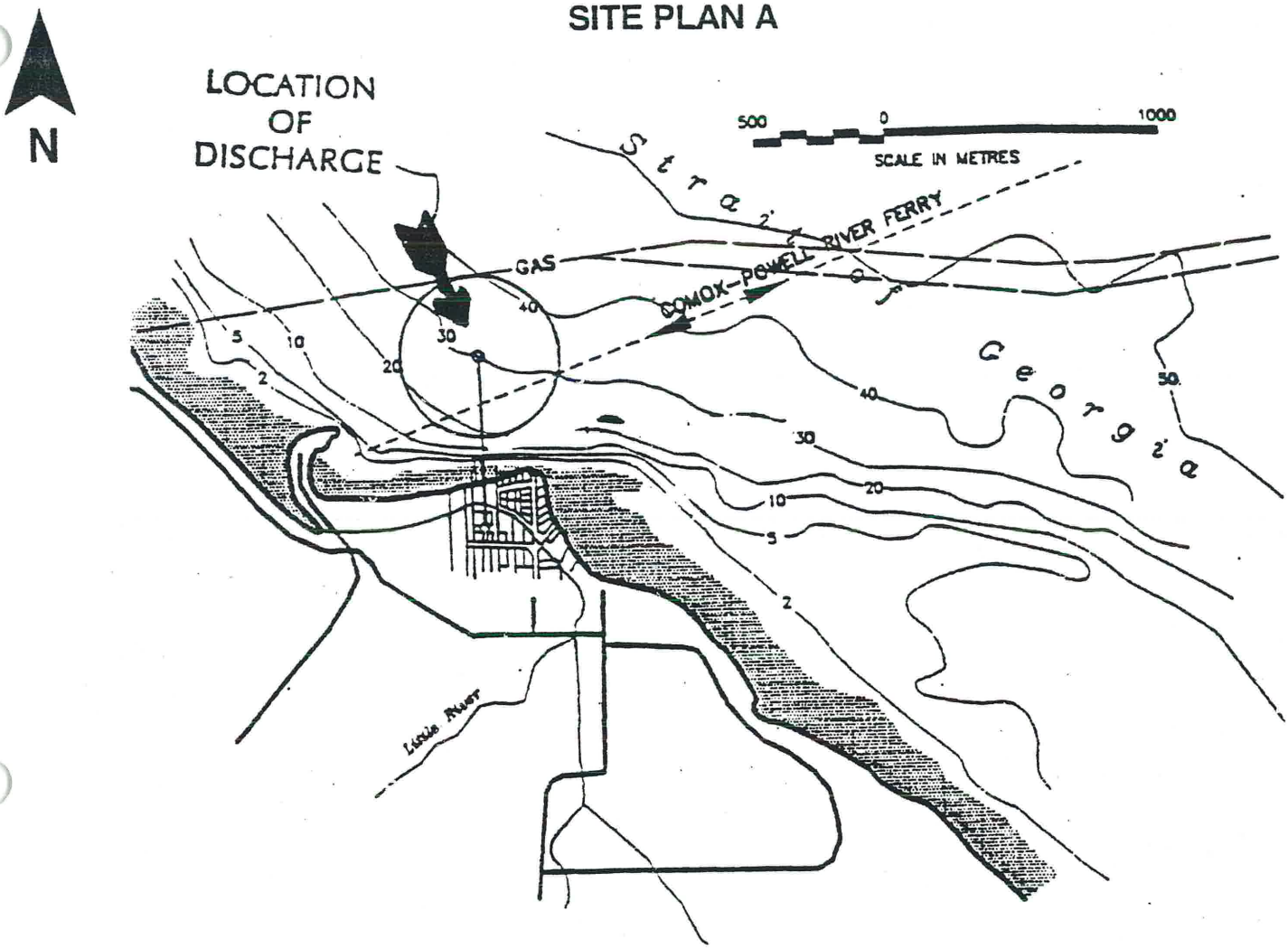
3.5 Reporting

Maintain data of analyses and flow measurements for inspection and every three months submit the data, suitably tabulated, to the Regional Waste Manager for the previous quarter. Based on the results of the monitoring program, the Permittee monitoring requirements may be extended or altered by the Regional Waste Manager.

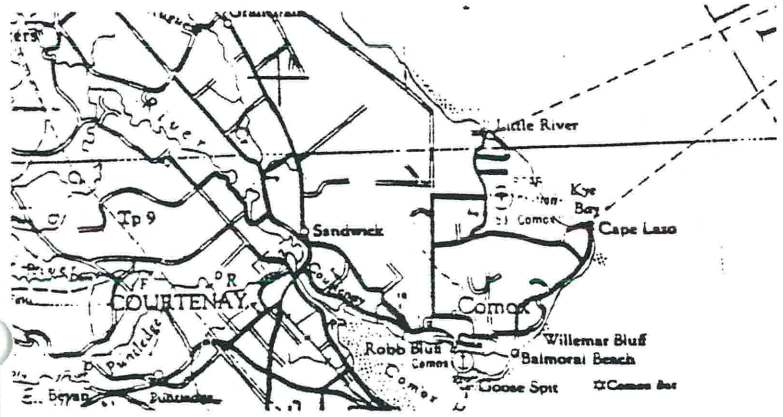
J. O. Finnie, P.Eng.
Assistant Regional Waste Manager

Date Issued: FEB 02 1998
Date Amended:
(most recent)

SITE PLAN A



Location Map



Scale: Not to Scale

Permit: PE-13155

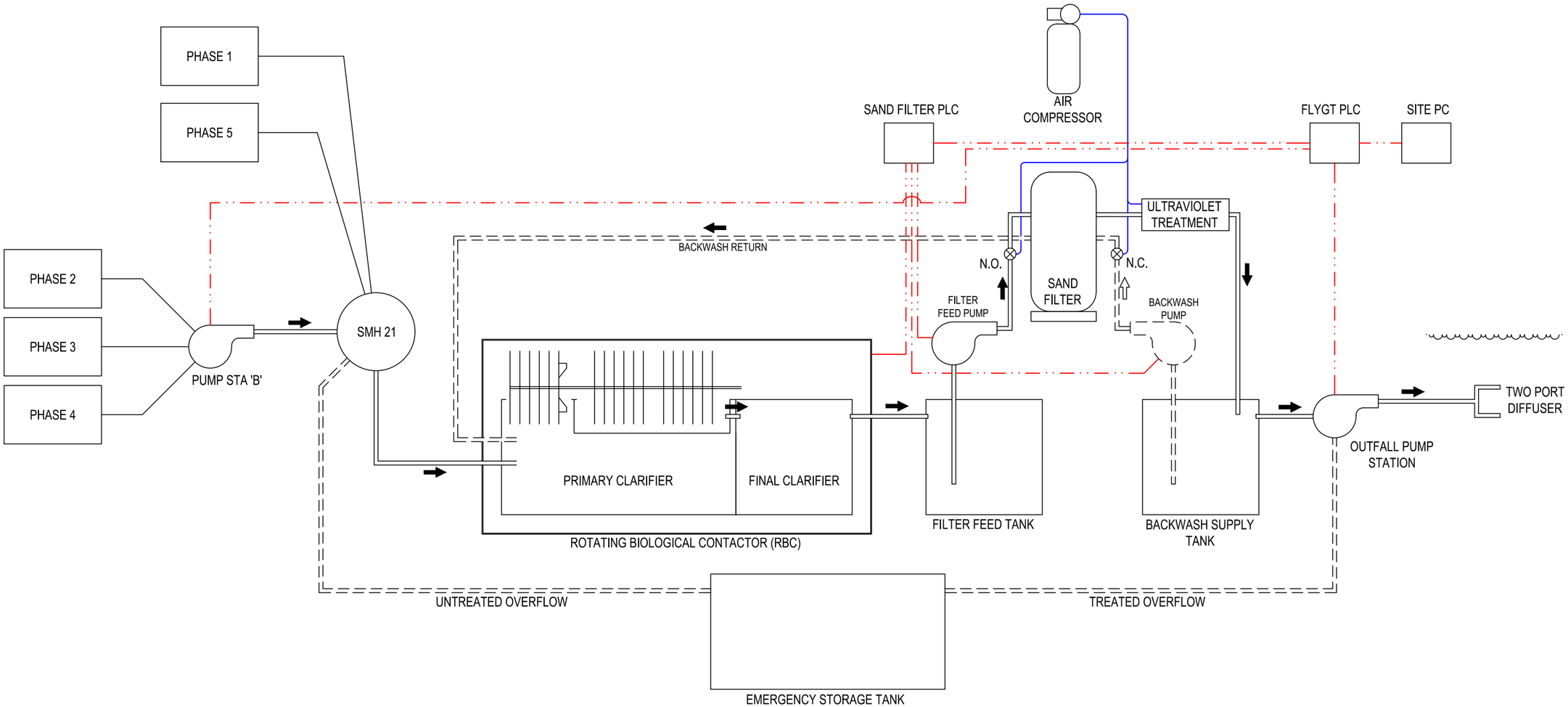
Date:

FEB 02 1998

John Finnie, P. Eng
Assistant Regional Waste Manager
Vancouver Island Region

APPENDIX B

KC PROCESS



Rev	Date	Description	Drawn	Design	App'd
####	####	####	####	####	####

ORIGINAL DWG SIZE: ANSI B (11" x 17")

McElhanney
McElhanney Consulting Services Ltd.
495 Sixth Street
Courtenay BC
Canada V9N 6V4
Tel 250 338 5495

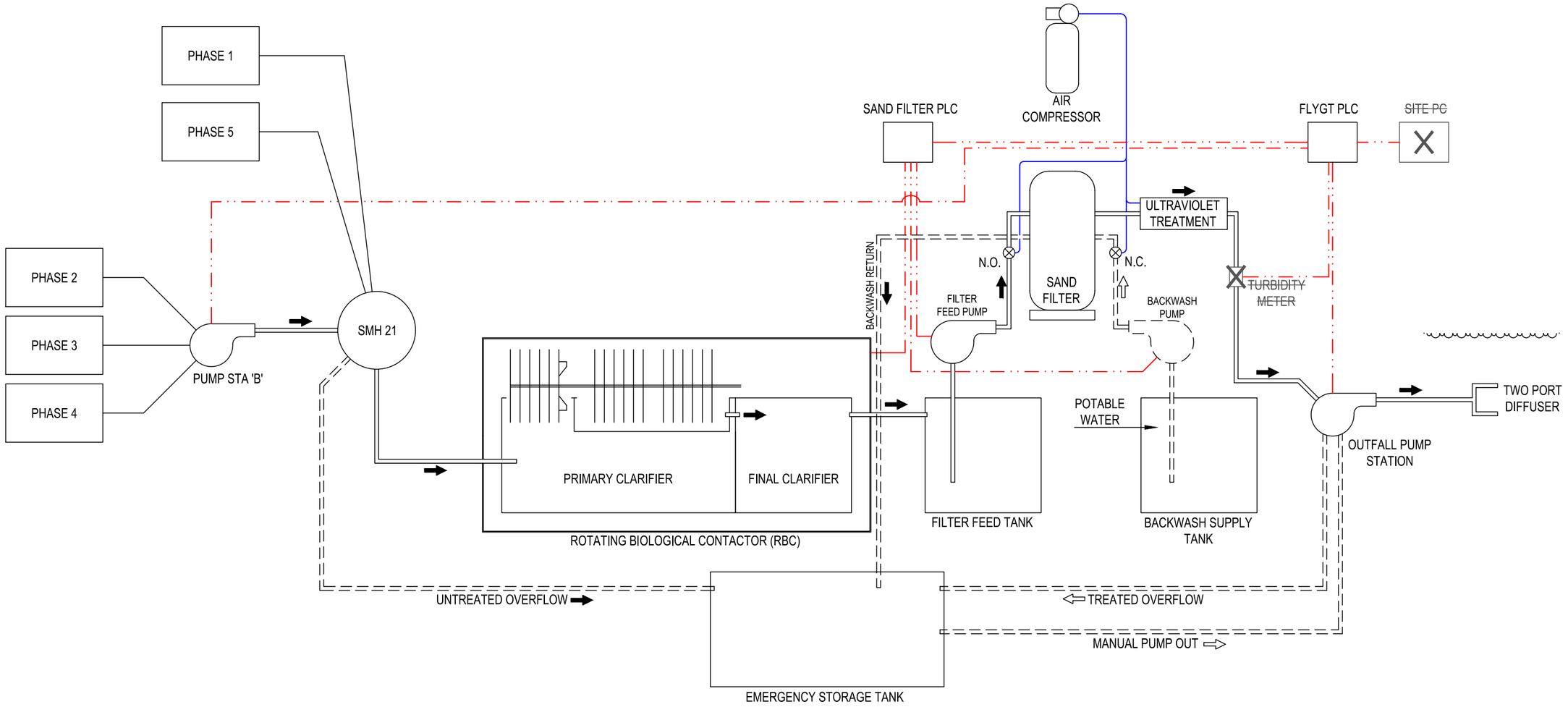
COMOX VALLEY REGIONAL DISTRICT

ORIGINAL DESIGN
PROCESS & CONTROL DIAGRAM
KING COHO WASTEWATER TREATMENT PLANT

LITTLE RIVER, B.C.

Drawing No.
SK-1

Project Number	Rev.
2211-47442-00	0



CONTROLS
COMPRESSED AIR
SEWER (NORMAL)
SEWER (INTERMITTENT)
ITEMS BROKEN / OUT-OF-SERVICE

Rev	Date	Description	Drawn	Design	App'd
0	2017-01-09	ISSUED FOR REVIEW	MS	-	-

ORIGINAL DWG SIZE: ANSI B (11" x 17")

McElhanney
McElhanney Consulting Services Ltd.
495 Sixth Street
Courtenay BC
Canada V9N 6V4
Tel 250 338 5495

COMOX VALLEY REGIONAL DISTRICT

CURRENT FUNCTION PROCESS & CONTROL DIAGRAM
KING COHO WASTEWATER TREATMENT PLANT

LITTLE RIVER, B.C.

Drawing No. SK-2

Project Number	Rev.
2211-47442-00	0

PHASE 1
PHASE 5
PHASE 2
PHASE 3
PHASE 4
PUMP STA 'B'
SMH 21
SITE PC
NEW PLC
AIR COMPRESSOR
FLYGT PLC
BACKWASH RETURN
ULTRAVIOLET TREATMENT
N.O.
N.C.
SAND FILTER
FILTER FEED PUMP
BACKWASH PUMP
TURBIDITY METER
FLOW METER
TWO PORT DIFFUSER
OUTFALL PUMP STATION
PRIMARY CLARIFIER
FINAL CLARIFIER
ROTATING BIOLOGICAL CONTACTOR (RBC)
FILTER FEED TANK
BACKWASH SUPPLY TANK
EQUALIZATION TANK

CONTROLS
COMPRESSED AIR
SEWER (NORMAL)
SEWER (INTERMITTENT)

Rev	Date	Description	Drawn	Design	App'd
0	2017-01-09	ISSUED FOR REVIEW	MS	MS/DR	-

ORIGINAL DWG SIZE: ANSI B (11" x 17")

McElhanney
McElhanney Consulting Services Ltd.
495 Sixth Street
Courtenay BC
Canada V9N 6V4
Tel 250 338 5495

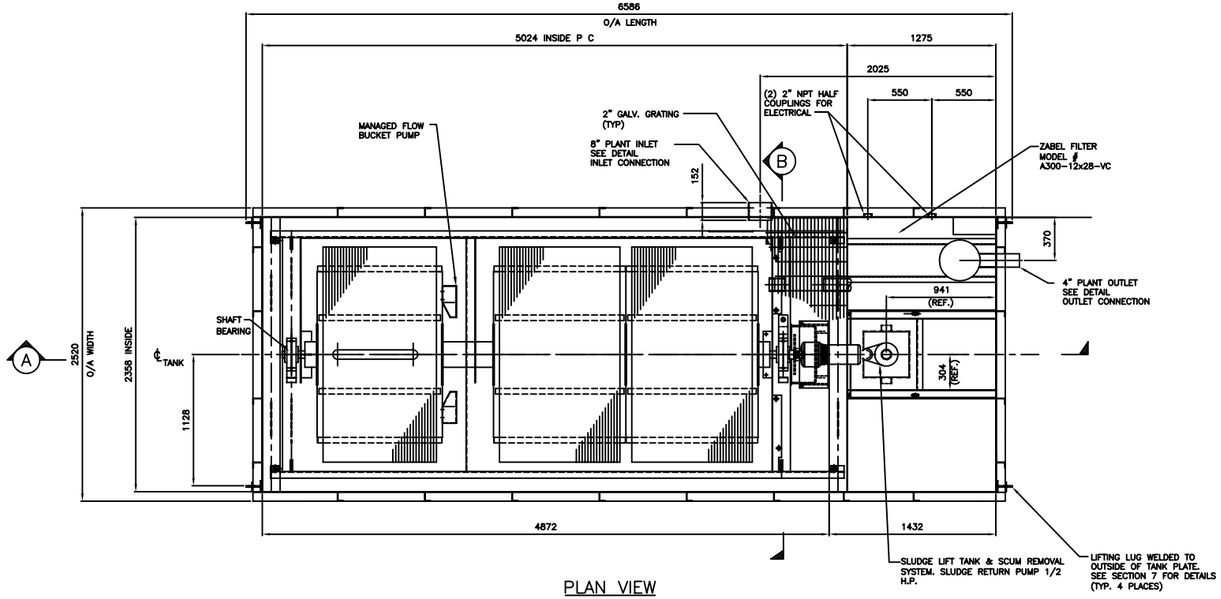
COMOX VALLEY REGIONAL DISTRICT

RECOMMENDED
PROCESS & CONTROL DIAGRAM
KING COHO WASTEWATER TREATMENT PLANT

LITTLE RIVER, B.C.

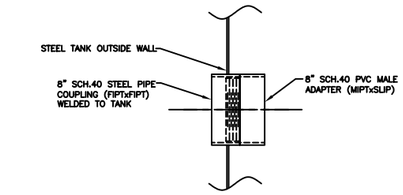
Drawing No. SK-3

Project Number	Rev.
2211-47442-00	0



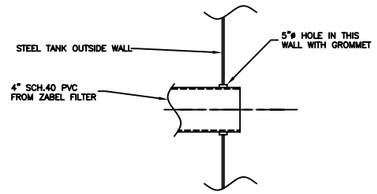
PLAN VIEW

NOTE: FRP COVER OMITTED FOR CLARITY



INLET CONNECTION

3x SCALE



OUTLET CONNECTION

3x SCALE

DESIGN CRITERIA

AVERAGE DAILY FLOW	47	M^3/DAY (JOUR)
SOURCE: DOMESTIC		
PEAK FLOW	5.8	M^3/H
BALANCED FLOW	2.25	M^3/H
INFLUENT BOD TOTAL: SUMMER / WINTER	11.28	KG/DAY (JOUR)
INFLUENT BOD SETTLED (EST)	7.9	KG/DAY (JOUR)
INFLUENT SUSPENDED SOLIDS	11.28	KG/DAY (JOUR)
EFFLUENT BOD (AVERAGE)	10	MG/L) AFTER
EFFLUENT SUSPENDED SOLIDS (AV.)	10	MG/L) TERTIARY FILTER
TEMPERATURE	13°	C MIN.
	21°	C MAX.
BIO SUPPORT MEDIA DIA.	1.85	M_2
BIO SUPPORT MEDIA AREA	1098	M^2
DISC LOADING: SUMMER / WINTER	7.19	GM/M^2

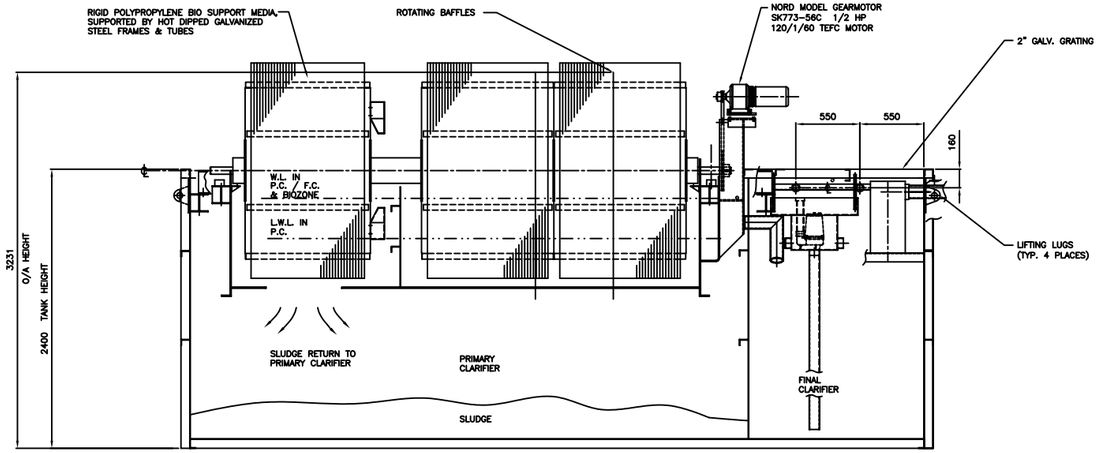
PRIMARY CLARIFIER

CAPACITY INCLUDING SLUDGE (BALANCING VOLUME EXCLUDED)	21.93	M^3
BALANCING VOLUME	4.07	M^3
SLUDGE STORAGE CAPACITY	8	M^3
SLUDGE STORAGE CAPACITY	30	DAYS

FINAL CLARIFIER

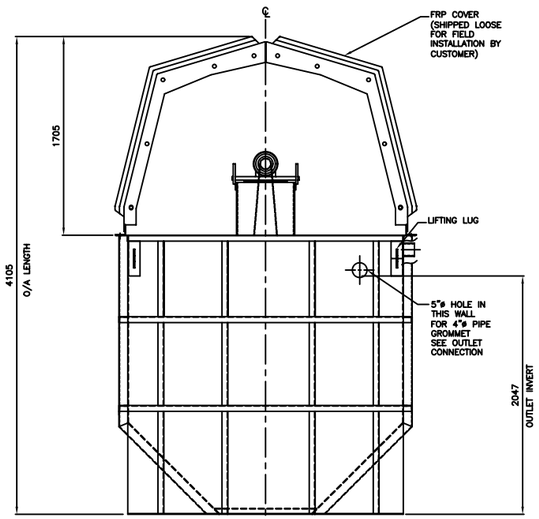
CAPACITY	5	M^3
SLUDGE STORAGE CAPACITY	0	M^3
SURFACE AREA	3.04	M^2

ALL FIGURES BASED ON AVERAGE DAILY FLOW AT RAW SEWAGE STRENGTH OF 240 MG/L

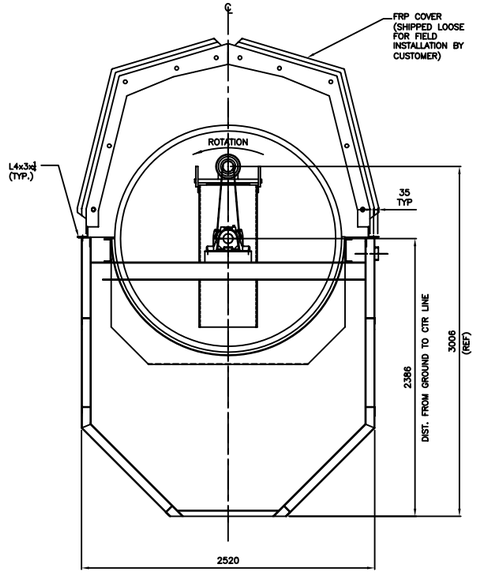


SECTION (A)

NOTE: FRP COVER OMITTED FOR CLARITY



END VIEW



SECTION (B)

PLEASE NOTE:

THIS EQUIPMENT, GIVEN THE CORRECT SITE & OPERATING CONDITIONS, MAY BECOME POSITIVELY BUOYANT. IF THERE IS A POSSIBILITY THAT THE AREA SURROUNDING THIS EQUIPMENT HAS OR MAY HAVE A HIGH GROUND WATER LEVEL, EVEN IF ONLY TEMPORARILY, TIE-DOWN HARDWARE & A BASE DESIGNED FOR ANTI-FLOTATION WILL BE REQUIRED.

NOTE:

STEEL TANK 3/16" MS PLATE. ALL SURFACES SANDBLASTED TO SSPC-SP6-63 & PAINTED WITH 1 COAT OF COAL TAR EPOXY TO A DRY FILM THICKNESS OF 14-16 MILS.

CLIENT KING COHO PROPERTIES

CONSULTANT McELHANNEY CONSULTING SERVICES LTD

PROJECT KING COHO LODGE

DESCRIPTION	REV.	DATE

DRAWN	RG
DATE	06/09/15
SCALE	N.T.S.
CHECKED	
APPROVED	
PLOT	1:25

P.J. HANNAH
EQUIPMENT SALES CORP.
VANCOUVER, TORONTO

*NORTH AMERICAN LICENSEE OF KEE PROCESS (FORMERLY KLARGESTER)
*CANADIAN LICENSEE OF SLY INC.

Specialists in pollution control since 1973

TITLE GENERAL ARRANGEMENT OF BIODISC MODEL BS9H-BFP(S)

OUR REF. # K17601

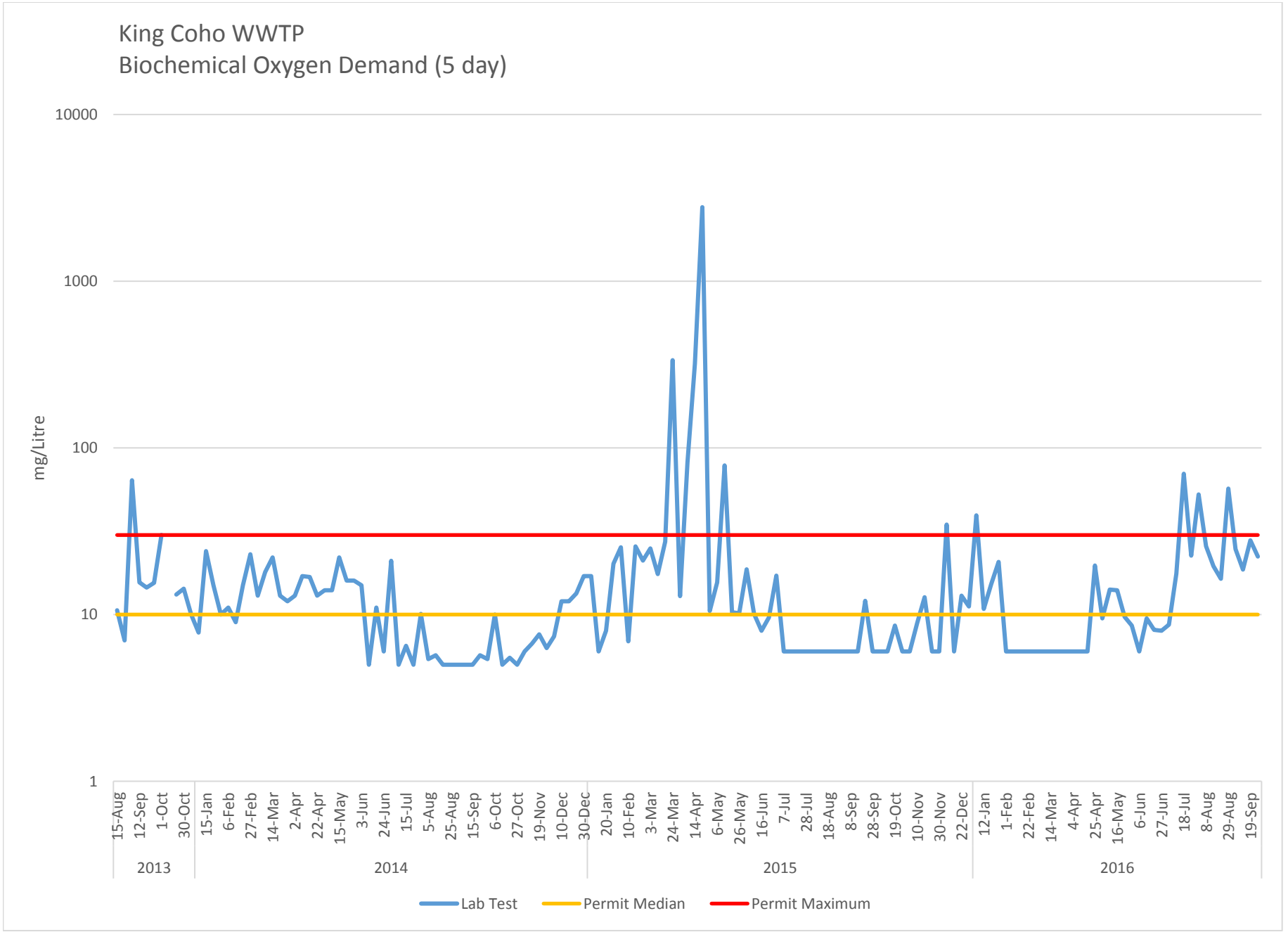
YOUR REF. #

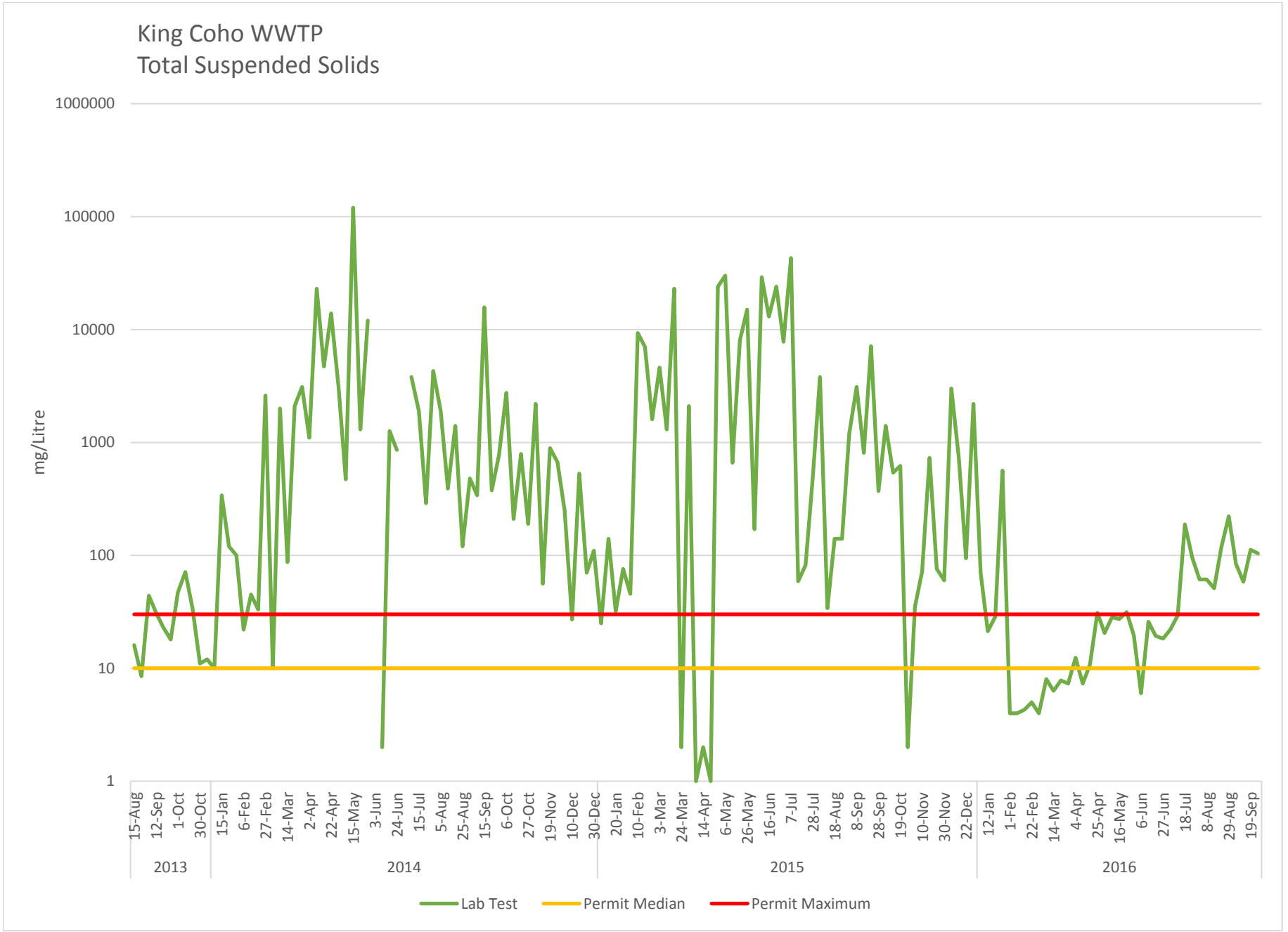
DRAWING NO. A1-K17601-10688

REV. -

APPENDIX C

KC WWTP LAB HISTORY


King Coho WWTP
Biochemical Oxygen Demand (5 day)
mg/Litre
10000
1000
100
10
1
15-Aug
12-Sep
1-Oct
30-Oct
15-Jan
6-Feb
27-Feb
14-Mar
2-Apr
22-Apr
15-May
3-Jun
24-Jun
15-Jul
5-Aug
25-Aug
15-Sep
6-Oct
27-Oct
19-Nov
10-Dec
30-Dec
20-Jan
10-Feb
3-Mar
24-Mar
14-Apr
6-May
26-May
16-Jun
7-Jul
28-Jul
18-Aug
8-Sep
28-Sep
19-Oct
10-Nov
30-Nov
22-Dec
12-Jan
1-Feb
22-Feb
14-Mar
4-Apr
25-Apr
16-May
6-Jun
27-Jun
18-Jul
8-Aug
29-Aug
19-Sep
2013
2014
2015
2016
Lab Test
Permit Median
Permit Maximum


King Coho WWTP
Total Suspended Solids
mg/Litre
1000000
100000
10000
1000
100
10
1
15-Aug
12-Sep
1-Oct
30-Oct
15-Jan
6-Feb
27-Feb
14-Mar
2-Apr
22-Apr
15-May
3-Jun
24-Jun
15-Jul
5-Aug
25-Aug
15-Sep
6-Oct
27-Oct
19-Nov
10-Dec
30-Dec
20-Jan
10-Feb
3-Mar
24-Mar
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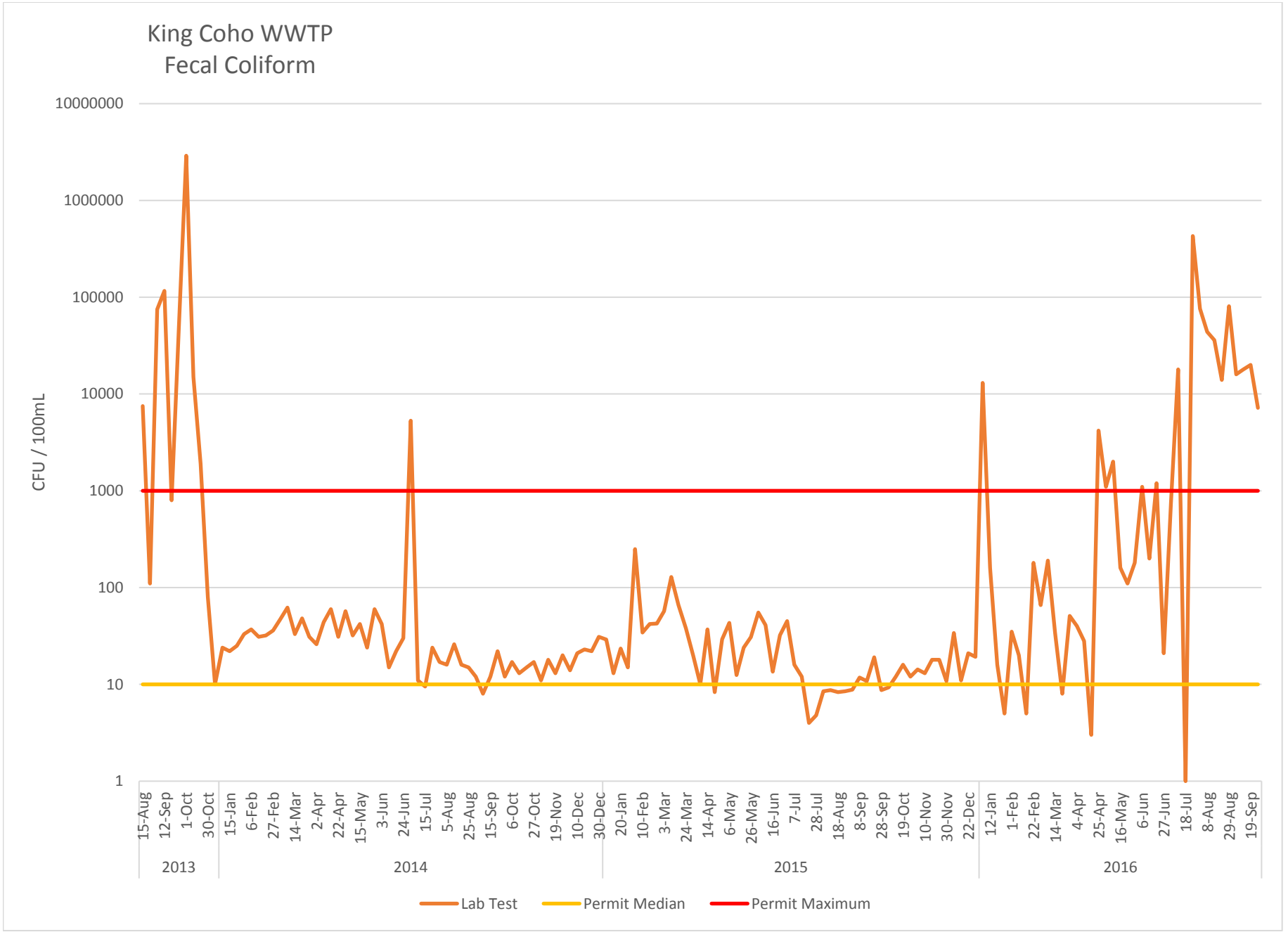
8-Sep
28-Sep
19-Oct
10-Nov
30-Nov
22-Dec
12-Jan
1-Feb
22-Feb
14-Mar
4-Apr
25-Apr
16-May
6-Jun
27-Jun
18-Jul
8-Aug
29-Aug
19-Sep
2013
2014
2015
2016
Lab Test
Permit Median
Permit Maximum


King Coho WWTP
Fecal Coliform
CFU / 100mL
10000000
1000000
100000
10000
1000
100
10
1
15-Aug
12-Sep
1-Oct
30-Oct
15-Jan
6-Feb
27-Feb
14-Mar
2-Apr
22-Apr
15-May
3-Jun
24-Jun
15-Jul
5-Aug
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15-Sep
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28-Sep
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10-Nov
30-Nov
22-Dec
12-Jan
1-Feb
22-Feb
14-Mar
4-Apr
25-Apr
16-May
6-Jun
27-Jun
18-Jul
8-Aug
29-Aug
19-Sep
2013
2014
2015
2016
Lab Test
Permit Median
Permit Maximum

APPENDIX D

LIVEWIRE ASSESSMENT

Q219 COMOX KING COHO CONTROL SYSTEM

LIVEWIRE AUTOMATION INC.

Estimate

To: Matt Sanderson

Quote#: Q000000219
Date: Nov 21, 2016
Project Name: WWTP Control System Upgrades
Revision #: 1.0

McElhanney

Comox King Coho

WWTP Control System Upgrades

Comox, BC

Thank you for your business!

2610 Beverly Street - Duncan, BC – V9L 5C7
Ph: 250.856.0082 Fax: 1.866.730.9438

Company Name: McElhanney Engineering
Project Name: WWTP Control System Upgrades – Comox King Coho

Contents

Company Name: McElhanney Engineering
Project Name: WWTP Control System Upgrades – Comox King Coho

1. Introduction:

LiveWire Automation Inc. has been invited to submit a proposal for the installation and commissioning of a new control system at the waste water treatment plant for the King Coho Strata. The new control system utilizes an Allen Bradley Compact Logix PLC with a Rockwell Automation RSView HMI. The proposal also includes the installation of a new control panel, which includes the CompactLogix PLC and all associated I/O, a new Hach turbidity sensor, an Endress+Hauser mag flowmeter and new backwash valves.

The following proposal is based on the information collected during interviews and an on-site visit, dated November 10, 2016, by Jeremy Warren.

2. About our company:

LiveWire Automation is Fort St. John, BC based automation company that has been in business, serving Western Canada since 2007. With offices in Vancouver and on Vancouver Island, LiveWire employs a staff from a variety of backgrounds including Electronics and Mechatronics Technology, Electrical and Instrumentation, and Computer Science. We strive to hire locally and contract other local businesses for parts and services.

We take great pride in the fact that we have had the opportunities to work with many professional and successful companies throughout Western Canada. From project inception to completion, LiveWire Automation is there to deliver your complete automation system, on time and on budget.

We work closely with our clients, analyzing the project at hand, listening to the client's requirements then selecting the optimum equipment and delivery mechanism to achieve the desired results. By making sure we are prepared for the unexpected and always putting in the extra effort needed, we can guarantee a safe and superior control system, every time.

3. Project features:

A. Control System (PLC & HMI)

I. The CompactLogix PLC by Allen Bradley is a small, yet powerful computing platform for small to medium sized installations. The CompactLogix PLC makes use of the latest programming standards which has allowed us to build user-defined data types and logic blocks that

streamline and drastically reduce the programming hours involved in new projects.

II. CVRD has come up with a 1500 point RSView32 license that we can use for this project, which will save on software costs. RSView32 is an older product, however it's what the CVRD is using at some of their sites already, and they would like to keep everything consistent.

III. Hardware requirements for RSViews are fairly basic. I have included a small form factor Lenovo desktop machine to run the HMI. This machine includes two solid state hard drives for storage.

IV. I have discussed the project requirements with Brian Pearson of the CVRD and he has accepted the Allen Bradley PLC and RSView HMI as a hardware/software solution that the CVRD can work with going forward.

V. Quote includes a 48" x 36" x 16" metal enclosure, complete with PLC, power supply and UPS and terminal blocks for all of the field wiring. The smaller filter control box will go away, and the Flygt pump control box will be stripped of all but the pump power wiring, and all site I/O will be moved over to the new control box.

B. Sand Filter Control Valves

I. As discussed, the two control valves on the inlet and outlet of the sand filter, are failing and causing the operator some grief. I have included two options for these valves.

II. Option 1 includes brand new air actuated valves, which are direct replacement for the valves out there.

III. Option 2 includes new electrically actuated ball valves. Providing ball valves will work for this application, then either option should work well and be reliable.

IV. A new more industrial air compressor is also included, but this will be required regardless, to run the wipers on the UV system.

C. Turbidity Sensor

I. Two options exist for a replacement turbidity sensor. Both options are Stainless Steel. Both are made by Solitax. The difference is the measurement range. 0.001-50 g/L is the lower cost model, and 0.001 mg/L – 500 g/L is the higher cost model.

II. I have also included the cost of a new sc200 controller. Hach tells me that the sc100 is quite out of date and while it should be compatible, the sc200 will definitely work with the new probes.

D. Effluent Flowmeter

I. I have included pricing for an Endress Hauser Promag L 400 flowmeter. The pipe needs to remain full at all times with these meters, so it was suggested to install this on the vertical pipe off of the discharge on the filter feed pump, instead of the horizontal outlet from the UV. If that line drains out when the pump stops, a check valve will need to be installed as well.

4. Scope of work:

A. Development (Software, hardware and labour)

I. Build PLC cabinet complete with CompactLogix PLC, 24VDC Power Supply, UPS Backup with battery. CSA approvals.

II. Build PLC logic for all associated I/O, as per control philosophy. Flygt pump and filter controls will all be run from main CompactLogix PLC.

III. Build HMI screens using RSView software. Overview screen of plant operation, with drill down detailed pages for various processes. All alarming and callouts to be provided through CV3 Callout unit.

B. Commissioning and installation:

I. All RSView screens will be pre-commissioned using the CompactLogix PLC, in house, in LiveWire Automation's test lab. All device to PLC I/O

commissioning will be done on site with the help of the electrical contractor.

II. A full function test of the control logic will be performed, once testing of all of the wired I/O has been completed.

III. Replacement filter valves, turbidity probe and mag flowmeter to be installed by mechanical contractor.

5. Quote:

Please see the attached quote, for the above scope. Thank you for the opportunity to provide you with a number for this job.

LIVEWIRE AUTOMATION INC.

P.O. Box 6298 Station Main
Fort St. John BC V1J 4H7
Phone: 250-787-9111 Fax: 1-866-730-9438

Estimate

DATE November 16, 2016
NUMBER Q000000219
CUSTOMER NO. MCELHANNEY

BILL TO:

McElhanney Engineering
Courtenay BC

SHIP TO:

McElhanney Engineering
Courtenay BC

P.O. NUMBER	SALESPERSON	EST. DATE	REQ. DATE	ORDER NUMBER
King Coho		16-Nov-16		Q000000219

F.O.B.	SHIP VIA	TERMS
F.O.B. value	Best way	

PART NUMBER / DESCRIPTION	UOM	QUANTITY REQ.	UNIT PRICE	EXTENDED PRICE
PLC Cabinet Complete with CompactLogix PLC, power supply and UPS, terminal blocks for field wiring (48x36x16 metal enclosure, CSA approved)				
PLC CABINET PLC Control Cabinet	EA	1	16,888.68000	16,888.68
RSView Server Hardware, Monitor, Keyboard & Mouse				
SERVER Lenovo ThinkCentre M900, 27" Monitor, Keyboard, Mouse, Windows 7 32bit	EA	1	2,103.23000	2,103.23
Alarm Callout Unit				
B1277 BARNETT CV3 CALLOUT	EA	1	1,954.41000	1,954.41
900001 POLYPHASER 125-1000MHZ NF-NF	EA	1	122.91000	122.91
BSAKIT BASE STATION & ANTENNA KIT	EA	1	128.50000	128.50
Control Valves Option 1 - New Air Actuated Valves Installation				
524-A NO Aquamatic Normally Open Noryl Valve 1 1/2"	EA	1	307.85000	307.85

CONTINUED

LIVEWIRE AUTOMATION INC.

P.O. Box 6298 Station Main
Fort St. John BC V1J 4H7
Phone: 250-787-9111 Fax: 1-866-730-9438

Estimate

DATE November 16, 2016
NUMBER Q000000219
CUSTOMER NO. MCELHANNEY

BILL TO:

McElhanney Engineering
Courtenay BC

SHIP TO:

McElhanney Engineering
Courtenay BC

P.O. NUMBER	SALESPERSON	EST. DATE	REQ. DATE	ORDER NUMBER
King Coho		16-Nov-16		Q000000219

F.O.B.	SHIP VIA	TERMS
F.O.B. value	Best way	

PART NUMBER / DESCRIPTION	UOM	QUANTITY REQ.	UNIT PRICE	EXTENDED PRICE
524-A NC Aquamatic Normally Closed Noryl Valve 1 1/2"	EA	1	342.01000	342.01
Control Valves Option 2 - Electrically Actuated Valves Installation				
21A020VC Chemline Ball Valve w/ Actuator, inidicating lights	EA	2	1,042.35000	2,084.70
Turbidity Sensors - Two Options (different ranges) sc200 Controller is optional				
LXV424.99.00100 Solitax inline turbidity probe (0.001-50 g/L)	EA	1	7,050.00000	7,050.00
LXV424.99.00200 Solitax inline turbidity probe (0.001 mg/L - 500 g/L)	EA	1	8,546.67000	8,546.67
LXV404.99.00552 Hach sc200 Controller (Optional)	EA	1	2,728.89000	2,728.89
Effluent Flowmeter - Engress+Hauser Promag L 400				
5L4C50 Endress+Hauser Flowmeter, Promag L 400	EA	1	2,848.89000	2,848.89
Instrument Air Compressor - Installed				

CONTINUED

LIVEWIRE AUTOMATION INC.

P.O. Box 6298 Station Main
Fort St. John BC V1J 4H7
Phone: 250-787-9111 Fax: 1-866-730-9438

Estimate

DATE November 16, 2016
NUMBER Q000000219
CUSTOMER NO. MCELHANNEY

BILL TO:

McElhanney Engineering
Courtenay BC

SHIP TO:

McElhanney Engineering
Courtenay BC

P.O. NUMBER	SALESPERSON	EST. DATE	REQ. DATE	ORDER NUMBER
King Coho		16-Nov-16		Q000000219

F.O.B.	SHIP VIA	TERMS
F.O.B. value	Best way	

PART NUMBER / DESCRIPTION	UOM	QUANTITY REQ.	UNIT PRICE	EXTENDED PRICE
INSTAIR Industrial Instrument Air Compressor (installed)	EA	1	2,500.00000	2,500.00
Mechanical (installation of Magmeter, fabrication of mounting hardware, air) - Estimate but as required				
MECHANICAL	EA	1	1,800.00000	1,800.00
Electrical Contracting - 5 days on site estimated, but as required				
ELECTRICAL	EA	1	4,000.00000	4,000.00
Programming of PLC and RSView HMI, in house				
PROGRAMMING1	EA	1	9,600.00000	9,600.00
Programming of PLC and RSView HMI, on site				
PROGRAMMING2	EA	1	5,040.00000	5,040.00

CANADIAN DOLLARS NET AMOUNT	
FREIGHT	
G.S.T	
P.S.T.	
TOTAL DUE	

Business Number 856947759RT0001

APPENDIX E

WTTP MAINTENANCE SUMMARY

King Coho WWTP **Maintanence Summary**

Device	Action	As Required	Weekly	Monthly	Quarter	Annual	Two Year
EQ tank	Inspect & clean inlet screens		X				
	Remove any floating debris		X				
	Lift pumps, remove debris			X			
	Verify pump floats are free & clear		X				
	Power wash tank interior						X
	Pump out sludge from tank bottom	X					
RBC	Disk rotation		X				
	Primary stage buckets clear of debris		X				
	Confirm effluent moving normally through stages		X				
	Remove any floating debris		X				
	Lubricate motor/bearings			X			
	Gaskets replacement	X					
	Integrity check of plastic media		X				
	Inspect chain and sprockets for wear and slack			X			
	Confirm sludge depth in primary clarifier		X				
	Confirm sludge depth in secondary clarifier		X				
	Remove sludge at 0.6m depth in primary clarifier	X					
	Check sludge/scum wasting rates from secondary clarifier		X				
	Check sludge pump for clogs		X				
	Verify outlet is clear of debris		X				
PS-B	Remove any floating debris		X				
	Lift pumps, remove debris		X				
	Verify pump floats are free & clear		X				
	Check / remove accumulated sludge			X			
Filter Feed Tank	Check/remove accumulated sludge, if any			X			
	Verify feed pump intake clear		X				
	Verify normal operating pressure <20 psi		X				
Sand Filter	Replace filter media						
	Verify back wash cycle function			X			
UV Bulbs	Verify all bulbs active, replace as required		X				
	Log operation hours		X				
	Confirm wiper operation			X			
Turbidity Meter	Ensure meter functioning normal		X				
	Verify lens' wipe function is active			X			
	Recalibrate turbidity meter					X	
Flow Meter	Ensure meter functioning normal		X				
	Recalibrate flow meter					X	
Back Wash Tank	Check for sand accumulation in tank bottom			X			
	Check/remove accumulated sludge, if any			X			
	Verify pipe outlet to Outfall tank is clear			X			
Air compressor	Check air tank drained of water			X			
	Check compressor oil level, top up as required			X			
Outfall PS	Remove any floating debris		X				
	Lift pumps, remove debris		X				
	Verify pump floats are free & clear		X				
	Verify air blower operating normal		X				
	Verify deodorant chemical tank is sufficiently full			X			
Outfall Pipe & Diffuser	Verify pipe attachments to anchor blocks are secure					X	
	Inspect diffuser outlets free and clear					X	
	Record video / photos of underwater inspection					X	
Reporting	Compile daily flow records and submit				X		
	Compile lab sample results and submit				X		
	Complete outfall inspection form and submit				X		

Notes:
1. This document serves as general guide only, always consult manufacturer's manuals for specific equipment maintenance intervals and procedures.
2. Alarms are to be addressed as required on a priority basis.
3. Sampling protocols shall comply with Ministry of Environment Permit and associated regulations.

APPENDIX F

COWICHAN WASTEWATER PLUS PROPOSAL

Cowichan WastewaterPlus Inc.
2398 Seine Road
Duncan B.C. V9L 3B1
250.710.9877
chrisbayley3@gmail.com

Matt Sanderson, AScT
Engineering Technologist
McElhanney Consulting Services Ltd.
495 Sixth St, Courtenay, BC V9N 6V4

December 17 2016

RE: King Coho Request for Maintenance Proposal at 1250 Wally Road, Courtney

Dear Matt,

As per your email of December 14, 2016, the following items are understood to be covered by Cowichan Wastewater Plus Inc. for the maintenance of the wastewater treatment facility at King Coho.

The dollar values attached to each line item are for the first twelve month operating period.

- Pump out of clarifier in RBC every six weeks: $ 9672.00
- Replacement of media in sand filter every six weeks: $ 2080.00
- Collection of weekly samples: $ 4992.00
- Replacement of UV bulbs annually: $ 1440.00
- Outfall inspection every two years: $ 1050.00

Each one of the above line items has a 20% administration cost added in to the cost seen.

- Labour to cover weekly checks, coordinate pump outs, replace media in sand filter, change UV bulbs, submit sample results with report to MOE quarterly, coordinate outfall inspections every two years, and be available for emergency call outs: $ 31460.00

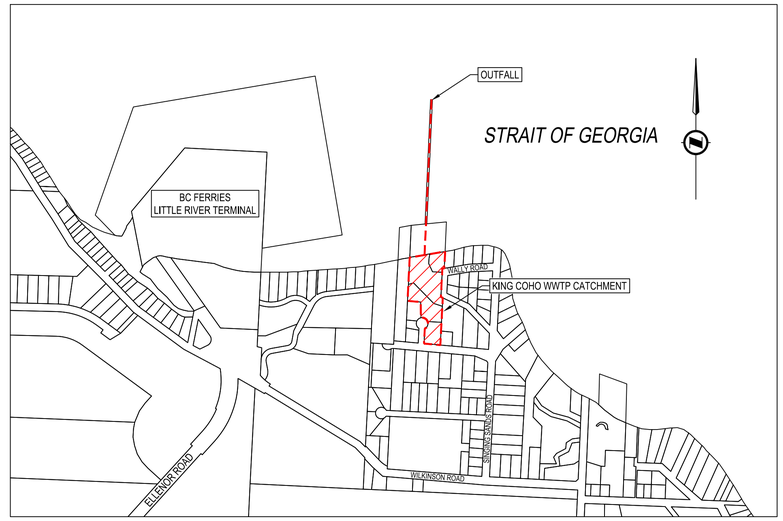
If you have any questions please feel free to call me at the number below.

Thank you

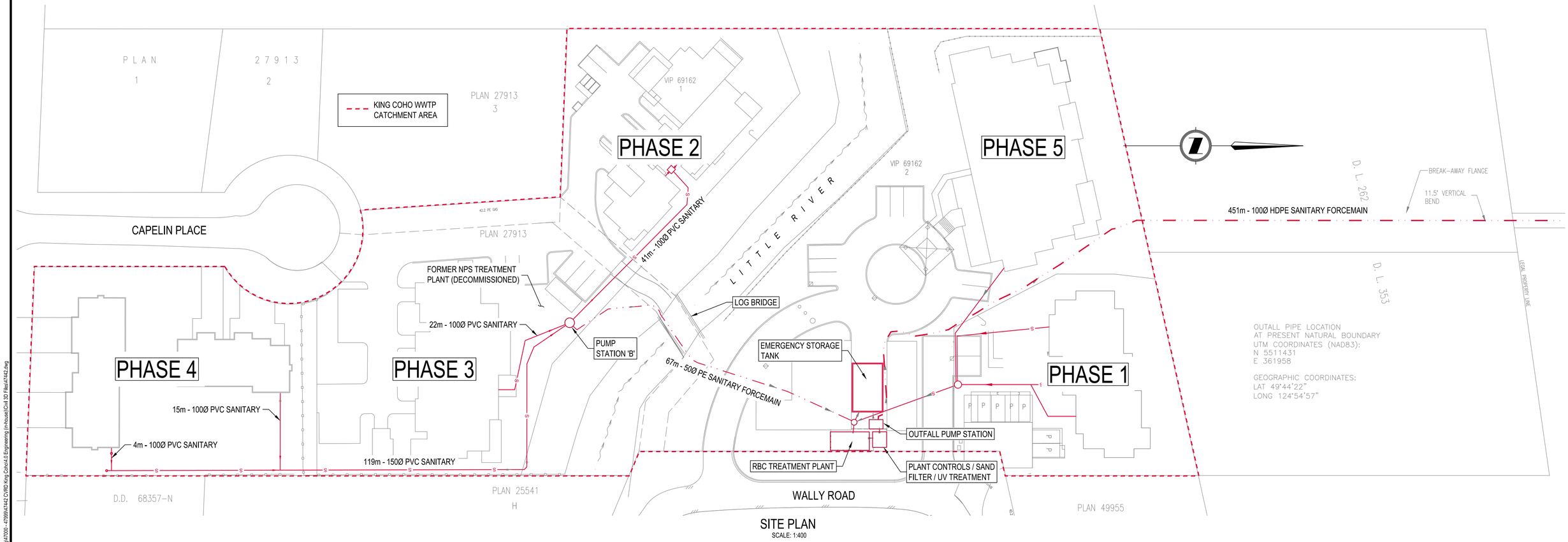
Chris

Chris Bayley P.Ag, WTPO ROWP
250 710 9877

MCSL DWG 47442, S-1, Rev.0



KEY PLAN
N.T.S.



SITE PLAN
SCALE: 1:400

Rev	Date	Description	Drawn	Design	App'd
0	2016-11-30	RECORD DRAWING	MS	MS	BH

ORIGINAL DWG SIZE: A1 (594 x 841mm)

McElhanney
McElhanney Consulting Services Ltd.
495 Sixth Street
Courtenay BC
Canada V9N 6V4
Tel 250 338 5495

Approved Sealed

COMOX VALLEY REGIONAL DISTRICT

SITE PLAN
KING COHO WASTE WATER TREATMENT PLAN

LITTLE RIVER, B.C.

Drawing No. S-1

Project Number	Rev.
2211-47442-00	0

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

Steps to Establishing a Wastewater Management Service for King Coho Strata Development

This document gives a brief overview of the legislative process for establishing a wastewater management service for the King Coho strata development. Establishing such a service would transfer responsibility and liability for the King Coho wastewater treatment system to the CVRD and would ensure that the system is provided with the same operational standard of care as applied to other CVRD local service areas. The timeframe for steps three to five below is four to six months depending on the level of detail available and the level of public engagement following the feasibility study. The alternative is for property owners to continue to have King Coho Strata VIS6599 manage the sewage treatment plant through service contracts.