

# Fraser River Action Plan



# District of Hope Sewage Treatment Study



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**DISTRICT OF HOPE  
SEWAGE TREATMENT STUDY**

**DOE FRAP 1994-12**

**Prepared for:**

**District of Hope**

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# **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

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# **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

## **1.0 INTRODUCTION**

In 1993, the District took over the responsibility for the sewage treatment works under the B.C. Environmental Permit No. PE 4125 from the Fraser Cheam Regional District. The sewage treatment works are 2 aerated lagoons, a service building with two 75 HP blowers and an effluent metering manhole and outfall to the Fraser River. The existing sewage works are outlined in Permit No. PE 4125 included in Appendix A.

The lagoon effluent exceeded the permit standards on several occasions in 1992 and 1993. The sewage lagoons are now 15 year old and increased loading, as well as the proposed changes to the Provincial criteria for sewage discharges, will require upgrading of the facilities.

The Federal Government under "Canada Green Plan" has provided partial funding for this study. The Terms of Reference for the study are outlined in Appendix C.

## **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

### **2.0 ASSESS LOADING AND IMPACT OF SEPTIC TANK DISCHARGES**

#### **2.1 Existing Lagoon Facility**

The existing sewage treatment plant consists of two concrete lined aerated lagoons with a total volume of 20,000 m<sup>3</sup>. The lagoons have an operating depth of 4.0 metres and static aerators supplied by a centrifugal blower. The aeration system is as follows:

Aerators:	Atora 1218 static aerators
Number per lagoon:	30
Blower:	75 HP Hoffman 960 cfm (second blower as standby)

The lagoons are operated in series and the air supply is shut off in the last third of the second cell to allow settling prior to discharge. The lagoons are alternated from time to time to distribute the accumulation of solids.

The site plan is included in Appendix A.

#### **2.2 Septage Discharge**

The septage dump station was upgraded at the lagoon system about two years ago. The existing septage dumping station provides a truck bay, a coarse screen for removal of rocks and a discharge hopper for better housekeeping. The District has a record of when the key was taken for the dumping station, but no record of the number or volume of loads discharged. The return date for the key is sometimes 2 to 5 days after the date of issue.

The discharge of septic tank trucks has been permitted since the facility was constructed in 1975. However, the discharge quantities are not known, so the impact on the facility is difficult to quantify.

The shock loads from septage discharge can upset the treatment process. The typical comparison of septage discharges to raw sewage is as follows:

	Raw Sewage	Septage	Ratio of Septage to Sewage
Total Suspended Solids (TSS)	200 ppm	15,000 ppm	75:1
BOD <sub>5</sub>	200 ppm	10,000 ppm	50:1
Ammonia Nitrogen	25	150	6:1

Therefore a typical 1000 gallon septage trunk discharge is equivalent to a daily BOD loading of 500 people. This loading is received over a relatively short period, so the impact can be even more significant to the process.

### 2.3 Waste Management Effluent Discharge Permit

The amended permit PE04125 dated March 5, 1993, was originally issued in 1975. The discharge criteria to be met are as follows:

- Maximum authorized discharge 6819 m<sup>3</sup>/day.
- Characteristics of discharge shall be equivalent to or better than:
 

Biochemical oxygen demand (BOD <sub>5</sub> )	100 mg/L
Total suspended solids (TSS)	100 mg/L

The permit also outlines possible future requirements as follows:

- Disinfection: Not required but suitable provisions should be made to include disinfection facility in the future. If disinfection is by chlorination, dechlorination facilities may also be required.
- Future Upgrading: Discharge does not meet Provincial criteria of BOD<sub>5</sub> = 45 mg/L and TSS = 60 mg/L. Future upgrading of the sewage treatment works may be required.

The permit also outlines monitoring requirements as follows:

- Grab Sampling: One sample every 3 months.
- Analysis Required:
  - BOD<sub>5</sub>
  - TSS
  - Fecal coliforms
- Flow Measurement: Record once per day the effluent volume discharged over 24 hours.
- Reporting: Maintain data for inspection and submit data suitably tabulated annually to Regional Waste Manager by January 31 of the following year.

A copy of the permit is included in Appendix A.

## 2.4 Effluent Monitoring Results

The performance results from the effluent monitoring are outlined in Figure 1 and Figure 2 for 1992 and 1993 respectively. The 1993 performance results are not as good as previous years. The 1993 results have exceeded the 100/100 permit limit for BOD on 2 out of 7 samples, and for TSS on 2 out of 7 samples. A comparison of 1993 results with previous records is as follows in Table 2.

# District of Hope 1992 Lagoon Effluent BOD and TSS

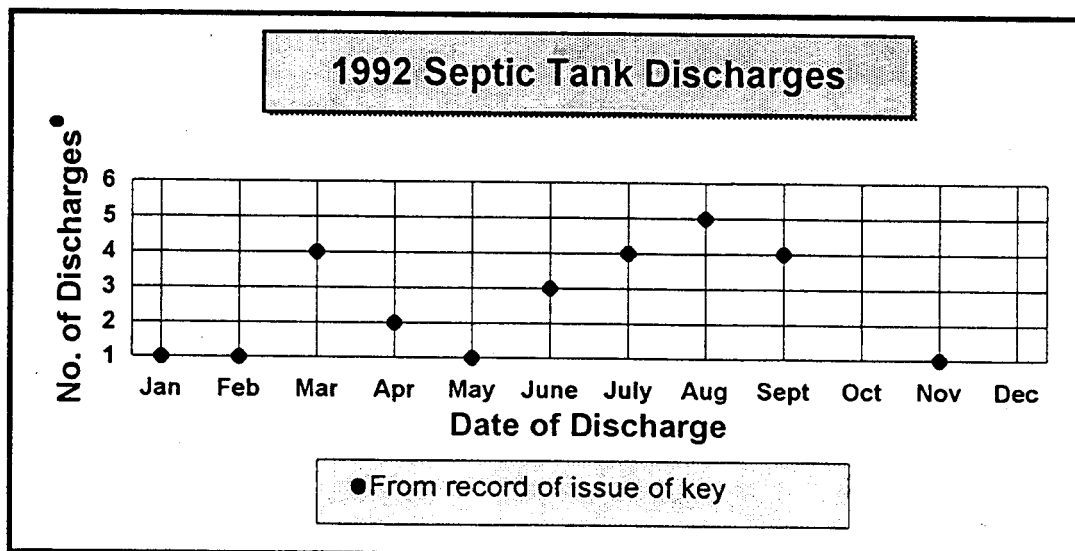
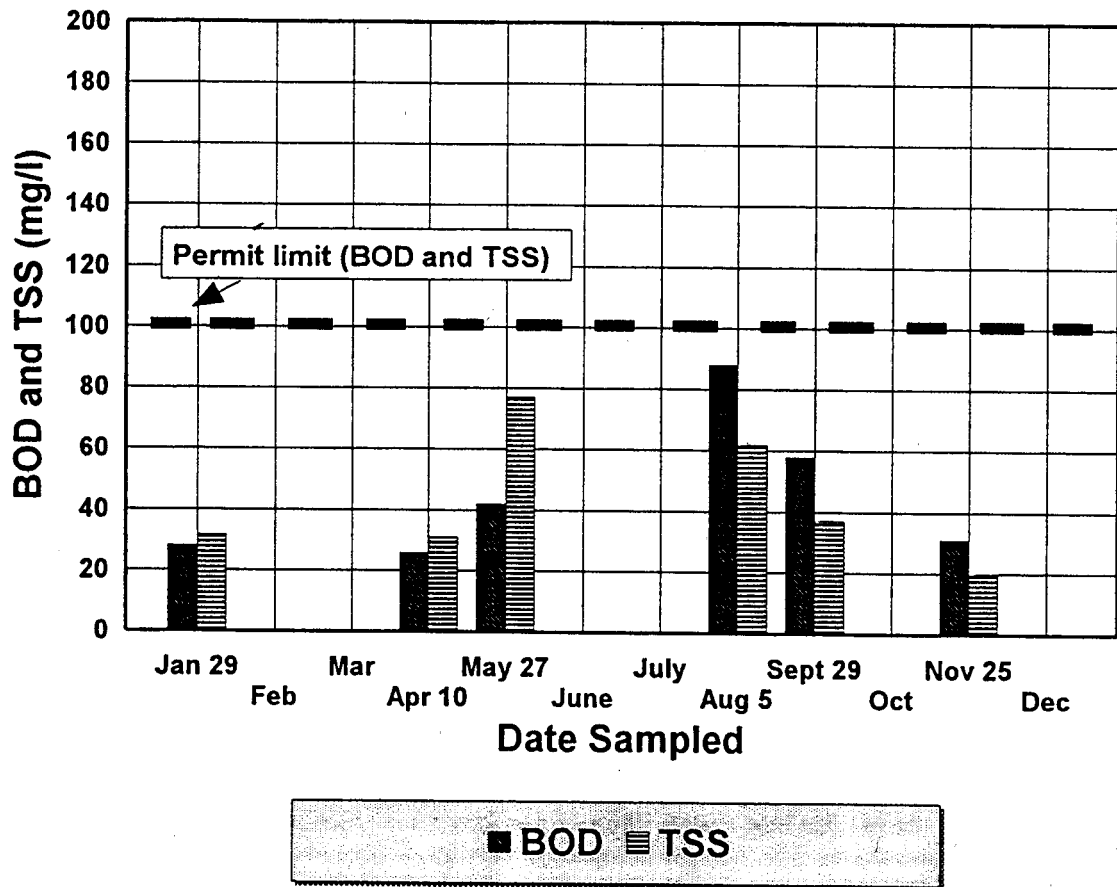
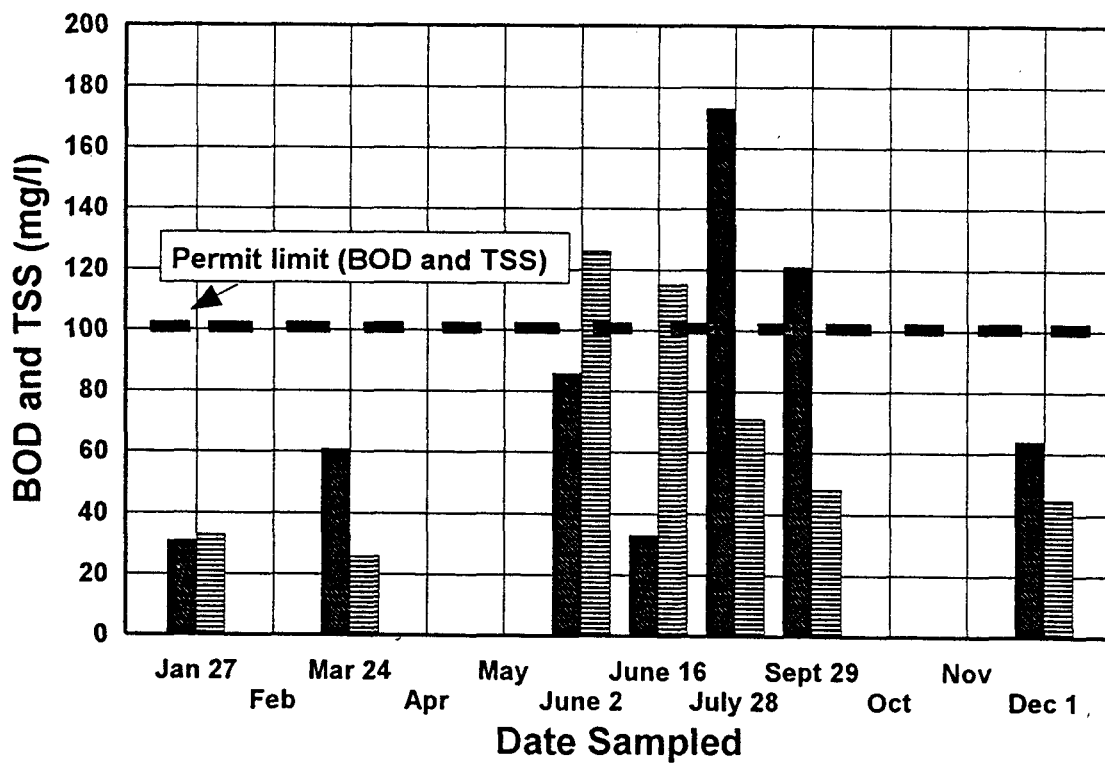


FIGURE 1

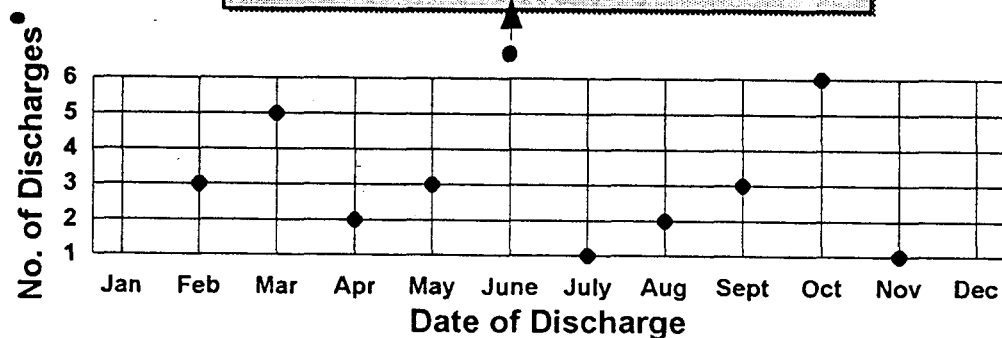


# District of Hope 1993 Lagoon Effluent BOD and TSS



■ BOD ▨ TSS

## 1993 Septic Tank Discharges



● From record of issue of key

▲ 34-includes 30 equiv. for 30000 gal discharge from Camp Hope June 10

FIGURE 2

**LAGOON PERFORMANCE  
EFFLUENT TEST RESULTS**

Year	Max. BOD mg/L	Max. TSS mg/L	Annual Avg. BOD mg/L	Annual Avg. TSS mg/L	Average Flow m <sup>3</sup> /d
1982	61	48	35	31	1690
1983	33	64	20	40	1630
1984	78	71	45	40	1720
1985	51	82	26	55	1650
1986	37	55	28	33	1930
1987	72	72	40	43	-
1988	41	55	32	43	1910
1989	83	92	56	63	1880
1990	83	68	63	54	2120
1991	49	86	33	33	1970
1992	88	77	46	43	1810
1993	173	125	81	66	2030

The flows in 1993 are not substantially different from previous years. Figures 1 and 2 also show the record of the key for the septage facility. In 1992 the key was taken out 26 times and in 1993, 30 times. However, what is not known is the number of loads or size of loads dumped on these occasions. On June 10, 1993, the lagoons received 30,000 gallons of septage discharge from Camp Hope. The effluent results in June, July and September, 1993, exceeded the permit.

The average BOD loading rate on the lagoons from sewage is approximately 18 kg/hour and the peak rate is 30 to 40 kg/hour. A typical 1000 gallon septage discharge has 40 to 50 kg of BOD which is a significant impact on the process.

The total BOD loading vs the septage loading in 1993 is estimated as follows in Table 3:

**TABLE 3**

	Septage BOD <sub>5</sub> Loading - 1993 (Percent of Sewage BOD Loading)			
	Annual	Peak Month	Daily	Hourly
Assuming 1000 gal. per key issue	1%	2%	11%	130%
Assuming 2000 gal. per key issue	2%	4%	22%	260%
Assuming 1000 gal. per key issue plus 30,000 gal. for Camp Hope on June 10	2%	12%	318%	Large

As noted in this table, the problem caused by the septage is the shock loading to the lagoon. Additional problems from septage include solids that accumulate in the lagoon and stringy material that can plug or reduce the efficiency of the static aerators.

The conclusions from the monitoring results include:

- 1) 1993 treatment efficiency is significantly less than previous years.
- 2) Flow records do not indicate significant change in flow rate from previous years.
- 3) Total septage loads (based on key records) have not changed significantly except for Camp Hope discharge.

These results therefore indicate the following possible causes of the deteriorating deficiency:

- 1) Biological process is not recovering as quickly from shock loading of septage.
- 2) Treatment volume is reduced from sludge accumulation in the lagoon.
- 3) Oxygen transfer efficiency is reduced.
- 4) Short circuiting or insufficient settling is occurring in end of second basin prior to discharge.

The upgrading or additional investigation required to address these problems is outlined in the subsequent sections.

## **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

### **3.0 CONTROLLING SEPTAGE DISCHARGES**

Septage discharges create problems at all sewage treatment plants that receive them. The aerated lagoon treatment process utilized in the Hope system is typically the least affected because of the longer detention times in relation to alternate processes with higher operation and maintenance requirements. The problems associated with septic discharges include:

- odour
- shock loadings
- rocks, debris and inert solids deposition
- grease and skimmings
- stringy and fibrous material

The problems caused by septic discharges are high in relation to the volume of septage discharged.

In principle, it is better to deal with the problem aspects of septage before dilution in the sewage. The controlling of septage discharges therefore requires all or some of the following:

- 1) System for recording and charging for volume discharged.
- 2) Coarse screens to remove rocks and debris.
- 3) Limiting the daily volume of septage discharge to the lagoons.
- 4) Storage to allow gradual addition to the sewage treatment lagoons.
- 5) Odour control.
- 6) Facility which could permit periodic removal of heavy solids and floatables.

Septage receiving plants are available commercially, but the installed costs are in the \$100,000 to \$200,000 range. The recommended solution is a septage holding tank. The tank could be precast concrete with a volume of approximately 3000 gallons. The holding tank would include the following:

- existing coarse screening
- submersible pump and time clock for controlled discharge
- 60° sloped bottom
- sump for gravel and debris removal
- cover with hatches for pump removal and cleaning
- limit of 3000 gallons per day of septage
- gravity overflow to lagoons
- submerged inlet for odour control
- level gauge for measuring volume discharged

The estimated cost for this sludge holding tank with pump system is \$30,000 including 25% for contingencies and engineering.

The sewage treatment plants in the area were canvassed to determine present charges for septage disposal. All operators expressed concerns with septage discharges and were evaluating upgrading to reduce the impact resulting from the discharges. The rates charged in January, 1994 were as follows:

	<u>Charge per 1000 Gal.</u>
Chilliwack STP	\$35.55
Langley STP	\$59.60
JAMES STP	\$40.00*

\* plus surcharge of \$25/truck < 1000 gal  
\$50/truck > 1000 gal

The District charge for septage discharge should be comparable with other plants in the area. A minimum charge of \$60 per 1,000 gallons is recommended.

## **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

### **4.0 EXISTING SLUDGE LEVELS IN LAGOONS**

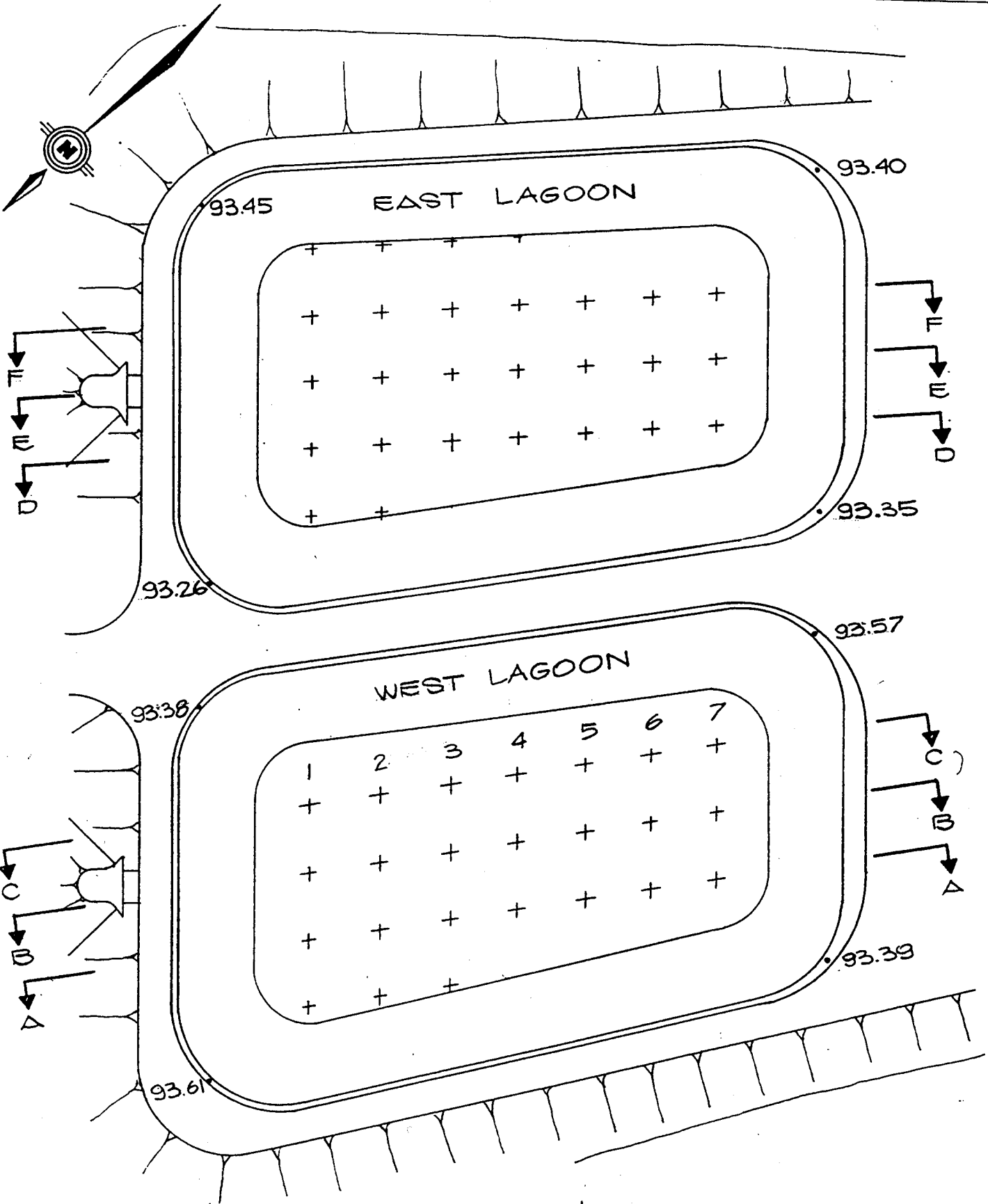
The reduced treatment efficiency could also be caused by reduced volume due to years of sludge accumulation. The sludge has not been removed from the lagoons since they were constructed in 1979. The District staff sounded the lagoons to assess the quantity of sludge. The sounding consisted of marking a 25 ft. x 25 ft. grid on the sides of the lagoons and then measuring the top of sludge and bottom of lagoon at all grid locations.

The results of the sounding are shown in Figures 3, 4 and 5. There is up to 1 metre of sludge in the lagoons, but the average thickness is between 0.3 and 0.6 metres of sludge. The volume of sludge is between 5% and 10% of the lagoon volume. Removal of the sludge is recommended to restore the treatment volume and to reduce the organic loading on the aeration system.

The sludge can be removed by dredging or excavating the material from the bottom. The aeration tubes and airlines would make it difficult to dredge without either damaging the aeration system or leaving a lot of the sludge. The preferred method would be to empty the lagoon and then excavate the sludge and dispose of it at a landfill.

Removal and cleaning and restoring of the aeration system and inspection of the lagoon lining while the lagoon is dewatered is recommended.

Provincial regulation for discharging sludge to a landfill require that the sludge has a minimum of 20% solids. Therefore composting of the sludge and mixing with wood chips or paper for drying would be required. The mixing and composting could be done at the Hope landfill site.



# PLAN

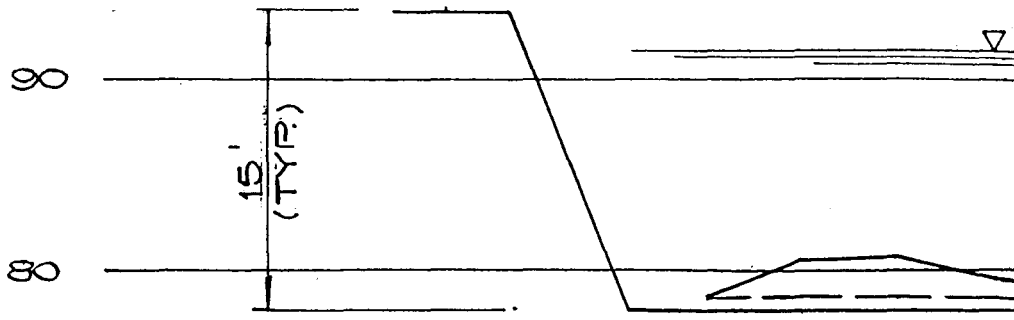
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25' x 25' GRID OF SOUNDING LOCATIONS  
DISTRICT OF HOPE

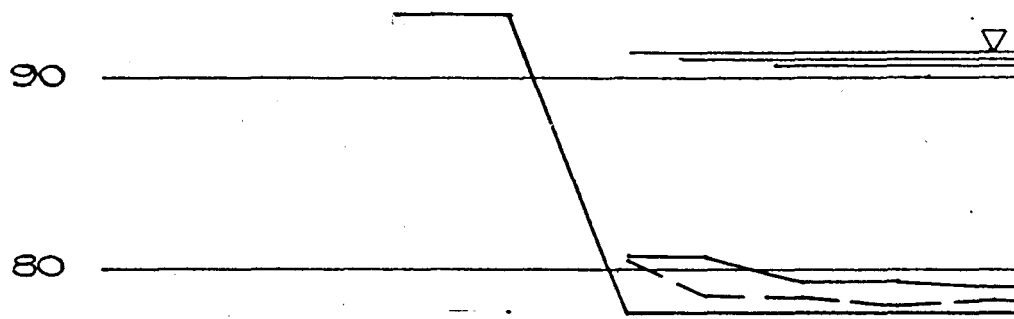
FIGURE 3

DAYTON & KNIGHT LTD.  
Consulting Engineers

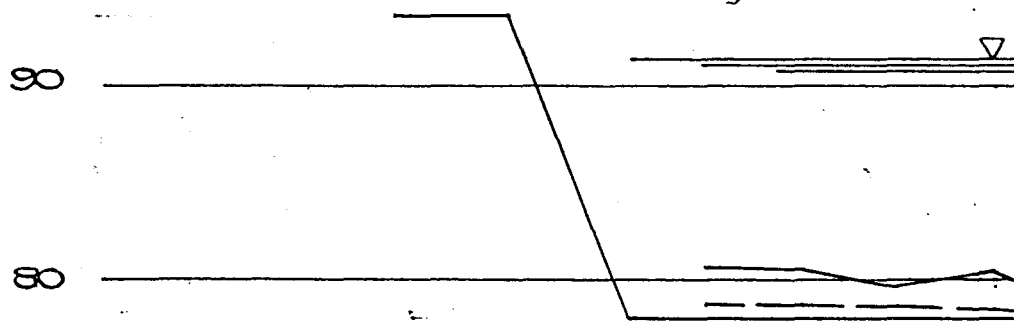
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SECTION



SECTION



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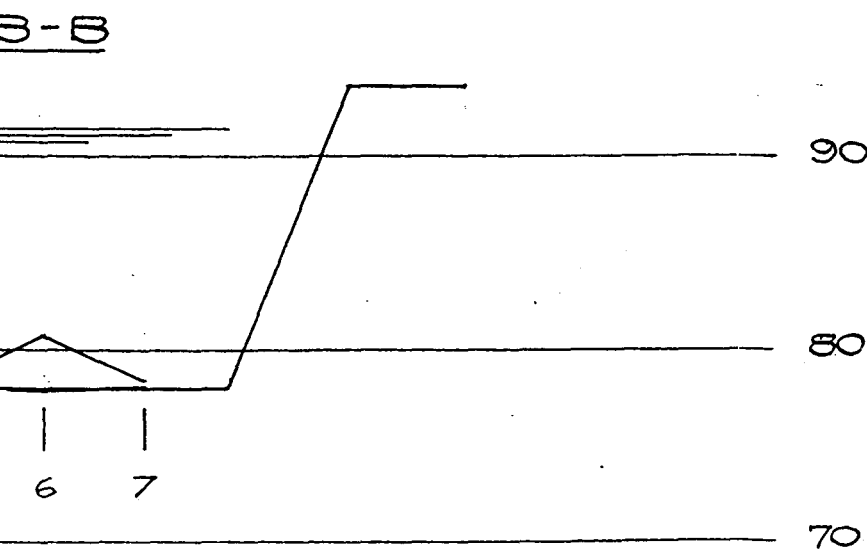
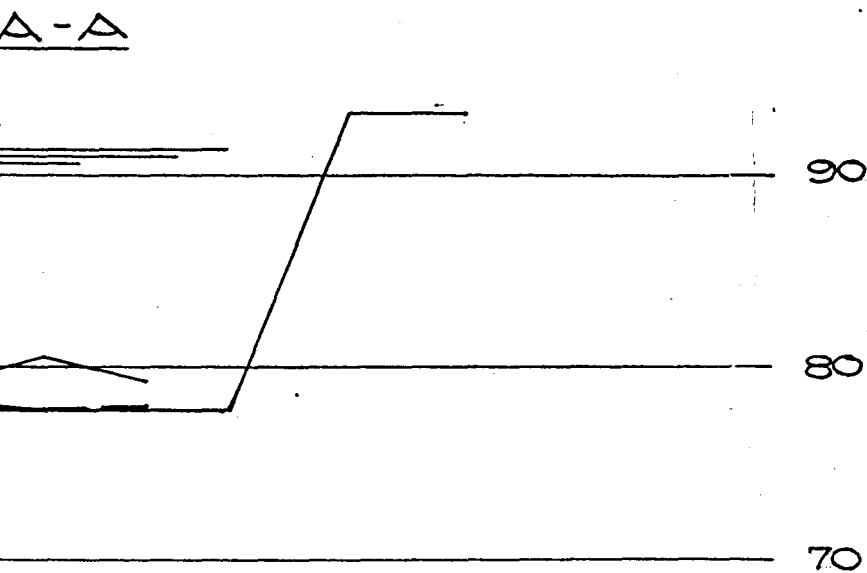
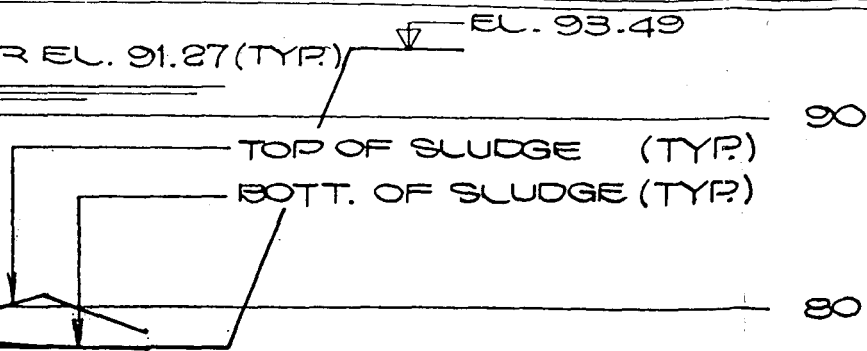
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SECTION



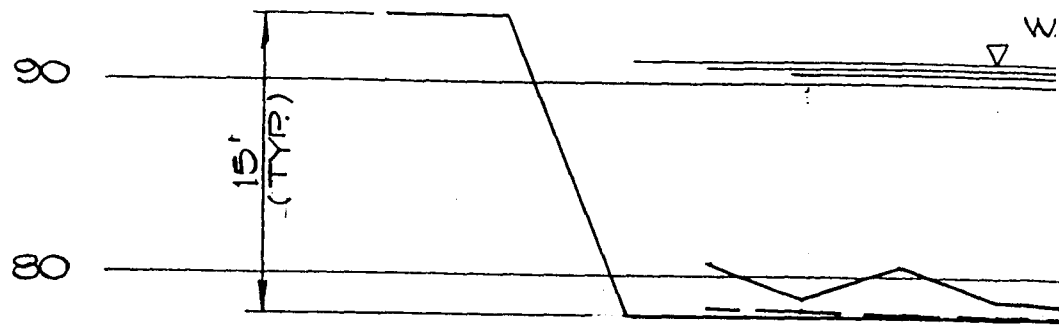
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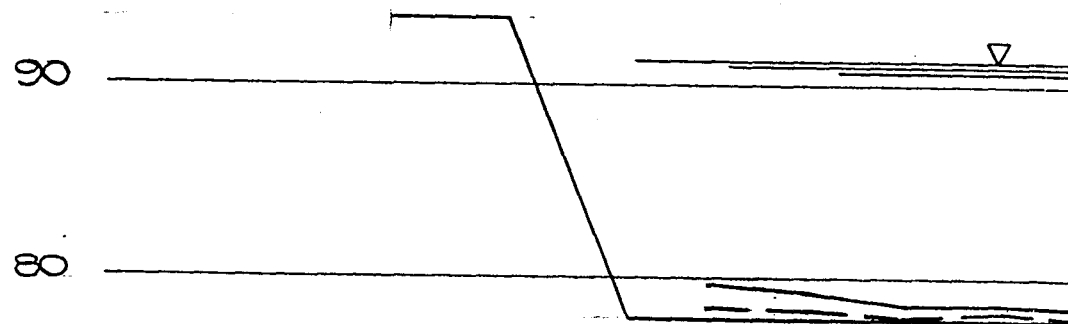


DISTRICT OF  
HOPE  
LAGOON  
SOUNDINGS  
NOV. 12, 1993  
WEST LAGOON

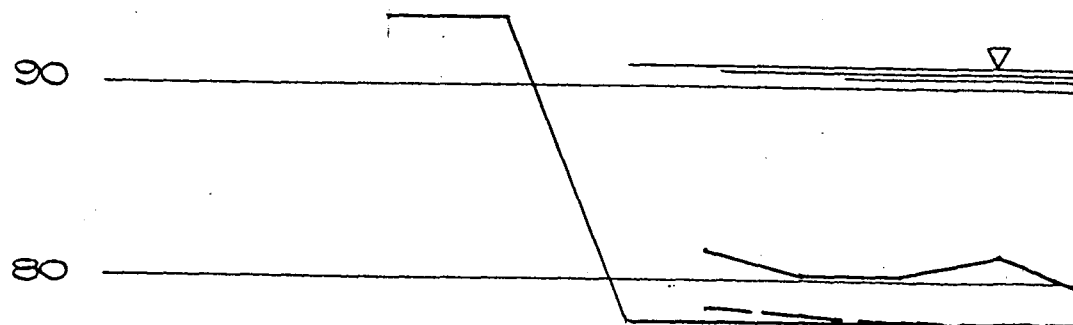
C-C FIGURE 4



SECTION



SECTION



1 2 3 4

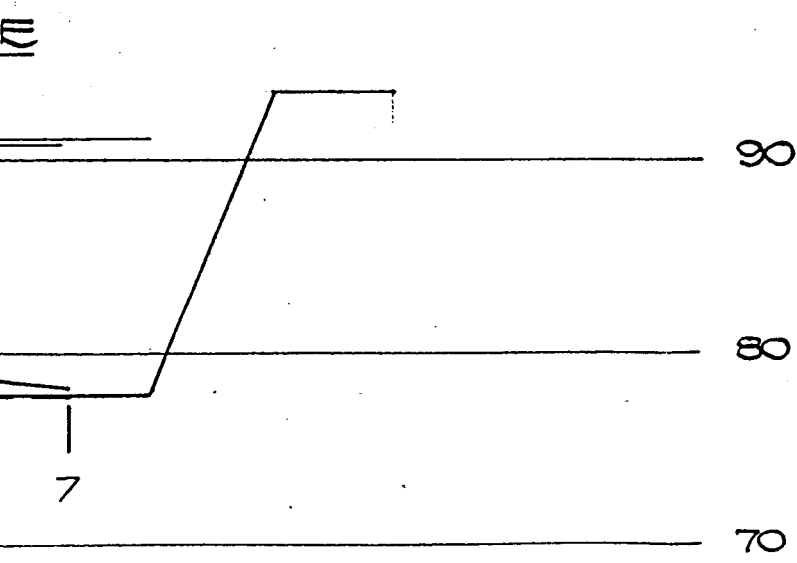
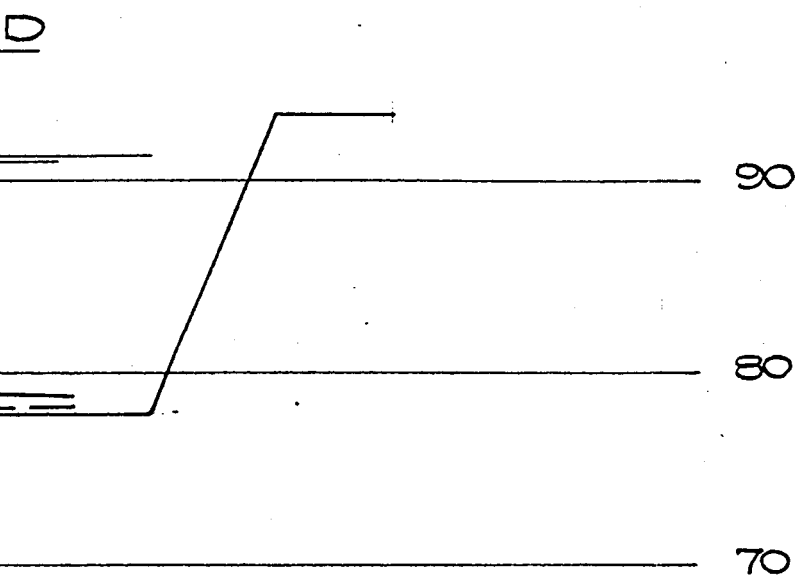
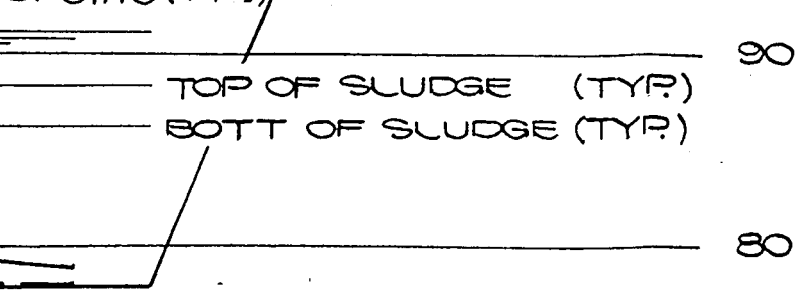
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DWG. No. 115-16

SECTION



DISTRICT OF  
HOPE

LAGOON  
SOUNDINGS  
NOV 12, 1993

EAST LAGOON

FIGURE 5

## **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

### **5.0 AERATION CAPACITY**

The 75 HP blower with a capacity of 960 cfm was designed for a capacity of 5000 people. This capacity has been slightly exceeded, but the air system capacity should be sufficient. The static aeration tubes and airlines have now operated continuously for 15 years and should be inspected and cleaned. It is likely that the tubes and orifices are restricted or plugged. The reduced air efficiency has contributed to the lagoons not recovering until the fall in 1993 after the large septage discharges in June.

It is recommended that all static aerators and airlines be removed and repaired or replaced as required after the sludge has been removed.

Raising of the lagoons is possible to provide more storage and air transfer. However, this would provide less freeboard for present and future operating options, and would result in flooding the sleeves where the airlines enter the lagoons. We recommend that the level not be raised beyond the level that would flood the air pipes at peak flows.

The present lagoon operation was modelled with the present loading of 5200 people not including septage discharge. The cell 1 aeration capacity was found to be deficient in the summer time (30 kg/hr O<sub>2</sub> required vs 22 kg/hr available). The septage discharges would make the oxygen deficiency worse. The available O<sub>2</sub> may be significantly less if the static tube aerators are plugged or restricted. Additional aeration capacity is required.

The existing system has one 75 HP blower operating with one 75 HP blower as standby. The District tested the operation of two blowers and confirmed that two can be operated together. A 35 to 40 percent increase in aeration capacity could be achieved by operating two blowers. Running two blowers would provide an inefficient method to increase the aeration capacity and would eliminate standby in the aeration system. Adding aspiration type aerators to the highly loaded cell 1 (as outlined in Section 8) is the preferred option. Running two blowers intermittently in the interim for say 4 to 6 hours per day would improve present treatment.

The condition of the diffusers should first be checked to confirm the increased air flow will not cause damage.

The present permit is for 100 BOD and 100 TSS. The authorities have advised that an amendment to 45 BOD and 60 TSS is being considered for this discharge. The lower discharge limits and the plant reaching design capacity will require upgrading. In addition the Provincial Regulations are being revised and the 45/60 criteria for secondary treatment will be lowered.

**DISTRICT OF HOPE  
SEWAGE TREATMENT STUDY**

**6.0 EFFLUENT CLARIFICATION**

The air is shut off in the last one-third of the final lagoon to provide a quiescent area for settling of the solids prior to discharge. This quiescent area is sufficient to meet the present 100/100 permit requirements, but will require upgrading to accommodate increased growth and higher quality discharge requirements. In the short term, a floating baffle curtain could be installed to reduce short circuiting. In the longer term, an additional cell is required as a polishing pond prior to discharge. The third cell would also provide more capacity to allow dewatering of a cell for normal inspection and maintenance. The third cell could be initially operated with the air off in the last one-third. However, as loadings increased, a floating baffle would be required to maintain effluent quality.

The District has been advised by the MOE of the proposed increase to secondary effluent standards. Therefore, a third cell is needed to meet this requirement. The estimated cost of a fabric baffle wall is \$15,000 to \$20,000 per cell. This cost does not appear to be warranted unless there was a long delay in building cell 3.

## **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

### **7.0 MONITORING AND FLOW RECORDING**

The effluent manhole has monitoring and flow recording instrumentation. The instrumentation consists of the following:

- transducer level recorder
- dissolved oxygen (DO) meter
- pH meter
- turbidity meter

The readout from these instruments is transmitted to a control panel by the manhole and then underground to the blower building. This data was previously transmitted by modem to the data receiver at the Regional District's office. The District of Hope is now recording the data directly at the blower building.

The level signal is from a sonic transducer which has no direct contact with the effluent. The level recorder is provided to satisfy the metering requirements included in the permit. The level recorder also can be used to identify unusual inflows and operating conditions that may occur when the operators are not at the plant. The present method of recording electrical data on an electronic data storage device does not provide the operator with any feedback or control information.

The DO, pH and turbidity meters all have sensors immersed in the effluent 24 hours per day. These instruments require frequent servicing and calibration and are not suitable for constant immersion. In addition, the characteristics measured by these meters are not included in the permit regulations and continuous readout is not warranted.

The District also has a portable DO meter which is sufficient for monitoring the DO. The pH can be checked weekly or monthly as required. The turbidity reading will not be reliable or consistent enough to assist in the operation. We therefore recommend the following:

- 1) Removing or abandoning the DO, pH and turbidity meters.
- 2) Recalibrating the flow meter.
- 3) Recording flow data at blower building on a chart recorder.
- 4) Checking flow meter calibration weekly and downloading data monthly.
- 5) Provide digital readout at blower building of totalizer reading in cubic metres.
- 6) Once flow meter calibration is established and reliable:
  - a) check calibration weekly;
  - b) record "totalizer" reading daily.

## **7.1 Flow Records**

The flow from the Hope Sewage Treatment Plant is measured by a rectangular weir located in the effluent manhole. The flow is monitored by a single reading that is recorded at 7:00 a.m. five days per week. The Regional District installed a transducer to measure the effluent level in September, 1992. The effluent level is logged every four hours with this equipment, but the calibration of the equipment is not known.

A comparison of flow records two weeks before to two weeks after installation of the flow transducer show the flow calculated from the transducer data is 30% to 50% higher than the manual reading.

A previous report for FCRD noted that the 300 mm (12 inch) wide weir was replaced with a 500 mm (20 inch) wide weir in September, 1992. The weir was found to be 310 mm (12.25 inches) wide in November, 1993. The calibration of the manual gauge was checked and found to be correct. Therefore, these values were assumed for flow comparison. The operators advise that a larger 422 mm (16.625 inch) wide weir was fabricated but has not been installed.

The variation in flow for the transducer reading data was reviewed for comparison with the manual data in the first 6 months of 1993:



## 1993 FLOW DATA COMPARISON

### HOPE MANUAL READINGS - 7:00 A.M. VERSUS (FLOW RECORDER - AVERAGE OF 6 READINGS PER DAY) (IN BRACKETS)

	Min. Flow m <sup>3</sup> /day	Max. Flow m <sup>3</sup> /day	Variation %	Monthly Average (m <sup>3</sup> /day)
January	1920 (2194)	3220 (4624)	68 (110)	2584 (3539)
February	1720 (3261)	3500 (5809)	103 (78)	2027 (3735)
March	1720 (1898)	2940 (4269)	71 (125)	2046 (3014)
April	1920 (2253)	2180 (3380)	14 (50)	2007 (2734)
May	1820 (1482)	2060 (5691)	13 (284)	1921 (2800)
June	1820 (1897)	2040 (2728)	12 (44)	1906 (2223)*

\* Intermittent operation - operated 14 out of 30 days.

The flow data comparison indicates that the digital flow recorder is not calibrated properly and the results are not dependable.

The composite data from the flow recorder should provide better results than the single morning reading. However, the unit must be calibrated and the operators have to be advised of the calibration so it can be checked regularly. The following procedure is recommended:

- 1) Calibrate transducer and weir height so that distance from face of transducer to top of liquid with no flow (i.e. base of weir) is known and checks with readout on recorder.
- 2) Make reference marks on weir plate and transducer so that if either are moved, they can be repositioned to maintain calibration.

- 3) Provide graph so that manual gauge reading and corresponding digital reading are known. Check during daily manual reading. Reduce manual reading to weekly to check calibration once dependability of flow recorder is confirmed.
- 4) Confirm formula for flow uses present width of weir opening.
- 5) Record flow on continuous 10 inch circular chart recorder with totalizer in blower building.
- 6) Download flow meter data monthly for storage.

In the meantime, the single daily reading has been used to estimate existing flow rates. The 1993 records indicate that the daily plant flows are as follows:

Average dry weather flows:	1800 to 1900 m <sup>3</sup> /day
Average wet weather flows:	2000 to 2500 m <sup>3</sup> /day
Peak wet weather flows:	3500 m <sup>3</sup> /day

## 7.2 Projected Growth

The 1993 records from the District for connections to the sewer system are as follows:

District of Hope	1034 connections
Regional District	<u>442 connections</u>
Total	1476 connections

The connected populations for the lagoon system projected in the 1993 Fraser Cheam Regional District (FCRD) report were as follows:

Year	Population	Assumed Approximate Growth Rate of Connections to Sewers
1990	4450	8%
1992	5175	
1996	7000	3.7%
2001	8200	
2006	10,200	
2009	12,700	7.0%
2012	15,200	
ult.	20,000	

The approximate growth rate based on building permits from June 1991 to December 1993 is 3.6% in the District of Hope area and 2.2% in Hope Town. The projected 1996 population of 7000 in the FCRD study appears to be based on a 3.6% growth rate plus adding the Floods (384 people) and Silver Creek area (1037 people) to the sewerage system.

Therefore the projected growth in the population loading in the FCRD report appears high unless existing unsewered areas are to be connected to the sewerage system. For comparison the population of 7,000 and 10,000 were used for determining the upgrading requirements for the existing permit and for the revised Provincial Objectives.

## **DISTRICT OF HOPE SEWAGE TREATMENT STUDY**

### **8.0 IMPROVEMENTS TO MEET FUTURE DISCHARGE CRITERIA**

Stage I of the lagoon system was designed for 5000 people and an effluent standard of 100/100 BOD/TSS. The connected population is presently 5300 which exceeds the Stage I design. The environmental agencies have also advised the District of the likely upgrading of the permit requirements to the existing secondary treatment standards of 45/60 BOD/TSS (see Appendix B). The Provincial standards are presently being revised and the limits for secondary treatment are likely to be reduced further. The revised Provincial secondary treatment standards will likely be a 30 day average of 30/30 and maximum 7 day average of 45/60. Therefore improvements at the plant are required to meet the improved effluent quality requirements and to provide for increased flows.

The septage holding tank outlined in Section 3.0 will reduce the impact on the treatment plant and provide a means to regulate and charge fees for septage discharges.

The lower BOD and TSS limits will require increased detention time, increased aeration capacity and improved settling before discharge.

The original long range plan for the sewage treatment works provided for an increase from 2 cells to 4 cells after the Stage 1 capacity was reached. The aerated lagoon option is still the least cost option to meet the proposed secondary treatment discharge criteria. The large increase in lagoon volume required for the revised standards indicate a third larger cell rather than 2 staged smaller cells.

The preferred option is to provide a 3rd cell north of the existing 2 cells. The third cell would have static aerators similar to the existing cells. The 3rd cell could be operated as a polishing pond with no or little aeration until the Towns present permit is changed to secondary.

The mathematical model results indicate an effluent quality for the present lagoons and future 3rd lagoon as follows:

Population	Effluent BOD Ex. System (20,000 m <sup>3</sup> )	Required Additional Vol for Effluent BOD of 45	Required Additional Vol for Effluent BOD of 30
5300	73	12,000 m <sup>3</sup>	22,000 m <sup>3</sup>
7000	89	22,000 m <sup>3</sup>	36,000 m <sup>3</sup>
10,000	--	40,000 m <sup>3</sup>	60,000 m <sup>3</sup>

The volumes include an allowance for 10% of the basin volume for sludge storage in the bottom of the lagoons.

Additional aeration capacity is required. The present blower and diffusers provide approximately 35 kg of O<sub>2</sub> per hour when operating as designed.

The existing blowers could be used for Cell 2 and the future Cell 3. Higher capacity aspirating type aeration units could be used for Cell 1.

A total of 30 HP of aspiration units (four 7.5 HP units) are recommended for Cell 1 to improve the mixing and aeration capacity. The aspirating units are more efficient, produce less odour and splashing and will improve the mixing of the incoming sewage and septage. These units can be inspected and serviced without draining the cell.

Environment Canada has also requested the Ministry of Environment (letter of July 23, 1993 in Appendix B) to require "non-acutely toxic effluent". Environment Canada completed toxicity tests on the Hope effluent twice in 1992 and twice in 1993. The results were as follows:

Test	July 6/92	Sept. 22/92	Jan. 25/93	Mar. 17/93
96 hr LC <sub>50</sub>	100% (non toxic)	69%	100% (non toxic)	74.8%
BOD <sub>5</sub>	90	113	35	33
TSS	33	50	50	30
NH <sub>3</sub>	27.3	10.6	20.5	21.8

Two out of the four tests were non toxic and the other 2 required dilutions to 69% and 74.8% to meet the 96 hr LC<sub>50</sub> requirements. The proposed new Provincial Water Quality Objectives require that the minimum secondary treatment be provided. The proposed objectives state that

where further treatment may be required (ie. toxicity), the "Water Quality Objectives must be met in the area just outside the initial dilution ozone of the discharge". The District's outfall would provide minimum dilution between 10 and 100 times. Therefore, with the upgrading to provide secondary effluent from the lagoons, the District would meet the new Provincial Criteria without providing a mechanical plant to nitrify the effluent.

The District should note that the Province is also in the process of reviewing discharge standards for ammonia from lagoon systems. It is unlikely that the ammonia requirements for secondary lagoon effluent will change in the foreseeable future. If reduced ammonia levels are required in the future, then a mechanical nitrifying process such as trickling filters will be required.

## 8.1 Site Restrictions

The Towns sewage treatment plant site is bounded by the Fraser River on the north and Silver Hope Creek on the east. The Provincial regulations require a minimum 60 metres set back from the river bank and the Ministry of Environment has confirmed that the 60 metre set back would be required in this location. Therefore the maximum practical single cell size that could be constructed north of the existing cells is approximately 30,000 cubic metres.

The District has purchased an additional approximately 1 ha parcel of land to the west of the existing site. If the present road to the blower building is moved to the east, an additional 4th cell with a volume of approximately 34,000 m<sup>3</sup> could be built in this area. The treatment capacity of the site using aerated lagoons is therefore as follows:

	Treatment Capacity Equivalent Population	
	Present Cells 1 & 2 and Cell 3 (30,000 m <sup>3</sup> )	Cells 1, 2, 3 and Cell 4 (34,000 m <sup>3</sup> )
Present Secondary 45/60 Standards	8,400	14,000
Proposed Secondary 30/30 Standards	6,300	10,500

The location of cells 3 and 4 are shown on Figure 6.

## 8.2 Proposed Upgrading

The present plant is overloaded and requires maintenance and upgrading. The recommended upgrading work and proposed schedule is outlined as follows:

	Estimated Cost (1994 \$)	When Required
1) Remove sludge from existing basins	30,000 to 40,000	Now
2) Remove and service static aerators and aeration tubing	25,000 **	Now
3) Install 4 aspirator aerators in Cell No. 1	50,000	Now
4) Calibrate metering facility and provide chart recorder and totalizer	5,000	Now
5) Construct septage receiving and holding facility	30,000	Now
6) Construct new Cell 3 (30,000 m <sup>3</sup> )	750,000	when secondary treatment standards required.
7) Provide third 75 HP blower	40,000	when secondary treatment standards required.
8) Construct new Cell 4 (34,000 m <sup>3</sup> )	830,000	when population exceeds 6300 or 8400*
9) Provide fourth 75 HP blower	60,000	when population exceeds 6300 or 8400*

\* 8400 for present secondary treatment standards  
6300 for proposed secondary treatment standards

\*\* Assumes 30% replacement

The new cell 3 (Item 6) is shown to be constructed after the upgrading work on the existing basins. However, Items 1 to 3 will require draining of one lagoon and loss of 50% of the treatment capacity. The best solution is to construct cell 3 before the maintenance work in cells 1 and 2 is commenced, so that a reasonable amount of treatment capacity remains in operation.

REQUIRED 60m  
SET BACK FROM  
RIVER BANK

SITE BOUNDARY

EXIST.  
SERVICE  
BUILDING

CELL 3  
30,000 m<sup>3</sup>

EXIST.  
CELL 2

EXIST.  
CELL 1

PROPOSED  
SEPTAGE  
RECEIVING  
FACILITY

EXIST.  
COQUIHALLA  
SEWAGE  
FORCEMAIN

CELL 4  
34,000 m<sup>3</sup>

SILVERHOPE CK.

A C B

B.C. HYDRO R/W

C.N.R. R/W

OUTFALL TO  
FRASER R.



DISTRICT OF HOPE  
SEWAGE TREATMENT PLANT SITE  
PROPOSED UPGRADING



DAYTON & KNIGHT LTD.

Consulting Engineers

DWG. No. 115.16

SCALE 1:2600±

FIGURE 6



### **8.3 Site Capacity**

The existing site area is suitable for treating flow from a tributary population of 10,500 using aerated lagoon treatment to produce secondary effluent to the proposed secondary effluent guidelines. The projected long term population of 20,000 people will therefore require additional land area to meet future needs. Based on the sewer population projections, this need will occur within 12 years. The District should therefore consider acquiring additional land adjacent to the site for future requirements. A doubling of the present site area is warranted.

More mechanical, higher maintenance processes, such as oxidation ditches or trickling filters, could be considered after the aerated lagoon capacity of the site is utilized. With mechanical treatment processes, the existing site is suitable for 20,000 people. Acquiring sufficient adjoining property in the next 5 years would allow the District to keep treatment options open in the future and would provide a buffer for future development in the area.

**DISTRICT OF HOPE  
SEWAGE TREATMENT STUDY**

**APPENDIX A**

**DISTRICT OF HOPE  
WASTE DISCHARGE PERMIT  
NO. PE04125**



Province of  
British Columbia

MINISTRY OF  
ENVIRONMENT,  
LANDS AND PARKS

BC  
Environment  
LOWER MAINLAND REGION

Environmental Protection  
15326 — 103A Avenue  
Surrey, British Columbia  
V3R 7A2

Telephone: (604) 582-5200  
Facsimile: (604) 584-9751 *Wm*

Our File: PE04125

MAR 05 1993

**DOUBLE REGISTERED**

**DISTRICT OF HOPE**

P. O. Box 609  
325 Wallace Street  
Hope, British Columbia  
V0X 1L0

Dear Permittee:

**LETTER OF TRANSMITTAL**

Enclosed is a copy of amended Permit No. PE04125 issued under the provisions of the Waste Management Act in the name of **DISTRICT OF HOPE**. Your attention is respectfully directed to the terms and conditions outlined in the Permit. An annual fee for Permit No. PE04125 will be determined in accordance with the Waste Management Permit Fees Regulation.

The administration of this Permit will be carried out by staff from our Regional Office located at 15326 - 103A Avenue, Surrey, British Columbia, V3R 7A2, (telephone: 582-5200). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

You will note that values have been expressed in the International System of Units (SI). *metre*  
These units are to be used in submitting monitoring results and any other information in connection with this Permit.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the Permittee. It is also the responsibility of the Permittee to ensure that all activities conducted under this Permit comply with any other applicable legislation which may be in force from time to time.

This Permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days from the date of a new or amended permit.

Yours very truly,

*E. M. Lawson*

E. M. Lawson  
Assistant Regional Waste Manager

Enc.



MINISTRY OF ENVIRONMENT  
LANDS AND PARKS

**PERMIT  
PE04125**

*Under the Provisions of the Waste Management Act*

**DISTRICT OF HOPE**

**P. O. Box 609**

**325 Wallace Street**

**Hope, British Columbia**

**V0X 1L0**

is authorized to discharge effluent to the Fraser River located at Silverhope Creek west of Hope, 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. Specific Authorized Discharge**

Treated municipal effluent from a sewerage system serving the District of Hope

1.1 The maximum authorized rate of discharge is 6819 cubic metres per day.

1.2 The characteristics of the discharge shall be equivalent to or better than:

5-day biochemical oxygen demand (BOD<sub>5</sub>), 100 mg/L:

Total suspended solids (nonfilterable residue), 100 mg/L.

1.3 The works authorized are two aerated lagoons, submerged outfall with diffuser, and related appurtenances approximately located as shown on the attached site plan (Appendix A).

1.4 The facilities are located at Lot A, D.L. 1172, Sec. 8, Twp. 5, R. 26, W6M, Y.D.Y.D., Plan 32544, and the discharge is located at the Fraser River at Sec. 8, Twp. 5, R. 26, W6M, Y.D.Y.D., Plan C18254.

Date Issued: January 2, 1975  
Amended Date: MAR 05 1993  
(most recent)

E.M. Lawson  
Assistant Regional Waste Manager

## 2. General Requirements

### 2.1 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 shall be approved by the Regional Waste Manager.

### 2.2 Disinfection

Although disinfection of the effluent is not required at this time, suitable provisions should be made to include such a facility in the future. If disinfection is to be by chlorination, dechlorination facilities may also be required.

### 2.3 Future Upgrading

The authorized discharge does not meet Provincial criteria of best available control technology, B.A.C.T., which are 5-day Biochemical Oxygen Demand, 45 mg/L, and total suspended solids, 60 mg/L. Future upgrading of the sewage treatment works may be required by the Regional Waste Manager.

### 2.4 Maintenance of Works

The Permittee shall inspect the pollution control works regularly and maintain them in good working order; notify the Regional Waste Manager of any malfunction of these works.

### 2.5 Emergency Procedures

In the event of an emergency which prevents the Permittee from complying with a requirement of the Permit that would otherwise be applicable, that requirement will be suspended for such time as the emergency exists or until otherwise directed by the Regional Waste Manager provided that:

- i. The Permittee can demonstrate the exercise of due diligence in relation to the process, operation or event which has caused the emergency and that the emergency has occurred notwithstanding this exercise of due diligence;
- ii. The Regional Waste Manager has been immediately notified of the emergency; and
- iii. The Permittee is proceeding with due diligence to correct the emergency condition.

Notwithstanding i, ii, and iii above, the Regional Waste Manager may require the Permittee to reduce or suspend operation to protect the environment while correcting the situation.



Province of  
British Columbia

MINISTRY OF  
ENVIRONMENT  
LANDS AND PARKS

BC  
Environment

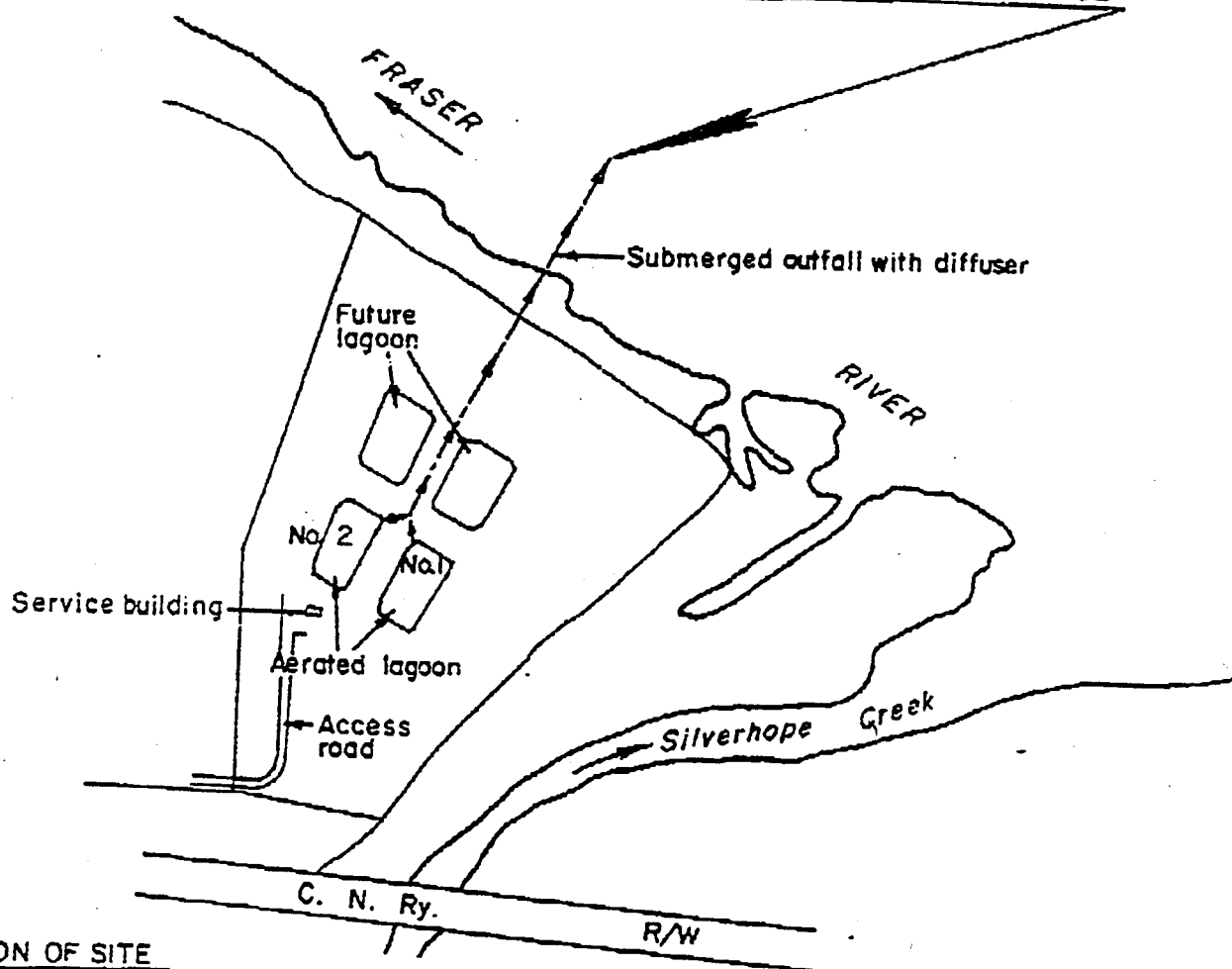
LOWER MAINLAND REGION

Environmental Protection

SITE PLAN

Scale  
1:5000

LOCATION OF DISCHARGE



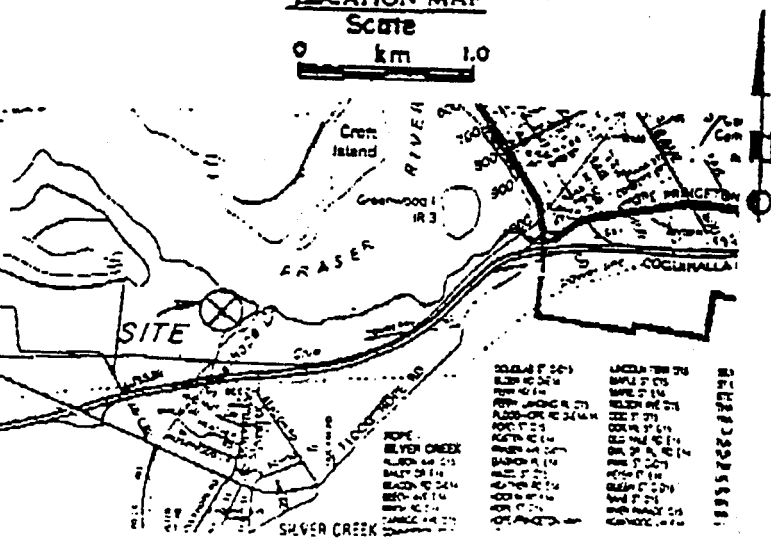
LEGAL DESCRIPTION OF SITE

Lot A, D.L. 1172, Sec. 8, Twp. 5, R. 26, W6M, Y.D.Y.D., Plan 32544

LOCATION MAP

Scale

0 km 1.0



(Name of applicant(s))

(Date)

(Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

MAR 05 1993

Date Issued

Assistant Regional Waste Mana

Date Amended

Appendix A

to Permit No. PE04125

Approval No

2.6 Bypasses

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

2.7 Process Modifications

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

3. Monitoring and Reporting Requirements

3.1 Discharge monitoring

3.1.1 Grab sampling

The Permittee shall install a suitable sampling facility and obtain a grab sample of the effluent once each three months. Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

3.1.2 Analyses

Obtain analyses of the sample for the following:

5-day biochemical oxygen demand, mg/L;  
Total suspended solids (nonfilterable residue), mg/L;  
Fecal coliforms, MPN/100 mL.

3.1.3 Flow measurement

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

3.2 Monitoring procedures

3.2.1 Sampling and flow measurement procedures

Sampling and flow measurement shall be carried out in accordance with the procedures described in "Field Criteria for Sampling Effluents and Receiving Waters", April 1989, 17 pp., or by suitable alternative procedures as authorized by the Regional Waste Manager.

Copies of the above mentioned manual are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, B.C. V8V 1X5, at a cost of \$20.00, and are available for inspection at all Environmental Protection Offices.

### 3.2.2 Chemical analyses

Analyses are to be carried out in accordance with procedures described in the second edition of "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials, (1976 edition including updates)", April 1979, 615 pp., or by suitable alternative procedures as authorized by the Regional Waste Manager.

Copies of the above manual are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X5, at a cost of \$70.00, or if Part 1 only, 1976 edition, 389 pp., \$40.00 and Part 2 only, supplement, 226 pp., \$40.00, and are also available for inspection at all Environmental Protection Program Offices.

### 3.3 Reporting

Maintain data of analyses and flow measurements for inspection and submit the data, suitably tabulated, to the Regional Waste Manager for the previous year. The next report is to be submitted by January 31, 1994.



**DISTRICT OF HOPE  
SEWAGE TREATMENT STUDY**

**APPENDIX B**

**February 10, 1993 Letter from Ministry of Environment**

**July 26, 1993 Letter from Environment Canada to  
Ministry of Environment**



PE-4125

February 10, 1993

District of Hope  
P. O. Box 609  
Hope, B. C.  
V0X 1L0



Attention: Mr. Scott Mitsumi  
Utility Manager

Dear Sir:

Subject: Amendment Request for  
Waste Management Permit PE-4125

I have received an amendment request for a name change from "Regional District of Fraser-Cheam" to "District of Hope" for Waste Management Permit PE-4125 covering operations at the Silverhope STP. The transfer is being processed at this time. I anticipate upgrading the effluent quality in the near future with a view to bringing it into line with other Fraser River discharges, which are BOD = 45mg/l and non-filterable residue = 60mg/l. I would appreciate any input from the District of Hope in this matter.

Thank you for your cooperation. If you have any questions, please contact me at our Surrey offices at 582-5317.

Yours sincerely,

Gordon Shea  
Environmental Protection Technician  
Municipal Section

CC: Fraser Cheam Regional District  
8430 Cessna Drive  
Chilliwack, B.C.  
V2P 7K4

Attn: Trevor Lewis



Environment  
Canada

Environnement  
Canada

Conservation and  
Protection  
Environmental Protection  
224 West Esplanade

Conservation et  
Protection

North Vancouver, BC V7M 3H7

RECEIVED

JUL 26 1993

LOWER MAINLAND REGION

FILE NO. ....

Your file Votre référence

PE-4125

Our file Notre référence

7615-6/F380



July 23, 1993

Mr. H.Y. Wong  
Regional Manager  
Environmental Protection  
Lower Mainland Region  
Ministry of Environment, Lands and Parks  
15326 - 103A Avenue  
SURREY, BC  
V3R 7A2

Dear Mr. Wong:

Re: Amended Permit pursuant to the Waste Management Act  
on behalf of the District of Hope  
issued March 5, 1993

Thank you for sending us a copy of the subject amended permit. We were not given the opportunity to comment on the proposed amendment and would like to provide comments now.

The amended permit indicates the discharge characteristics to be equivalent to or better than BOD<sub>5</sub> of 100 mg/L and TSS of 100 mg/L. These limits do not represent an acceptable effluent quality for a freshwater discharge. As stated in the amended permit, the discharge characteristics do not meet the provincial criteria for best available control technology.

The maximum authorized rate of discharge of 6 819 cubic metres per day is also of concern as it represents approximately three times the current average discharge flow. The permitted discharge flow may need adjustment.

The following table represents results of sampling carried out by Environment Canada on four occasions in 1992 and 1993. The treatment facility is not producing final effluent quality equivalent to secondary treatment.

Canada

2 recycled paper



papier recyclé

Mr. H.Y. Wong  
EP, Surrey  
July 27, 1993

Page Two  
7615-6/F380  
PE-4125

<u>Parameters</u>	<u>92/07/06</u>	<u>92/09/22</u>	<u>93/01/25</u>	<u>93/03/17</u>
96-hr LC <sub>50</sub>	100% (non-toxic)	69%	100% (non-toxic)	74.8%
NH <sub>3</sub> (mg/L)	27.3	10.6	20.9	21.3
Nitrite (mg/L)	4.01	18.6	0.003	0.02
Nitrate (mg/L)	4.91	21.6	0.006	0.007
BOD <sub>5</sub> (mg/L)	90	113	35	33
T. Phosphorus (mg/L)	4.9	6.1	4.77	4.81
TSS (mg/L)	33	50	50	30

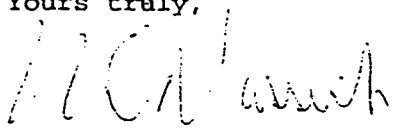
We are opposed to the effluent quality requirements as stated in the issued permit and suggest the treatment system can provide a better effluent quality. The final effluent quality requirements should specify secondary treatment with a non-acutely toxic effluent.

A study should be undertaken to determine if the treatment system is currently overloaded, requires sludge removal or could be optimized through aeration/settling to produce a higher quality effluent. The Fraser Pollution Abatement Office, under the Fraser Green Plan initiative, may be able to provide funding for a treatment system study.

Although we expect our concerns will be reflected in an amended permit, we would appreciate the opportunity to discuss any proposed variance with you as our response has been developed within the context of requirements to protect the Fraser River fishery resource pursuant to the Fisheries Act. Alain David of my office may be contacted at 666-2699 for further discussion.

Your continued cooperation is appreciated.

Yours truly,

  
M. D. Nassichuk  
Acting Manager  
Pollution Abatement Branch

cc: D. Paterson, DFO, New Westminster

**DISTRICT OF HOPE  
SEWAGE TREATMENT STUDY**

**APPENDIX C**

**TERMS OF REFERENCE**



# DAYTON & KNIGHT LTD.

Consulting Engineers

P.O. BOX 91247, (612 CLYDE AVENUE), WEST VANCOUVER, BRITISH COLUMBIA, CANADA V7V 3N9  
TELEPHONE: (604) 922-3255 FAX: (604) 922-3253

copy

September 2, 1993

**District of Hope**  
P.O. Box 609  
325 Wallace Street  
Hope, B.C.  
V0X 1L0

Attention: Mr. Scott Misumi, A.Sc.T.

Dear Mr. Misumi:

**RE: Sewage Lagoons**

The District has recently taken over the responsibility for sewage treatment works that are included under the B.C. Environment Permit No. PE 4125. The sewage lagoons are now 15 years old and increased loading, as well as the proposed changes to the Provincial criteria for sewage discharges, will require upgrading of the facilities.

The Ministry of Environment has provided test results from June and July 1993 which indicate that the discharge is exceeding the present permit. The Ministry has requested that the discharge be brought into compliance.

The District therefore should plan and budget for:

- 1) Short term improvements to bring the system into compliance.
- 2) Long term plan for growth and for meeting the more stringent discharge criteria presently being prepared by the Province.

As requested, we have prepared an outline and budget for a study to address these concerns. The study outline is as follows:

A. Short Term Improvements to Meet Present Permit Requirements

- 1) Assess loading and impact of septic tank discharge to lagoon.
- 2) Outline systems for monitoring and controlling septic discharges.
- 3) Recommended improvements to septage receiving facilities and possible pre-treatment.
- 4) Assist District with measurement of sludge levels in both lagoons.
- 5) Develop sludge removal methods and determine sludge disposal requirements.

- 6) Review options for increasing lagoon aeration capacity.
- 7) Review options for improving effluent clarification.
- 8) Review and recommend upgrading of instrumentation and monitoring facilities.
- 9) Sealing requirements if lagoon operating level is raised.

**B. Long Term Improvements to Meet Future Discharge Criteria**

- 1) Outline expected future discharge criteria.
- 2) Outline upgrading required to meet new discharge criteria.
- 3) Provide cost estimates for upgrading including O&M costs.
- 4) Outline most economic staging of the work.
- 5) Outline additional testing and monitoring required to determine staging requirements and timing.

The budget and effort to complete this study and to provide 10 bound copies of the report is estimated as follows:

Principal	32 hrs x \$100	\$ 3,200
Project Engineer	90 hrs x \$70	6,300
Technical Assistance	40 hrs x \$60	2,400
Drafting	50 hrs x \$50	2,500
Secretarial	8 hrs x \$35	<u>280</u>
<b>SUB-TOTAL</b>		<b>\$14,400</b>
<b>Disbursements</b>		<b><u>600</u></b>
<b>TOTAL</b>		<b>\$15,000</b> <b>+ GST</b>

This study would be completed within 8 weeks of the notice to proceed. We anticipate that interim findings on the short term requirements could be provided in 3 to 4 weeks.

Please call if you require additional information.

Yours truly,

Dayton & Knight Ltd.

**D.R. Harrington, P.Eng.**

DRH/ad

115.14  
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