Report

FLORENCE LAKE IMPROVEMENT DISTRICT

Engineering / Takeover Study

Submitted to:
Florence Lake Improvement District

Submitted by:
Colquitz Engineering Ltd.
4211 Commerce Circle
Victoria, BC V8Z 6N6

Date: February 1, 2019
Project Number: 301.001

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1. INTRODUCTION

The Florence Lake Improvement District (FLID) was established in 1975 to provide potable drinking water to properties on the west side of Florence Lake in the City of Langford (City). The water system was originally constructed in 1976 and has been upgraded and expanded in subsequent years.

The Capital Regional District (CRD) owns and operates the water facilities in the City and recently constructed watermains on Savory Road, approximately 80 m south of the FLID distribution main. The FLID is now considering dissolving and having the water system be taken over by the CRD.

The primary purposes of this study are as follows:

- provide an assessment of the existing water system;
- outline the proposed works that would allow takeover of the water system by the CRD, and;
- estimate the costs for the design and construction of the proposed works.

2. SYSTEM DESCRIPTION

2.1 General

The FLID encompasses 17 lots on the west side of Florence Lake in the City of Langford. When the FLID was established in 1975, the CRD water distribution system (formerly the Greater Victoria Water District) did not service properties on the west side of Florence Lake. The FLID water system conveys water from the CRD system on the east side of the lake to the properties on the west side of the lake, for distribution to properties within the FLID.

The main FLID water system components are as follows:

- Connection (including meter) to the CRD water system on the east side of Florence Lake near the intersection of Florence Lake Road and Setchfield Avenue;
- A supply main conveying water from the east side of Florence Lake to the FLID, laid on the lake bottom;
- A distribution main along Savory Road within the road allowance, and;
- Water services to each of the properties within the FLID including meter boxes (no meters).

The system components are described in further detail in the following sections. The record drawings for the water system are provided in Appendix A.

A schematic of the FLID water system is illustrated in Figure 2-1 below.

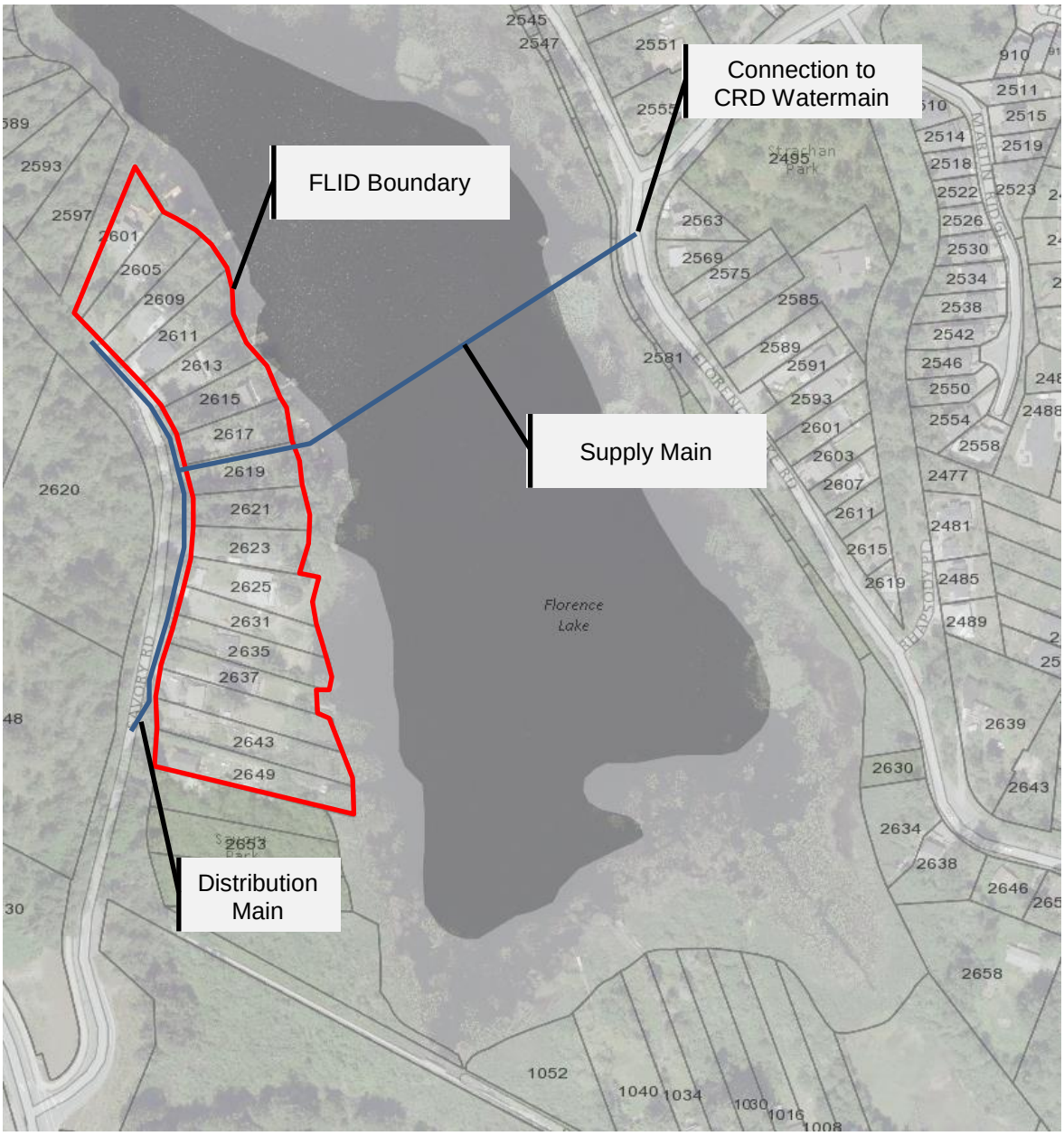

Figure 2-1: FLID Water System Schematic
(Background source – CRD Regional Map)

2.2 Connection to CRD

The connection to the CRD water system is on the east side of Florence Lake, near the intersection of Florence Lake Road and Setchfield Avenue, includes a 19 mm service and water meter. The 19 mm water meter is in a box on the beach adjacent to the road near the base of the retaining wall. The water meter box is shown in Figure 2-2 below.

Figure 2-2: Existing Water Meter

The CRD water system hydraulic grade line (HGL) on the east side of the lake is El. 169 m. This results in a maximum static pressure in the FLID distribution system of approximately 830 kPa or 120 psi (based on a Savory Road low-point elevation of approximately El. 84 m).

2.3 Supply Main

The 50 mm polyethylene supply main under Florence Lake was constructed around 1993. This main is a replacement of the original 19 mm supply main, and allowed for the reservoir and booster pump station on the west side of the lake to be abandoned. This reservoir and booster pump station remains, although not functional, and is located in the road allowance in front of Lot 25 (2619 Savory Road) and Lot 26 (2617 Savory Road).

Record drawings of the supply main are not available, however the supply line is described in the memorandum, *Analysis of Water Supply for the Florence Lake Improvement District, Willis Cunliffe Tait, August 30, 1993*. This memorandum recommends the supply main be 50 mm in diameter (42 mm internal diameter) class 160 polyethylene.

Through discussions with FLID members involved with the construction of the supply main, we understand that the supply main is attached to a rope/cable which is anchored to the bottom of the lake with concrete

blocks spaced approximately every 3 m. At the east side of the lake, a short section of the supply main is encased in concrete.

FLID members also indicate that the original 19 mm supply main has not been removed as it was planned for use as an emergency back-up if the new main became damaged. This line was however damaged by the lake weed harvester and is no longer available as a back-up.

2.4 Distribution Main

The original 1976 distribution main was constructed in the road allowance of Savory Road at a consistent 1.0 m meter from the east property line. This distribution main is 150 mm in diameter and ductile iron. Through discussions with the Ductile Iron Pipe Research Association (DIPRA), it is most likely that 1976 ductile iron pipe is cement lined. DIPRA also indicated that because the water is not discoloured, this helps to confirm that the watermain is cement lined. The record drawings also indicate that the watermain is installed with a minimum depth of cover of 1.0 m.

In subsequent years, the distribution main has been extended to the north and south.

The watermain was extended to the south to service Lot 16 (2649 Savory Road) in 1988. The record drawings for the south extension indicate that the watermain is PVC DR18.

Record drawing for the north extension are not available, but it appears that the north extension was constructed to service Lot 30 (2609 Savory Road), prior to 1997. A record drawing for the services to Lot 31 (2605 Savory Road) and Lot 32 (2601 Savory Road), which come off of this north extension, indicate the north extension watermain is PVC. Photos from when the sanitary sewer was constructed on Savory Road indicate that the watermain is likely PVC DR18 (see Figure 2-3 below).

Figure 2-3: North Extension Watermain
(Photo Credit: FLID)

2.5 Services

All of the 15 water services are 19 mm in diameter. The record drawings indicate that the services to Lot 31 and Lot 32 (north extension) are a combined 25 mm service before branching to 19 mm services to each meter box.

The twelve original services are thermoplastic polyethylene class 160. Through discussions with the Plastics Pipe Institute (PPI), we understand that these services pre-date the original AWWA standard for polyethylene pressure pipe, tubing and fittings that was published in 1978 (AWWA C901-78).

We have also received information from Canadian polyethylene pipe manufacturer Infra Pipe Solutions (IPS). IPS provided a 1978 brochure for polyethylene (PE) pipe produced by KWH (now IPS). This brochure is included in Appendix B for information.

Through communication with IPS, key information is summarized as follows:

- Class 160 pipe is suitable for continuous working pressures up to 160 psi (note the maximum FLID static pressure is approximately 120 psi);
- The polyethylene resin has been replaced with superior resins, but IPS still predicts that these services will provide, “100 years or more of service against ductile rupture failure”;
- Earlier failure could be caused by, “the formation of a crack where the pipe might be embedded in larger stones or be sitting against a rock”, and;
- “The best prediction of remaining service life against this failure mode (cracks forming due to bedding), can be made by looking at the service history. PE failures occur on a logarithmic time scale. The longer the period without failure, the ‘safer’ it is to predict more of the same for a very long time. If none have occurred to date, there is every reason to expect that these service laterals will last another 50 or more years”.

The subsequent service installations to Lot 16 (south extension), and Lot 31 and Lot 32 (north extension) are copper. The record drawing for the Lot 16 service indicates that it is a Type ‘K’ service tube. The record drawing for the Lot 31 and 32 services does not indicate the type of copper service other than a note which states, “All work and materials are in accordance with the Greater Victoria Water District Standards…”.

All services have corporation stops at the main and meter boxes (no meters) with shut-off valves at the property line. The service details indicate that the connections to the PVC mains have saddles. The service detail for the ductile iron main does not show a service saddle, indicating they are directly tapped.

A summary of the meter boxes for each lot are summarized in Table 2-1 below.

Table 2-1: Meter Box Summary

Address	Lot #	Found (Yes/No)	Damaged	Notes
2649	16	No		
2643	17 & 18	Yes	Yes	Lid may have to be replaced.
2637	19	No		
2635	20	Yes		This service has been turned off (source: FLID).
2631	21	N/A		No house. No service connection
2625	22	Yes		
2623	23	Yes	Yes	Half under wall. Lid has crack and may need to be replaced.
2621	24	Yes		
2619	25	Yes		
2617	26	Yes	Yes	Lid and box to be replaced.
2615	27	No		Likely under pile of wood chips
2613	28	Yes		
2611	29	Yes		No service line observed in box.
2609	30	Yes	Yes	In concrete driveway. Lid and box to be replaced. Valve in this box may not be standard (source: FLID).
2605	31	Yes		
2601	32	Yes		

An example of an existing meter box is shown on Figure 2-4 below.

Figure 2-4: Meter Box Example

2.6 Other System Components

Flush Outs

There are flushouts located at the south and north end of the distribution main. The flushout at the south end is 50 mm in diameter, and the flushout on the north end is 19 mm in diameter.

Reservoir and Booster Pump Station

There is an existing water reservoir and booster pump station located in the road allowance adjacent to Lot 25 (2619 Savory Road) and Lot 26 (2617 Savory Road). This reservoir and booster pump station was required with the original 19 mm supply main, but has been out of service since the installation of the 50 mm supply main around 1993. The BC Hydro service to this station has been removed along with other mechanical and electrical components. The structure and some internal components remain.

3. PROPOSED WORK

The proposed scope of work required to allow the FLID water system to be taken over by the CRD is outlined below. The proposed work has been developed taking into consideration the CRD's *Engineering Specifications and Standard Drawings*, The City of Langford's *Subdivision and Development Servicing Bylaw No. 1000* (specifically regarding fire protection), and good engineering judgement.

3.1 Connection to CRD

The proposed connection to the CRD water system is to the existing 200 mm diameter ductile iron watermain on Savory Road, approximately 120 m from McCallum Road. This connection will be the new supply to the properties on Savory Road, and allow for the elimination of the connection to the CRD system on the east side of the lake and the supply main under Florence Lake.

The proposed watermain between the existing CRD main and the existing FLID distribution watermain is 200 mm in diameter. This size main will provide the required fire flow of 80 L/s at the proposed hydrant (see further description for the proposed hydrant below) and result in a velocity of less than 3.0 m/s during the fire flow demand (CRD standard). This watermain is to be ductile iron or PVC conforming to section *4.4 Materials*, in the *CRD Engineering Specifications and Standard Drawings*.

3.2 Supply Main

The supply main under Florence Lake will no longer be required once the above connection to the CRD is completed. Regarding removal or abandonment of this supply main, a Senior Authorizations Officer, West Coast Region Authorizations – Water at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development stated, "As discussed, it is currently the opinion of West Coast Authorizations – Lands that the concrete at the shore of Florence Lake must be removed. However, the line itself, if as described (submerged in the sediment at the bottom of the lake) may be abandoned in place, provided it poses no hazard to swimmers or boaters." The written correspondence (email records) with the Ministry is included in Appendix D for reference.

Based on this response from the Ministry, the proposed work includes the removal of the concrete encasement at the shore (east side of Florence Lake) and abandoning the remaining supply main in place. For the concrete encasement removal, this work will require a notification under the Water Sustainability Act and will likely require an erosion and sediment control plan to be prepared. The removal will have to occur during the *Reduced Risk Timing Window for Fish*, likely between August 15 to September 15.

The existing 19 mm water service will be closed at the main (Florence Lake Road and Setchfield Avenue) by the CRD by excavating down to the main and closing the corporation stop. The CRD will also remove the existing meter box on the beach and cap/plug the existing supply main under Florence Lake.

3.3 Distribution Main

The existing distribution main (ductile iron and PVC) is to remain. This watermain is capable of providing adequate water supply and pressures for both peak domestic and fire flow scenarios. Based on the material type and the age of the watermains, it is anticipated that the distribution watermains will provide adequate operation for many years to come.

The CRD standard is for distribution mains to extend across the entire frontage of the last lot of a dead-end system, if there is the potential that the water system can be extended in the future. There are single-family lots further to the north, however the watermain does not extended across the frontage of Lot 31

(2605 Savory Road) and Lot 32 (2601 Savory Road). In reviewing the topography, extension of the distribution main across the entire frontage of Lot 31 and Lot 32 would require significant blasting as the rock to the north is approximately 3 m higher than the existing road grade. Therefore, it is proposed that the watermain not be extended to the north as part of this takeover by the CRD.

3.4 Services

The water services are all 19 mm in diameter, conforming to the CRD required size for single-family properties. The combined portion of the service to Lot 31 and Lot 32 is 25 mm diameter. A 25 mm service has approximately the same capacity as two 19 mm services and therefore the conveyance capacity in this portion of the service is not a concern.

Based on the information received from PPI and IPS, and considering the lack of repairs needed on the existing PE services, it is expected that the existing services will last another 50 years. It is therefore proposed that these services, and the three copper services, remain.

Meters are required for all of the services. The existing meter boxes do not match the current standard which calls for a polymer meter box and lid, however the existing meter boxes are approximately the same length and width as the CRD's current standard and therefore it is proposed that the existing boxes remain. Some boxes and lids are damaged (see Table 2-1) and should be repaired. This includes the replacement of two meter boxes and lids (Lots 26 and 30) and two lids (Lots 17/18 and Lot 23).

3.5 Other System Components

Hydrants

There currently are no fire hydrants on the FLID water system. Hydrant(s) are required and are to be provided in accordance with the City of Langford standards. The required spacing in the City's bylaw is as follows:

> *8.15.1 - For one and two family residential development, the centre of the building envelope as identified in Bylaw 300 for the appropriate zone shall be within 150 metres of a fire hydrant, measured along the access route as defined in Building Bylaw No. 1160 and along the highway to which the access route connects. For all other building types fire protection shall be as prescribed by Building Bylaw 1160.*

A hydrant anywhere along the front property lines of Lot 26 (2617 Savory Road) or Lot 25 (2619 Savory Road) would provide coverage in accordance with the bylaw for all lots except for Lot 16 (2649 Savory Road). Lot 16 however is within 150 m of the existing CRD hydrant on Savory Road near to McCallum Road, and therefore only one additional hydrant is required to provide adequate fire protection coverage.

The minimum required fire flow as outlined in the CRD's specifications is 80 L/s, and in accordance with the Fire Underwriters Survey (FUS) and the municipality having jurisdiction (City of Langford). The City's bylaw also references the FUS for fire flow requirements.

The FUS calculation of fire flow requires detailed information including construction type, floor area, building contents, and building exposure. As this information is not easily available, a typical single-family residential fire flow rate of 80 L/s is proposed for use in the analysis.

The CRD provided available flow and pressure data at the end of the existing CRD main on Savory Road. Using this flow and pressure information, for a 200 mm main connecting CRD water system to the FLID watermain, the residual pressure at the proposed hydrant location is approximately 475 kPa (70 psi) for

a fire flow of 80 L/s. This exceeds the requirement for residual pressure and therefore the existing and proposed distribution mains are adequate.

A line valve on the distribution main is also proposed at the hydrant tee in accordance with the CRD standard for maximum line valve spacing of 300 m.

Flush Assemblies

There are currently two flush assemblies on the existing distribution system. The flush assembly at the south end of the existing distribution watermain will be eliminated when the connection to the CRD main is made. The existing flush assembly at the north end of the project is 19 mm in diameter. The CRD's standard for flush assembly on the end of a distribution main is a 100 mm in diameter. It is therefore proposed that the existing 19 mm flush assembly at the north end of the distribution main be abandoned, and a 100 mm flush assembly be installed in accordance with CRD standards.

Testing and Cleaning

To confirm that the existing water system is relatively free of leaks, it is proposed that a leakage test be completed under the direct supervision of a professional engineer. The proposed leakage test should be completed by closing all services to the lots at the meter boxes and monitoring the pressure. This leakage test could be completed at the same time as the leakage test for the new watermain. The maximum allowable leakage rate should not be greater than the AWWA specifications.

The existing distribution main has not been regularly flushed since it has been operation, raising concerns of sediment and build-up on the pipe wall. It is proposed that the existing distribution main be cleaned through "pigging" under the supervision of a professional engineer. This cleaning should be repeated until the discharge water is clean and clear.

Reservoir and Booster Pump Station

The existing reservoir and booster station is no longer in use and will not be required. It is proposed that the existing water reservoir and booster pump station be removed. The tee connection from the booster pump to the distribution main at this location should be replaced with a straight section of pipe complete with couplers as required.

The end of the supply main under Florence Lake and over Lot 25 should be capped/plugged, and therefore abandoning the watermain under Florence Lake.

3.6 Summary

In summary, the proposed scope of work required for the CRD to takeover the FLID water system is as follows:

1. A 200 mm diameter watermain connecting the CRD watermain with the existing FLID distribution watermain (approximately 80 m length);
2. One new hydrant including a line valve on the distribution main;
3. A 100 mm diameter flush assembly at the north end of the distribution main;
4. Replace two water meter boxes and lids, and two water meter box lids;
5. Install 15 water meters;

6. Close the existing water service connection on the east side of Florence Lake, remove the meter box and cap/plug the supply main;
7. Remove the existing water reservoir and booster pump station, and cap/plug the supply main;
8. Leakage testing of the existing system, and;
9. Cleaning (pigging) of the existing distribution main;

3.7 Procedure

The following outlines the potential process for completion of the work following an agreement to proceed with the dissolution of the FLID:

1. FLID retains the services of a civil engineering consultant to prepare the detailed design and tender documents, obtain Island Health and CRD approvals, and provide construction inspection and contract administration services. A qualified environmental professional should also be retained to prepare the notification (Water Sustainability Act) for removal of the concrete encasement, prepare the sediment control plan, and monitor this portion of the work.
2. Following completion of the detailed design and approval of the design from CRD and Island Health, tender the works for construction.
3. Select a contractor to construct the waterworks.
4. Contractor constructs the 200 mm watermain.
5. Bacteriological testing of the new 200 mm watermain. Following passing of the test, the contractor installs a temporary connection from the CRD's existing watermain to the new 200 mm watermain, and from the new watermain to the existing 150 mm watermain.
6. Contractor installs the fire hydrant and line valve, and the flushout assembly.
7. Pigging and flushing of the existing 150 mm watermain.
8. Pressure testing of the new 200 mm watermain and the existing 150 mm watermain.
9. Permanent connection from the new 200 mm watermain to the existing 150 mm watermain.
10. Flushing of the new 200 mm watermain and existing 150 mm watermain, and connection to the CRD water system.
11. Installation of water meters by the CRD for each of the lots.
12. Close existing water service on the east of the lake and removal of the existing meter box and cap/plug the supply main, by the CRD.
13. Removal of existing water reservoir and booster station, and remove existing tee. Cap/plug the supply main and therefore abandon the water main under Florence Lake.
14. Remove the existing concrete encasement on the east side of the lake, within *the reduced risk timing window for fish*.

The water service to the existing properties will be interrupted during above steps 7 to 13. Water service could be restored between steps.

4. RECOMMENDATIONS

It is recommended that this report be presented to the CRD for their review and acceptance.

5. COST ESTIMATE

A construction cost estimate is included in Appendix C.

This cost estimate is defined as a “Class C” estimate as described in the *Budget Guidelines for Consulting Engineering Services, 2009, Consulting Engineers of British Columbia and the Association of Professional Engineers and Geoscientists of BC*.

The total estimated costs for the scope of work is $300,000, plus GST.

6. REPORT SUBMISSION

Prepared by:

COLQUITZ ENGINEERING LTD.

Jeff Howard, P.Eng.
Water Resources Engineer

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Revision History

Revision #	Date	Status	Revisions	Author
0	December 12, 2018	DRAFT	Working Draft submitted for discussion	J. Howard
1	February 1, 2019	FINAL	Final report submitted for acceptance	J. Howard

colquitz engineering

Appendix A

RECORD DRAWINGS

PLAN SHOWING PROPOSED WATER SERVICE TO LOTS 17 THROUGH 32 PLAN 1577 SECTION 113 ESQUIMALT LAND DISTRICT

NOTES

A APPROVAL OF WORKS MUST BE OBTAINED FROM THE COMPTROLLER OF WATER RIGHTS

B APPROVAL OF WORKS MUST BE OBTAINED FROM THE MINISTER OF HEALTH (ENVIRONMENTAL ENGINEERING)

C PERMISSION TO CONSTRUCT WORKS WITHIN CROWN LAND MUST BE OBTAINED FROM THE DEPT. OF HIGHWAYS PRIOR TO CONSTRUCTION

D THE PROPOSED WATERMAIN AND HOUSE CONNECTIONS WITHIN THE ROAD ALLOWANCE ON SAVORY ROAD TO BE TO GREATER VICTORIA WATER BOARD STANDARDS

E THE WATERMETER AND PRESSURE SUSTAINING VALVE TO BE INSTALLED BY THE G.V.W.B. AT THE WATER DISTRICTS EXPENSE

F ALL BEDDING TO BE CLASS "C" EXCEPT CLASS "B" UNDER DRIVEWAYS

AS-CONSTRUTED
A.CHALMERS
APRIL 20/1976
A Chalmers

KEY PLAN

SCALE - 1" = 200'

DESIGN A CHALMERS
1204 MARIN PARK DRIVE
BRENTWOOD BAY B.C.
652-3806

DRAFTING CHECK			LEGEND - REFERENCE TO MOST COMMON SYMBOLS USED (Existing services shown)								
SERVICE	DATE	SIGN	175W 250W 400W LIGHT	STANDARD BASE	SIDEWALK	CURB —C—	VALVE
U/G & GAS			POLE (Hydro, tel) O H T O	CONCRETE BOX	CATCHBASIN	DITCH —D—	REDUCER
SEWER			EXISTING U/G WIRING	FLUSH VALVE	CLEANOUT	DRAIN —D—	CAP
DRAIN			PROPOSED U/G WIRING		WOOD BOX	SEWER —S—	PLUG
WATER					MANHOLE	WATER —W—	HYDRANT

APPROVED FOR CONST.
Florence Lake Improvement District
Savory Road, R.R. 6 Victoria, B.C.

PROJECT	W/O No.	DATE	SIGN	PROJECT	W/O No.	DATE	SIGN

REVISIONS APPROVED

REVISIONS	DATE	SIGN

Florence Lake Improvement District
Savory Road, R.R. 6 Victoria, B.C.

DESIGN APPROVED

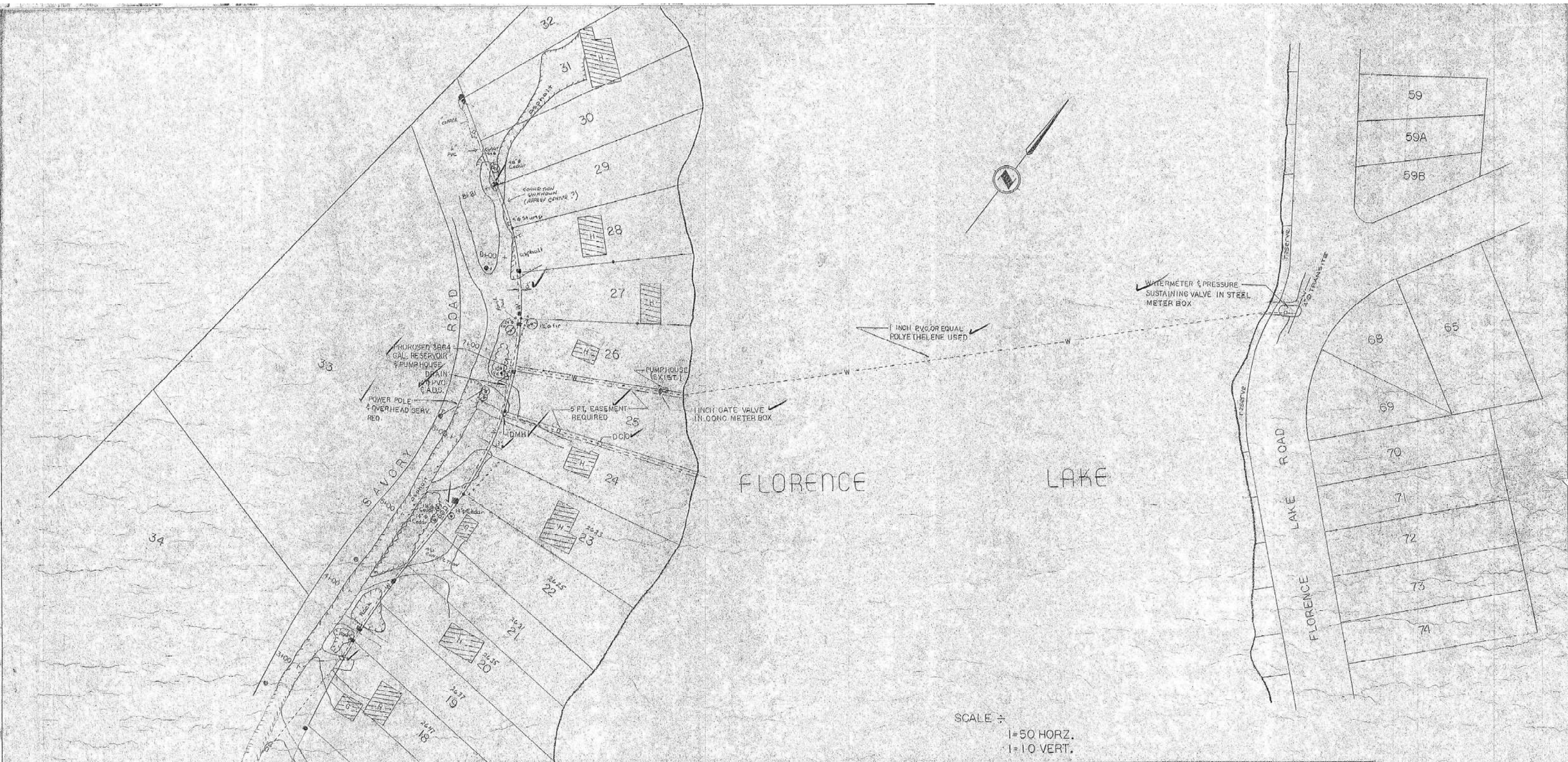
EXCEPTIONS		
APPROVED BY	DATE	SIGN
DESIGN. ENG.		
ASSIST. ENG.		
MUNICIPAL ENG.		

Florence Lake Improvement District
Savory Road, R.R. 6 Victoria, B.C.

DESIGN
B.M. ELEV.
SCALES: Hor. 1" = 20' Vertical 1" =

DRAWN
CHECKED
DATE

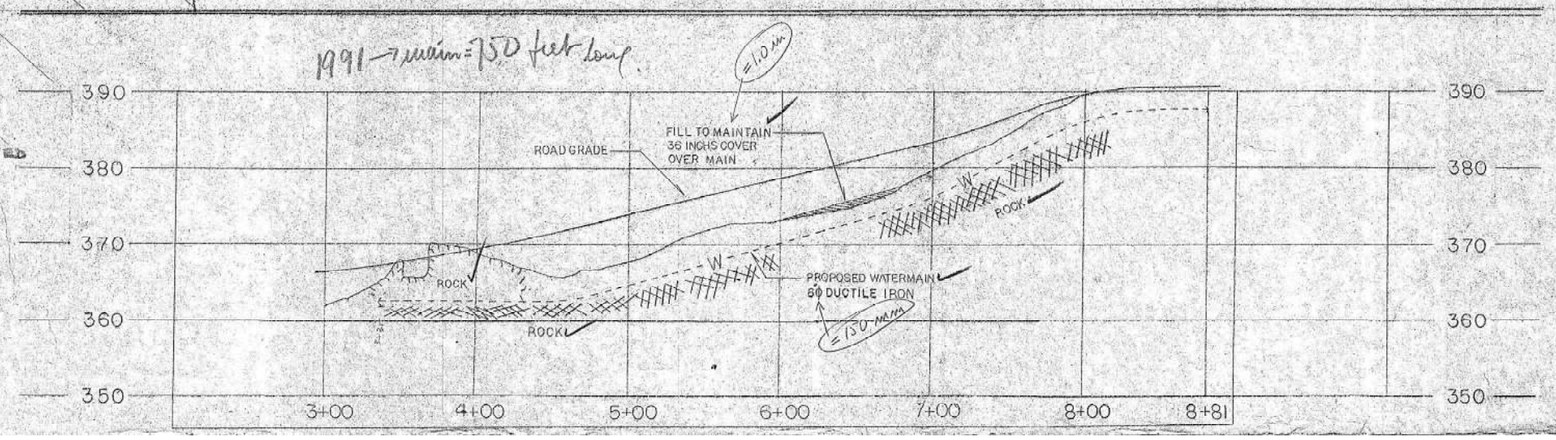
FIELD BOOK
DESIGN DRAWING 1 OF 3
FILE NUMBER



NOTE

1. ONE INCH Ø LINE TO BE CONTINUOUS FROM WATERMETER TO RESERVOIR PUMPHOUSE. EXCEPT FOR VALVE AS ANOTED
2. WATER LINE UNDER LAKE TO BE ANCHORED TO 3/4 TERIPROPYLENE ROPE CABLE

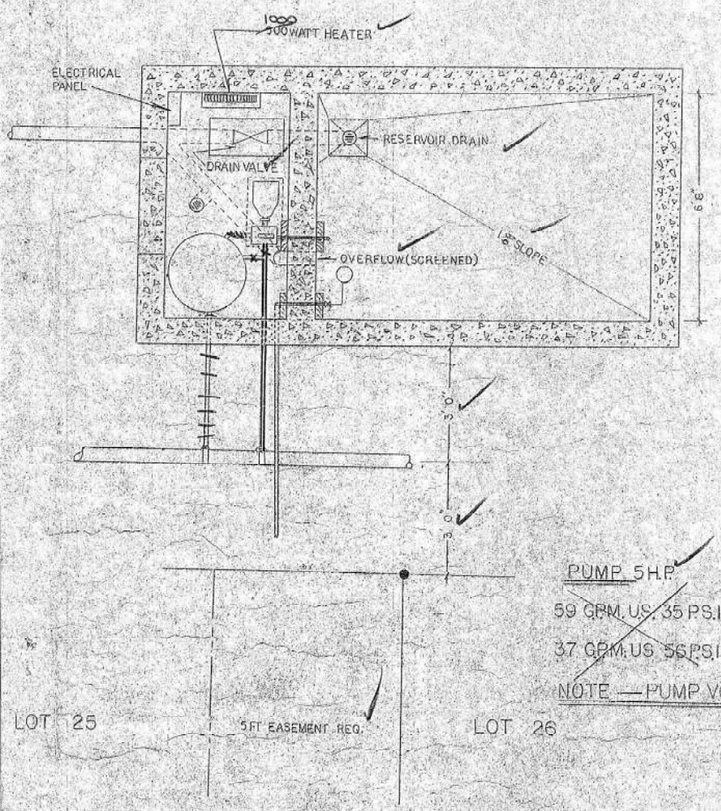
1991 → main = 750 feet long



Florence Lake Improvement District
Savory Road, R.R. 5 Victoria, B.C.

PLAN RESERVOIR & PUMPHOUSE

SCALE 1"=2'

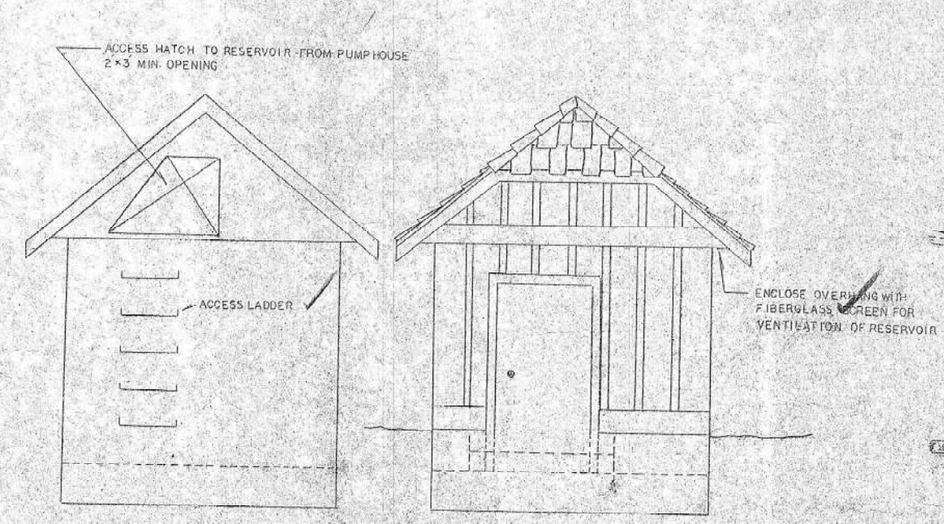


PUMP 5 H.P.

59 GPM. US. 35 P.S.I.

37 GPM. US 56 P.S.I.

NOTE — PUMP VOLTAGE 220



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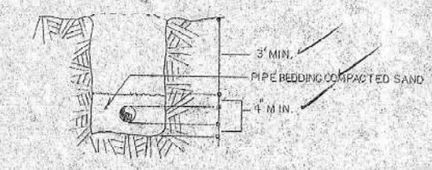
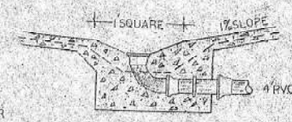
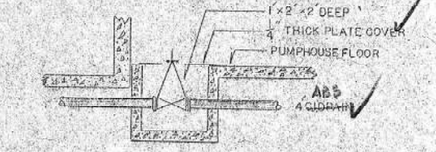


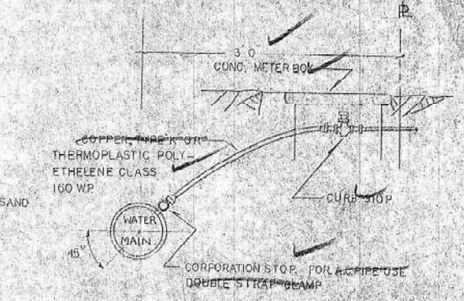
DETAIL TRENCH



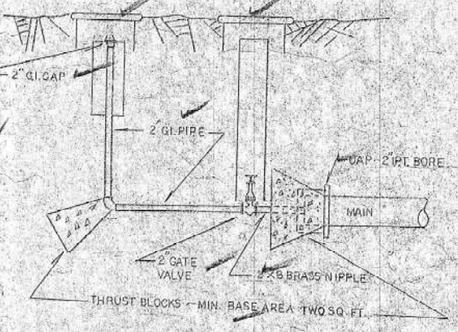
DETAIL RESERVOIR DRAIN



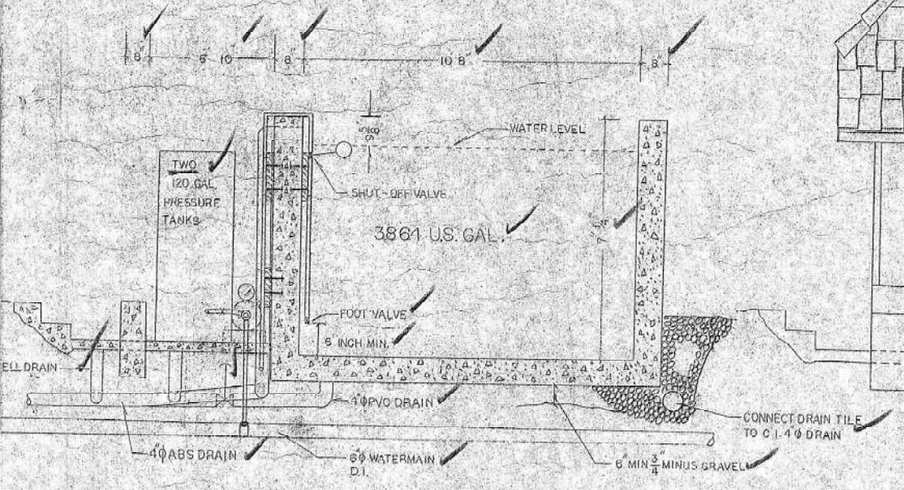
DETAIL DRAIN VALVE PIT



TYPICAL SERVICE BETWEEN MAIN AND PROPERTY LINE

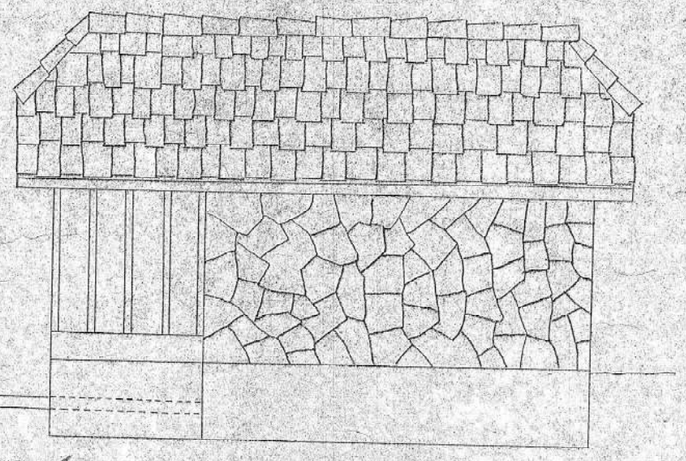


TYPICAL FLUSH VALVE



SECTION RESERVOIR & PUMP HOUSE

SCALE 1"=2'



SCALE 1=2'

RESERVOIR REINFORCING SCHEDULE

VERTICAL	#4 BAR	15"	CENTERS
HORZ.	#4 BAR	12"	CENTERS
FLOOR	#4 BAR	6"	CENTERS

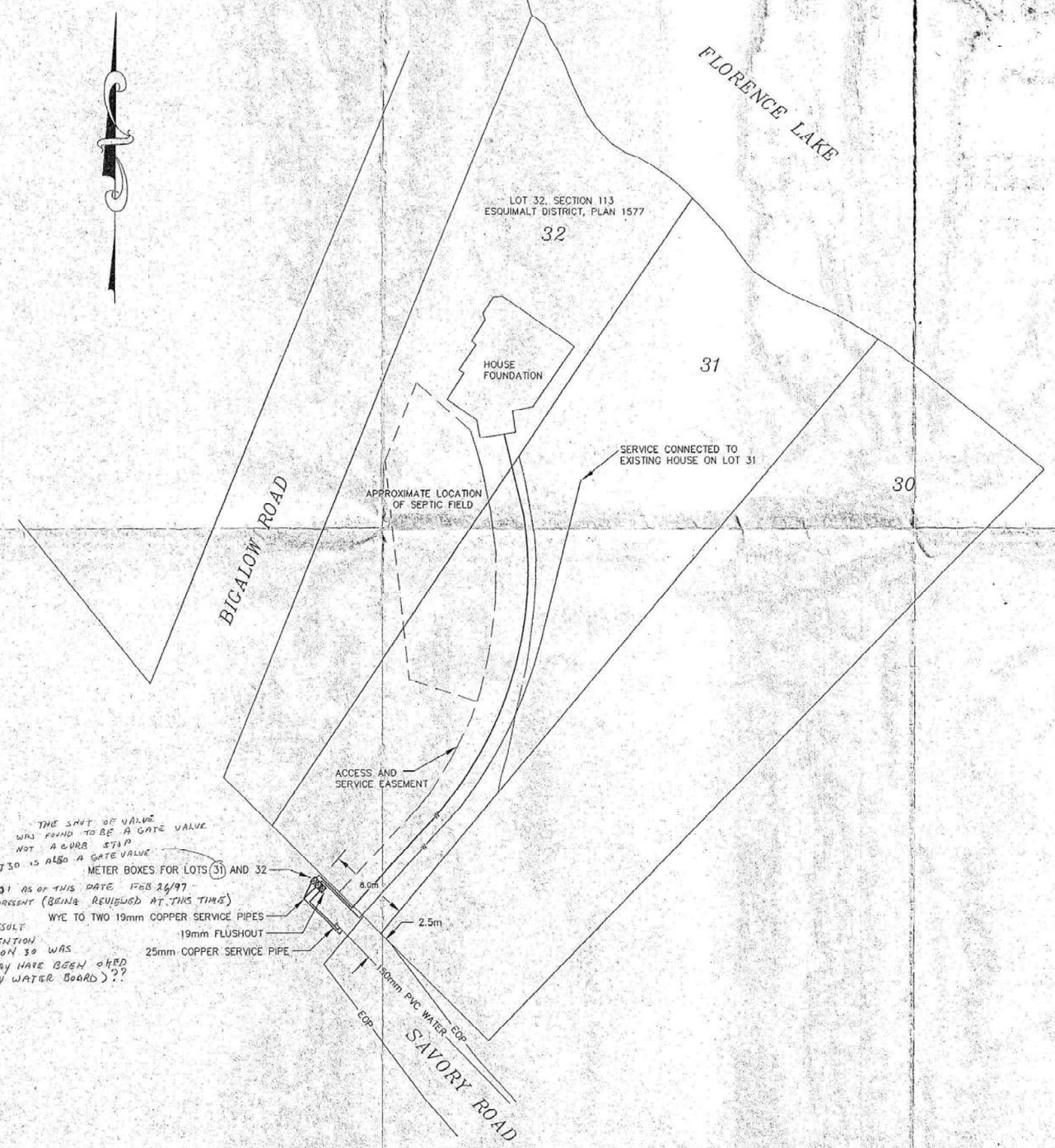
NOTE

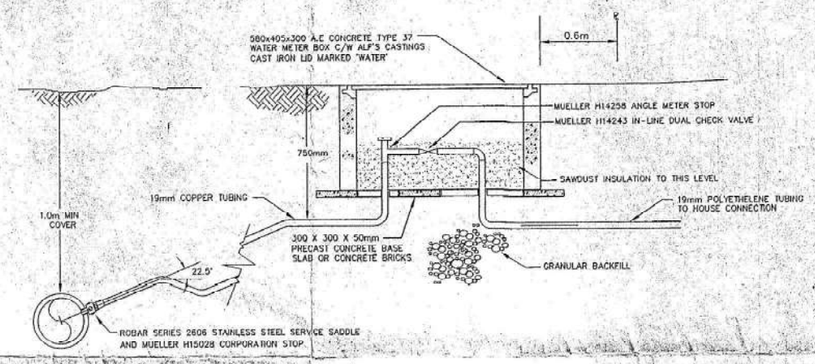
CARRY REBAR THROUGH ALL CORNERS CONTINUOUS

CONCRETE — 3,000 P.S.I. — 28 DAYS

Hans Hildebrandt
Derek Peters
Superintendent (estimator)

Florence Lake Improvement District
Savary Road, R.R. 6 Victoria, B.C.





WATER SERVICE CONNECTION.
N.T.S.

GENERAL NOTES:

1. ALL WORK AND MATERIALS ARE IN ACCORDANCE WITH THE GREATER VICTORIA WATER DISTRICT STANDARDS, FLORENCE LAKE IMPROVEMENT DISTRICT STANDARDS, THE B.C. PLUMBING CODE, AND THIS DRAWING.
2. CONTRACTOR EXPOSED AND CONFIRMED LOCATIONS OF ALL CONNECTIONS AND CROSSING POINTS PRIOR TO CONSTRUCTION.
3. CONTRACTOR TO ENSURE THAT THERE ARE NO CROSS CONNECTIONS IN THE HOUSE PLUMBING BETWEEN OUTSIDE SOURCES AND THE F.L.I.D. SUPPLY. WATER SUPPLIED BY F.L.I.D. IS FOR IN-DOOR DOMESTIC HOUSEHOLD USE ONLY.
4. G.V.W.D. WAS CONTACTED FOR INSPECTION PRIOR TO BACKFILLING.

date	revision	no.
02/ 14/97	AS CONSTRUCTED	3
01/17/97	AS PER CLIENT'S COMMENTS	2
02/19/96	AS PER GVWD COMMENTS	1

drawn: ETR
checked: AJB
approved:
date: FEB 96

bullock baur
associates ltd
civil ■ land development ■ municipal

1192 fort street
victoria, bc V8V 3K8
phone: 604.386.2521
fax: 604.381.1865

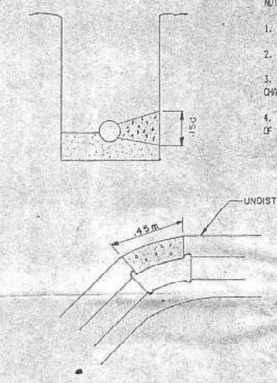
client: *BLAKE FALLIS*
project: 2601 SAVORY ROAD
title: LOT 32 WATER SERVICING

scale
hor: 1:250
vert:

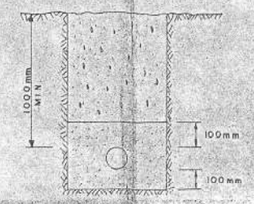
drawing no: 11712-1-01
sht 1 of 1
rev: 3

NOTES:

1. CONCRETE TO BE 15 MPA AT 28 DAYS MINIMUM.
2. BLOCKING SHOULD BE KEPT CLEAR OF BELLS ON BEND.
3. CONCRETE TO BE CURED A MINIMUM OF 48 HOURS PRIOR TO CHARGING THE LINE.
4. CONCRETE THRUST BLOCKS SHALL EXTEND INTO THE VERTICAL FACE OF UNDISTURBED SOIL.



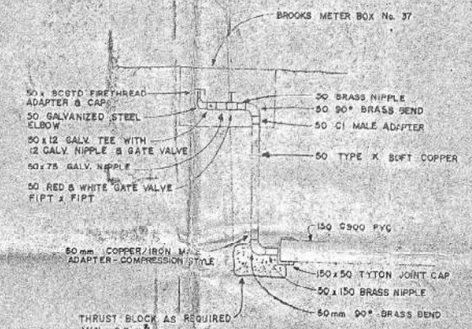
THRUST BLOCK DETAIL
FOR 45° BEND
N.T.S.



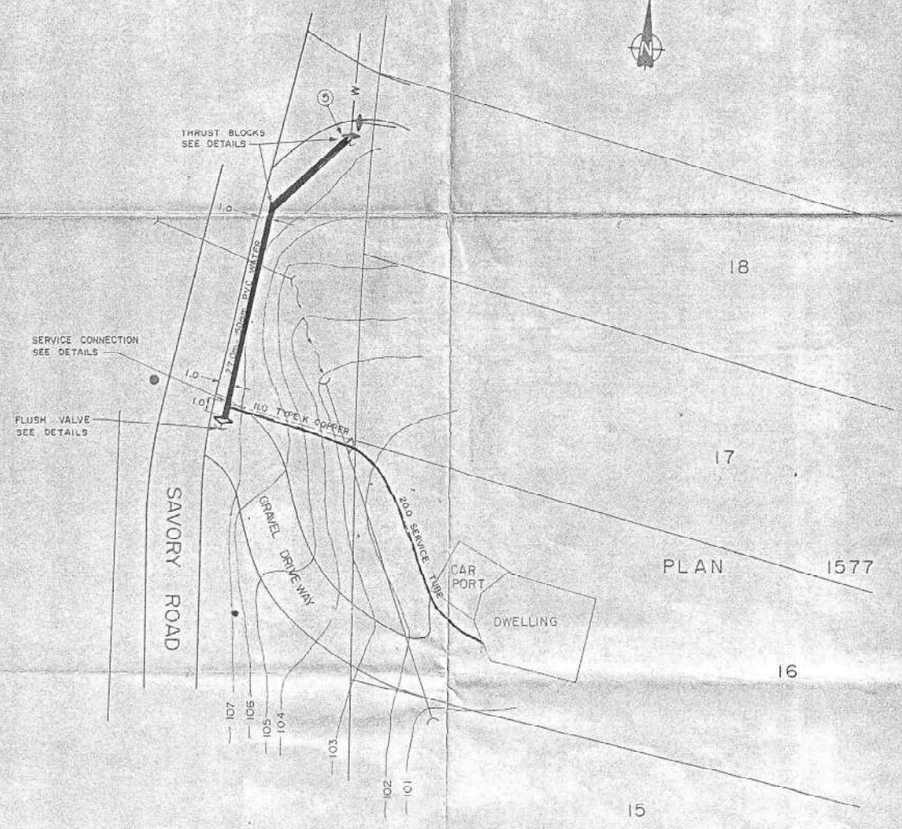
NOTES:

1. PIPE BEDDING TO BE [illegible] COMPACTED IN 0.15M LIFTS AND COMPACTION TO BE DONE FIRST 0.3 ABOVE PIPE.
2. TRENCH BACKFILL TO BE [illegible] PIPE BOTTOM [illegible]

TRENCH DETAIL
N.T.S.

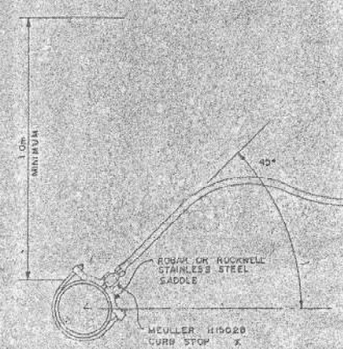


FLUSH VALVE ASSEMBLY
N.T.S.

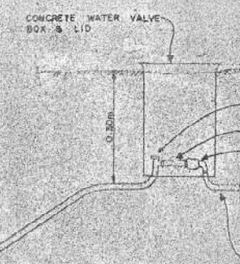


NOTES:

1. WATERMAIN TO BE 150mm PVC [illegible] PRESSURE [illegible].
2. ALL MATERIAL USED MUST BE [illegible] BY THE PROPERTY RECORD WATER DISTRICT (G.V.W.D.).
3. ALL CONSTRUCTION TO BE IN ACCORDANCE WITH G.V.W.D. STANDARD PRACTICES.
4. G.V.W.D. IS TO BE NOTIFIED [illegible] PRIOR TO CONSTRUCTION.
5. DISCONNECT THE EXISTING [illegible] VALVE ASSEMBLY AND REUSE AS POSSIBLE.
6. THE MAIN CULVERT CROSSING IS TO HAVE A MINIMUM OF 0.3M CLEARANCE OR THAT SECTION OF MAIN IS TO BE REPLACED WITH DUCTILE IRON.
7. CONTRACTOR IS TO ENSURE THAT THERE ARE NO CROSS-CONNECTIONS IN THE HOUSE PLUMBING, BETWEEN POTABLE SOURCES AND G.V.W.D. SUPPLY.
8. CONTRACTOR IS TO HAVE THE HOUSE PLUMBING CLEANED OF [illegible] PRIOR TO CONNECTION.
9. IF THE TREVOR SIDEWALK ADJACENT AND BELOW THE LOGGER IS LOOSE, A MINIMUM OF 0.3M OF BASE [illegible] REQUIRED.



WATER SERVICE DETAIL
N.T.S.



X OR APPROVED EQUIVALENT

NOTES

1. THE VALVE ASSEMBLY AND CONCRETE WATER BOX ARE TO BE INSTALLED AT THE PROPERTY LINE.

No.	DATE	REVISION	ENGR.	No.	DATE	REVISION	ENGR.
1	DEC. 89	LOCATION OF WATER LINE					

NOTES

ENGINEER

DESIGN: MWM
DRAWN: RER
TRACED:
CHECKED: JESP
DATE: SEPT. 27, 1988
SCALE: 1:250

CLIENT: MR. R. RAYNER

PROJECT: Florence Lake Improvement District
SAVORY ROAD WATERWORKS
Florence Lake Improvement District
Savory Road, R.R. 6 Victoria, B.C.

TITLE: WATERMAIN EXTENSION
Florence Lake Improvement District
Savory Road, R.R. 6 Victoria, B.C.

DUNCAN & ASSOCIATES ENGINEERING LTD

DRAWING No. V-1248-01-100
REV.

colquitz engineering

Appendix B

1978 POLYETHYLENE PIPE BROCHURE

general information 2

Sclairpipe® Polyethylene Pipe

General Catalogue and Specifications

1. Introduction

Sclairpipe® high-density polyethylene pipe, marketed by Du Pont Canada Inc., allows freedom in the design and construction of engineered piping systems. It is a versatile pipe material with exceptional flexibility and durability.

Sclairpipe® is manufactured from Sclair® polyethylene resin, developed and produced by Du Pont Canada at its St. Clair River Works in Sarnia, Ontario. The molecular structure is carefully controlled so that the material possesses an optimum balance of physical and processing properties. This ensures that Sclairpipe® will meet or exceed all short and long term requirements of the appropriate specifications.

2. Material Specification

The physical properties of the Sclair® polyethylene resin used in the manufacture of Sclairpipe® are given in Table I. According to the current issue of ASTM D 1248 "PE Plastics Molding and Extrusion Materials", Sclairpipe® would be defined as Type III, Class C, Category 5, Grade P34 polyethylene material.

According to the latest issue of Canadian General Standards Board standard CGSB 41-GP-25M, "Pipe, PE, for the Transport of Liquids" only one level of hydrostatic design basis is recognized, namely 10 MPa. Sclairpipe® meets this standard and is designated PE 3510; identified as follows — Type 3, Category 5, Design Basis 10 MPa.

3. Product Information

Sclairpipe® is supplied in a complete range of both hard metric and iron pipe sizes, with up to nine (9) possible series of pipe weights from which to choose. In the metric size range, sizes from 90 mm (3.54″) to 1200 mm (47.24″) nominal diameter are available, and in the iron pipe size range, sizes from 27 mm (¾″ IPS) to 219 mm (8″ IPS) nominal diameter are available.

For dimensions of Sclairpipe®, see Tables II and III for metric pipe and Tables IV and V for iron pipe size pipe, in both SI units and Imperial units.

The maximum recommended operating pressure for use with water at 23°C (73°F) is given by the 'series number' in pounds per square inch gauge (psig), based on a useful life of approximately 50 years. The dimension tables indicate the equivalent 'nominal series number' and 'actual series number', in kilopascals (kPa).

The standard stocked length is 12 metres (39.4 feet), with 15 metres (49.2 feet) and 20 metres (65.6 feet) available on special order. Coiled pipe is available in 100 metre (328 feet) lengths. See Table VI for details on coiled pipe.

4. Fittings

For a description of fittings available for use with Sclairpipe®, see "General Information 4 — Fittings Catalogue".

5. Joining Equipment

Equipment is available from Du Pont for joining small-diameter pipe by socket fusion, and larger diameter pipe by butt fusion. For a description of the joining equipment available for use with Sclairpipe®, see details outlined in Table VII.

6. General Specification for Polyethylene Pipe

Table VIII contains a general specification for use by Consulting Engineers in describing polyethylene pipe for engineered systems. This proposed specification describes the design and properties of pipe made from polyethylene, and the joining system(s) to be used in connecting the pipe to itself, to auxiliary equipment and to other piping systems.

TABLE I

TYPICAL PROPERTIES OF SCLAIRPIPE® POLYETHYLENE PIPE

PROPERTY	ASTM TEST METHOD	UNITS	VALUE
Compound Density	D 1505	g/cm^3	0.952
Melt Index	D 1238	dg/min	0.25
Tensile Yield	D 1248 (D 638-72)	MPa (psi)	
2″/minute			21 (3,000)
20″/minute			26 (3,750)
Elongation at Break	D 1248	%	
2″/minute			1,050
20″/minute			500
Flexural Stiffness (Secant Modulus at 1% Strain)	D 747	MPa (psi)	655 (95,000)
Hardness	D 1706	Shore D	D 62
Environmental Stress Crack Resistance	D 1693-70 (Condition C)	h/F_{20}	>192
Low Temperature Brittleness Point	D 746	°C	−70
Coefficient of Thermal Expansion/Contraction	—	mm/mm•°C (in/in-°F)	1.62×10^{-4} (9×10^{-5})
Thermal Conductivity	C-177	W/m•°C	0.361
		(BTU-in/ft²-hr-°F)	(2.5)
		(BTU/ft-hr-°F)	(0.208)

This sheet supersedes Table I coded SC-547, published August 1978

TABLE II — IMPERIAL UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE

METRIC PIPE

All dimensions in inches

Nominal Pipe Size	Average Outside Diameter	SERIES 45			SERIES 60			SERIES 80			SERIES 100			SERIES 125			SERIES 160			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	
3 (90)	3.58	—	—	—	3.28	0.141	0.7	3.18	0.185	0.8	3.09	0.228	1.0	2.98	0.281	1.3	2.83	0.352	1.5	3 (90)
4 (110)	4.37	—	—	—	4.00	0.172	1.0	3.89	0.226	1.3	3.77	0.279	1.5	3.64	0.343	1.9	3.46	0.430	2.3	4 (110)
6 (160)	6.36	5.95	0.189	1.6	5.82	0.250	2.1	5.66	0.329	2.7	5.50	0.406	3.3	5.30	0.500	4.0	5.04	0.626	4.9	6 (160)
8 (200)	7.93	7.43	0.237	2.5	7.27	0.313	3.3	7.06	0.411	4.2	6.86	0.508	5.1	6.61	0.625	6.2	6.28	0.782	7.6	8 (200)
10 (250)	9.90	9.27	0.296	3.9	9.07	0.391	5.1	8.81	0.514	6.6	8.56	0.635	8.0	8.25	0.781	9.7	7.84	0.978	11.8	10 (250)
11 (280)	11.08	10.38	0.332	4.9	10.15	0.438	6.4	9.86	0.576	8.2	9.58	0.711	10.0	9.24	0.874	12.1	8.77	1.095	14.8	11 (280)
12 (315)	12.46	11.67	0.373	6.1	11.42	0.492	8.0	11.09	0.648	10.4	10.77	0.800	12.6	10.39	0.984	15.3	9.86	1.232	18.7	12 (315)
14 (355)	14.03	13.14	0.420	7.8	12.86	0.555	10.2	12.49	0.730	13.2	12.13	0.901	16.1	11.70	1.109	19.4	11.11	1.388	23.7	14 (355)
16 (400)	15.83	14.80	0.474	10.1	14.47	0.625	13.2	14.05	0.823	17.2	13.63	1.015	20.8	13.13	1.249	25.2	12.45	1.564	30.8	16 (400)
18 (450)	17.79	16.64	0.533	12.8	16.27	0.704	16.7	15.80	0.926	21.7	15.33	1.142	26.4	(14.76	1.405	(31.8)	—	—	—	18 (450)
20 (500)	19.76	18.48	0.592	15.8	18.07	0.782	20.6	17.54	1.029	26.7	17.03	1.269	32.5	(16.40	1.561	(39.3)	—	—	—	20 (500)
22 (560)	22.13	20.69	0.663	19.8	20.23	0.875	25.9	19.64	1.152	33.5	19.06	1.421	40.7	—	—	—	—	—	—	22 (560)
24 (630)	24.88	23.27	0.746	25.1	22.76	0.985	32.7	22.09	1.296	42.4	21.43	1.599	51.6	—	—	—	—	—	—	24 (630)
28 (710)	28.03	26.21	0.841	31.8	25.64	1.110	41.5	24.88	1.461	53.8	(24.15	1.802	(65.4)	—	—	—	—	—	—	28 (710)
32 (800)	31.59	29.55	0.947	40.4	28.90	1.251	52.7	(28.05	1.646	68.3	—	—	—	—	—	—	—	—	—	32 (800)
36 (900)	35.53	33.23	1.066	51.1	32.50	1.407	66.6	(31.54	1.852	86.4	—	—	—	—	—	—	—	—	—	36 (900)
40 (1000)	39.47	36.91	1.184	63.0	(36.10	1.563	(82.2)	—	—	—	—	—	—	—	—	—	—	—	—	40 (1000)
48 (1200)	47.38	44.32	1.421	90.7	(43.34	1.876	(118.4)	—	—	—	—	—	—	—	—	—	—	—	—	48 (1200)
Dimensional Ratio $\left(\frac{Do}{t} - 1\right)$:		32			24			18			14			12			9			

NOTES:

1) Reference Specification: Canadian CGSB 41-GP-25 M
2) Design Stress 725 psi (5 MPa).
3) Sizes in brackets are available on special order only.
4) Series number represents the recommended operating pressure in p.s.i.g. for use with water at 73° F (23° C).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
45	315	310
60	400	414
80	560	551
100	710	689
125	900	862
160	1100	1103

TABLE II — SI UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE

METRIC PIPE

All dimensions in millimetres

Nominal Pipe Size	Average Outside Diameter	SERIES 45			SERIES 60			SERIES 80			SERIES 100			SERIES 125			SERIES 160			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	
90	91	—	—	—	83.3	3.6	1.0	80.9	4.7	1.3	78.6	5.8	1.6	75.8	7.1	1.9	72.0	8.9	2.3	90
110	111	—	—	—	101.6	4.4	1.5	98.7	5.7	1.9	95.9	7.1	2.3	92.5	8.7	2.8	87.8	10.9	3.4	110
160	161.5	151.2	4.8	2.4	147.9	6.3	3.1	143.7	8.4	4.0	139.6	10.3	4.9	134.6	12.7	5.9	127.9	15.9	7.2	160
200	201.5	188.7	6.0	3.7	184.6	7.9	4.8	179.3	10.4	6.3	174.2	12.9	7.6	168.0	15.9	9.2	159.6	19.9	11.3	200
250	251.5	235.5	7.5	5.8	230.4	9.9	7.5	223.9	13.1	9.8	217.4	16.1	11.9	209.6	19.8	14.4	199.1	24.8	17.6	250
280	281.5	263.6	8.4	7.3	257.9	11.1	9.5	250.6	14.6	12.3	243.4	18.0	14.9	234.6	22.2	18.0	222.9	27.8	22.0	280
315	316.5	296.4	9.5	9.2	290.0	12.5	12.0	281.7	16.5	15.5	273.6	20.3	18.8	263.8	25.0	22.8	250.6	31.3	27.8	315
355	356.5	333.9	10.7	11.6	326.7	14.1	15.2	317.3	18.5	19.6	308.2	22.9	23.9	297.2	28.2	28.9	282.2	35.3	35.3	355
400	402	375.9	12.0	15.1	367.6	15.9	19.7	356.8	20.9	25.5	346.3	25.8	31.0	333.6	31.7	37.5	316.4	39.7	45.8	400
450	452	422.7	13.5	19.1	413.4	17.9	24.9	401.2	23.5	32.3	389.4	29.0	39.2	(375.0	35.7	47.4)	—	—	—	450
500	502	469.4	15.0	23.5	459.1	19.8	30.7	445.6	26.1	39.8	432.5	32.2	48.4	(416.5	39.7	58.5)	—	—	—	500
560	562	525.6	16.8	29.5	514.0	22.2	38.5	498.9	29.3	49.9	484.2	36.1	60.7	—	—	—	—	—	—	560
630	632	591.0	18.9	37.3	578.0	25.0	48.7	561.0	32.9	63.1	544.4	40.6	76.7	—	—	—	—	—	—	630
710	702	665.9	21.4	47.3	651.2	28.2	61.8	632.0	37.1	80.1	(613.4	45.8	97.4)	—	—	—	—	—	—	710
800	802.5	750.5	24.1	60.1	734.0	31.8	78.4	(712.4	41.8	101.7)	—	—	—	—	—	—	—	—	—	800
900	902.5	844.1	27.1	76.0	825.4	35.7	99.2	(801.2	47.0	128.6)	—	—	—	—	—	—	—	—	—	900
1000	1002.5	937.6	30.1	93.8	(916.9	39.7	122.4)	—	—	—	—	—	—	—	—	—	—	—	—	1000
1200	1203.5	1125.7	36.1	135.0	(1100.8	47.6	176.2)	—	—	—	—	—	—	—	—	—	—	—	—	1200
Dimensional Ratio $\left(\frac{Do}{t} - 1\right)$:		32			24			18			14			12			9			

NOTES:

1) Reference Specification: Canadian CGSB 41-GP-25 M
2) Design stress 5 MPa (725 psi).
3) Sizes in brackets are available on special order only.
4) Series number represents the recommended operating pressure in p.s.i.g. for use with water at 23° C (73° F).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
45	315	310
60	400	414
80	560	551
100	710	689
125	900	862
160	1100	1103

This sheet supersedes Table II coded SC-548, published August 1978

November 1980 SC-802

TABLE III — SI UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE, SPECIAL SERIES

METRIC PIPE — Available on special order

All dimensions in millimetres

Nominal Pipe Size	Average Outside Diameter	SERIES 36			SERIES 145			SERIES 200			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	
90	91	—	—	—	73.6	8.2	2.1	67.9	10.9	2.7	90
110	111	—	—	—	89.8	10.0	3.2	82.8	13.3	4.1	110
160	161.5	—	—	—	130.8	14.5	6.7	120.6	19.4	8.6	160
200	201.5	—	—	—	163.1	18.2	10.4	150.4	24.2	13.4	200
250	251.5	238.6	6.0	4.7	203.6	22.7	16.2	187.7	30.3	20.9	250
280	281.5	267.1	6.8	5.9	227.9	25.4	20.3	210.1	33.9	26.2	280
315	316.5	300.3	7.6	7.4	256.2	28.6	25.7	(236.1	38.2	33.1)	315
355	356.5	338.2	8.6	9.4	288.6	32.2	32.6	—	—	—	355
400	402	381.0	9.7	12.3	323.6	36.3	42.3	—	—	—	400
450	452	428.4	10.9	15.5	—	—	—	—	—	—	450
500	502	475.8	12.1	19.1	—	—	—	—	—	—	500
560	562	532.6	13.5	23.9	—	—	—	—	—	—	560
630	632	599.0	15.2	30.3	—	—	—	—	—	—	630
710	712	674.8	17.2	38.4	—	—	—	—	—	—	710
800	802.5	760.6	19.4	48.7	—	—	—	—	—	—	800
900	902.5	855.4	21.8	61.6	—	—	—	—	—	—	900
1000	1002.5	950.2	24.2	76.0	—	—	—	—	—	—	1000
1200	1203.5	1140.8	29.0	109.4	—	—	—	—	—	—	1200
Dimensional Ratio $\left(\frac{Do}{t} - 1\right)$:		40			10			7			

NOTES:

1) Reference Specification: Canadian CGSB 41-GP-25 M
2) Design Stress 5 MPa (725 psi).
3) Series number represents the recommended operating pressure in p.s.i.g. for use with water at 23° C (73° F).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
36	250	248
145	1000	1000
200	1370	1379

This sheet supersedes Table III coded SC-549, published August 1978

November 1980 SC-803

TABLE III — IMPERIAL UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE, SPECIAL SERIES

METRIC PIPE — Available on special order

All dimensions in inches

Nominal Pipe Size	Average Outside Diameter	SERIES 36			SERIES 145			SERIES 200			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	
3 (90)	3.58	—	—	—	2.90	0.322	1.4	2.67	0.429	1.8	3 (90)
4 (110)	4.37	—	—	—	3.53	0.393	2.1	3.26	0.525	2.7	4 (110)
6 (160)	6.36	—	—	—	5.15	0.572	4.5	4.75	0.763	5.8	6 (160)
8 (200)	7.93	—	—	—	6.42	0.715	7.0	5.92	0.954	9.0	8 (200)
10 (250)	9.90	9.39	0.238	3.2	8.01	0.894	10.9	7.39	1.192	14.0	10 (250)
11 (280)	11.08	10.51	0.267	4.0	8.97	1.002	13.7	8.27	1.335	17.6	11 (280)
12 (315)	12.46	11.82	0.300	5.0	10.09	1.127	17.3	9.30	1.502	22.2	12 (315)
14 (355)	14.03	13.32	0.338	6.3	11.36	1.270	21.9	—	—	—	14 (355)
16 (400)	15.83	15.00	0.381	8.2	12.74	1.431	28.5	—	—	—	16 (400)
18 (450)	17.79	16.86	0.429	10.4	—	—	—	—	—	—	18 (450)
20 (500)	19.76	18.73	0.477	12.8	—	—	—	—	—	—	20 (500)
22 (560)	22.13	20.97	0.534	16.1	—	—	—	—	—	—	22 (560)
24 (630)	24.88	23.58	0.600	20.3	—	—	—	—	—	—	24 (630)
28 (710)	28.03	26.56	0.677	25.8	—	—	—	—	—	—	28 (710)
32 (800)	31.59	29.95	0.763	32.7	—	—	—	—	—	—	32 (800)
36 (900)	35.53	33.68	0.858	41.4	—	—	—	—	—	—	36 (900)
40 (1000)	39.47	37.41	0.953	51.1	—	—	—	—	—	—	40 (1000)
48 (1200)	47.38	44.91	1.144	73.5	—	—	—	—	—	—	48 (1200)
Dimensional Ratio $\left(\frac{Do}{t}-1\right)$:		40			10			7			

NOTES:

1) Reference Specification: Canadian CGSB 41-GP-25 M
2) Design Stress 725 psi (5 MPa)
3) Series number represents the recommended operating pressure in p.s.i.g. for use with water at 73° F (23° C).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
36	250	248
145	1000	1000
200	1370	1379

TABLE IV — SI UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE

IRON PIPE SIZE PIPE & CTS TUBING

All dimensions in millimetres

Nominal Pipe Size	Average Outside Diameter	SERIES 45			SERIES 60			SERIES 80			SERIES 100			SERIES 125			SERIES 160			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	
27 (¾")	26.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19.8	3.0	0.23	27 (¾")
33 (1")	34.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	25.1	3.8	0.4	33 (1")
48 (1½")	48.3	—	—	—	—	—	—	—	—	—	40.4	3.6	0.5	—	—	—	36.3	5.5	0.8	48 (1½")
60 (2")	60.3	—	—	—	—	—	—	—	—	—	50.5	4.5	0.8	—	—	—	45.5	6.8	1.2	60 (2")
89 (3")	88.9	—	—	—	80.0	4.1	1.1	77.2	5.3	1.4	74.4	6.6	1.8	71.4	8.1	2.1	67.0	10.1	2.5	89 (3")
114 (4")	114.3	—	—	—	104.4	4.5	1.6	101.3	6.0	2.1	98.3	7.4	2.5	94.5	9.1	3.1	89.7	11.3	3.8	114 (4")
168 (6")	168.3	157.2	5.0	2.7	153.7	6.7	3.5	149.1	8.8	4.5	144.8	10.8	5.5	139.4	13.4	6.6	132.1	16.7	8.1	168 (6")
219 (8")	219.1	204.7	6.6	4.5	200.1	8.7	5.9	194.3	11.4	7.7	188.5	14.1	9.3	181.3	17.4	11.2	171.9	21.8	13.7	219 (8")

Copper Tube Size (CTS) Tubing

22 (¾")	22.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17.0	2.5	0.15	22 (¾")
29 (1")	28.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21.8	3.2	0.25	29 (1")
Standard Dimension Ratio $SDR = \frac{Do}{t}$																				
– for 4.3 MPa (625 psi)		—			22			16.5			13.5			11			9			
– for 5 MPa (725 psi)		33			25			19			15.5			12.5			10			

NOTES:

1) Reference Specifications: Canadian CSA B 137.1
American ASTM D-3035
2) Design Stress is 4.3 MPa (625 psi) for 27 mm up to and including 89 mm (¾" — 3") and for 22 and 28 mm (¾" and 1" CTS)
Design Stress is 5 MPa (729 psi) for 114, 168 and 219 mm (4", 6" and 8")
3) Series number represents the recommended operating pressure in psig for use with water at 23° C (73° F).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
45	315	310
60	400	414
80	560	551
100	710	689
125	900	862
160	1100	1103

This sheet supersedes Table IV coded SC-550, published August 1978

November 1980 SC-804

TABLE IV — IMPERIAL UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE

IRON PIPE SIZE PIPE & CTS TUBING

All dimensions in inches

Nominal Pipe Size	Average Outside Diameter	SERIES 45			SERIES 60			SERIES 80			SERIES 100			SERIES 125			SERIES 160			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	
¾	1.050	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.78	0.119	0.15	¾
1	1.315	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.99	0.149	0.24	1
1½	1.900	—	—	—	—	—	—	—	—	—	1.59	0.141	0.35	—	—	—	1.43	0.216	0.5	1½
2	2.375	—	—	—	—	—	—	—	—	—	1.99	0.176	0.5	—	—	—	1.79	0.270	0.8	2
3	3.500	—	—	—	3.15	0.160	0.8	3.04	0.210	1.0	2.93	0.259	1.2	2.81	0.318	1.4	2.64	0.397	1.7	3
4	4.500	—	—	—	4.11	0.179	1.1	3.99	0.235	1.4	3.87	0.290	1.7	3.72	0.357	2.1	3.53	0.447	2.5	4
6	6.625	6.19	0.199	1.8	6.05	0.263	2.3	5.87	0.346	3.0	5.70	0.427	3.7	5.49	0.526	4.4	5.20	0.658	5.5	6
8	8.625	8.06	0.260	3.0	7.88	0.343	4.0	7.65	0.451	5.1	7.42	0.556	6.2	7.14	0.684	7.6	6.77	0.857	9.2	8

Copper Tube Size (CTS) Tubing

¾	0.875	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.67	0.097	0.10	¾
1	1.125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.86	0.125	0.17	1
Standard Dimension Ratio $SDR = \frac{Do}{t}$																				
— for 625 psi			—			22			16.5			13.5			11			9		
— for 725 psi			33			25			19			15.5			12.5			10		

NOTES:

1) Reference Specifications: Canadian CSA B 137.1
American ASTM D-3035
2) Design Stress is 625 psi (4.3 MPa) for ¾" up to and inclulding 3" (27 — 89 mm) and for ¾" and 1" CTS (22 — 28 mm)
Design Stress is 725 psi (5.0 MPa) for 4", 6" and 8" (114, 168 and 219 mm)
3) Series number represents the recommended operating pressure in p.s.i.g. for use with water at 73° F (23° C).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
45	315	310
60	400	414
80	560	551
100	710	689
125	900	862
160	1100	1103

TABLE V — SI UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE, SPECIAL SERIES

IRON PIPE SIZE PIPE — Available on special order

All dimensions in millimetres

Nominal Pipe Size	Average Outside Diameter	SERIES 145			SERIES 200			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (kg/m)	
27 (¾")	26.7	—	—	—	—	—	—	27 (¾")
33 (1")	34.4	—	—	—	—	—	—	33 (1")
48 (1½")	48.3	37.3	5.0	0.7	—	—	—	48 (1½")
60 (2")	60.3	46.7	6.3	1.1	—	—	—	60 (2")
89 (3")	88.9	68.8	9.2	2.3	62.2	12.3	3.0	89 (3")
114 (4")	114.3	91.7	10.4	3.4	84.3	13.8	4.4	114 (4")
168 (6")	168.3	135.1	15.3	7.5	124.2	20.4	9.6	168 (6")
219 (8")	219.1	176.0	19.9	12.7	161.8	26.5	16.3	219 (8")
Standard Dimension Ratio $SDR = \frac{Do}{t}$								
– for 4.3 MPa (625 psi)			9.5			7		
– for 5 MPa (725 psi)			11			8		

NOTES:

1) References Specifications: Canadian CSA B 137.1
American ASTM D-3035
2) Design Stress is 4.3 MPa (625 psi) for 27 mm up to and including 89 mm (¾" — 3") and for 22 and 28 mm (¾" and 1" CTS)
Design Stress is 5 MPa (729 psi) for 114, 168 and 219 mm (4", 6" and 8")
3) 89 and 114 mm (3" and 4") Series 200 are not intended for socket fusion.
4) Series number represents the recommended operating pressure in psig for use with water at 23° C (73° F).

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
145	1000	1000
200	1370	1379

This sheet supersedes Table V coded SC-551, published August 1978

November 1980 SC-805

TABLE V — IMPERIAL UNITS

DIMENSIONS OF SCLAIRPIPE® POLYETHYLENE PIPE

IRON PIPE SIZE PIPE — Available on special order

All dimensions in inches

Nominal Pipe Size	Average Outside Diameter	SERIES 145			SERIES 200			Nominal Pipe Size
		Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lb/ft)	
¾	1.050	—	—	—	—	—	—	¾
1	1.315	—	—	—	—	—	—	1
1½	1.900	1.47	0.197	0.46	—	—	—	1½
2	2.375	1.84	0.247	0.7	—	—	—	2
3	3.500	2.71	0.364	1.6	2.45	0.483	2.0	3
4	4.500	3.61	0.409	2.3	3.32	0.545	3.0	4
6	6.625	5.32	0.602	5.0	4.89	0.803	6.5	6
8	8.625	6.93	0.784	8.5	6.37	1.045	10.9	8
Standard Dimension Ratio $SDR = \frac{Do}{t}$								
– for 625 psi			9.5			7		
– for 725 psi			11			8		

NOTES:

1) Reference Specifications: Canadian CSA B 137.1
   American ASTM D-3035
2) Design Stress is 625 psi (4.3 MPa) for ¾" up to and including 3" (27 — 89 mm) and for ¾" and 1" CTS (22 — 28 mm)
   Design Stress is 725 psi (5.0 MPa) for 4", 6" and 8" (114, 168 and 219 mm)
3) 3" and 4" (89 and 114 mm) Series 200 are not intended for socket fusion
4) Series number represents the recommended operating pressure in p.s.i.g. for use with water at 73° F (23° C)

Series No. (psig)	Nominal Series No. (kPa)	Actual Ser. No. (kPa)
145	1000	1000
200	1370	1379

TABLE VI — SI UNITS

PACKAGING OF COILED SCLAIRPIPE®

All dimensions in millimetres

Nominal Size	Metres Per Coil	Avg. Coil Wt (kg)		Coil Dimensions (mm)			Non-Ret. Wooden Pallets		Cartons
		Series 100	Series 160	I.D.	O.D.	Width	Size (m)	Approx. Wt (kg)	Size (m)
¾"	100	—	23	610	1016	190	1.0 x 1.0	29	1.0 x 1.0
1"	100	—	36	711	1118	229	1.1 x 1.1	32	None
1½"	100	52	77	1397	1880	203	1.9 x 1.9	91	None
2"	100	82	118	1448	1905	381			

COPPER TUBE SIZES (CTS)

¾"	100	—	15	762	1016	152	1.0 x 1.0	29	1.0 x 1.0
1"	100	—	25			203			

This sheet supersedes Table VI coded SC-552, published August 1978

TABLE VI — IMPERIAL UNITS

PACKAGING OF COILED SCLAIRPIPE®

All dimensions in inches

Nominal Size (IPS)	Feet Per Coil	Average Coil Weight (lbs.)		Coil Dimensions (in.)			Non-Returnable Wooden Pallets		Cartons
		Series 100	Series 160	I.D.	O.D.	Width	Size (in.)	Approx. Weight (lbs.)	Size (in.)
¾"	328	—	51	24	40	7.5	40 x 40	65	40 x 40
1"	328	—	80	28	44	9	44 x 44	70	None
1½"	328	115	170	55	74	8	76 x 76	200	None
2"	328	180	260	57	75	15			

COPPER TUBE SIZES (CTS)

¾"	328	—	33	30	40	6	40 x 40	65	40 x 40
1"	328	—	55			8			

Appendix C

COST ESTIMATE

Class C Cost Estimate

Description:

Capital cost estimate for the proposed scope of work that would allow for takeover of the FLID water system.
The cost estimate excludes legal or administrative costs associated with the dissolution of the FLID.
Class C cost estimate as defined in the *Budget Guidelines for Consulting Engineering Services, CEBC and APEGBC, 2009* .

Item	Description	Unit	Quantity	Rate	TOTAL COST $
1	**Engineering**				
1.01	Topographic survey	Lump Sum	1	3,000	$ 3,000
1.02	Detailed design and approvals	Lump Sum	1	15,000	$ 15,000
1.03	Notification (Water Act) for removal of concrete encasement, sediment control plan, monitoring	Lump Sum	1	3,000	$ 3,000
1.04	Inspection and contract administration	Lump Sum	1	15,000	$ 15,000
1.05	Record drawings	Lump Sum	1	2,500	$ 2,500
	Subtotal for Task				**$ 38,500**
2	**General**				
2.01	Bonding and Insurance	Lump Sum	1	2.00%	$ 3,608
2.02	Mobilization and Demobilization	Lump Sum	1	2.00%	$ 3,608
2.03	Layout and Survey Control	Lump Sum	1	2,000.00	$ 2,000
	Subtotal for Task				**$ 9,216**
3	**Waterworks**				
3.01	200mm watermain	Lineal Meters	80	1,000.00	$ 80,000
3.02	Trench Rock (1/2 of excavation)	Cubic Meters	20	500.00	$ 10,000
3.03	Fire hydrant assembly and line valve	Each	1	12,000.00	$ 12,000
3.04	Flush assembly	Each	1	5,000.00	$ 5,000
3.05	Replace meter box and lid	Each	2	500.00	$ 1,000
3.06	Replace meter box lid	Each	2	200.00	$ 400
3.07	Install water meters (CRD)	Each	15	800.00	$ 12,000
3.08	Connect new watermain to existing CRD main (CRD)	Lump Sum	1	14,000.00	$ 14,000
3.09	Remove existing meter box and close existing service (CRD)	Lump Sum	1	6,000.00	$ 6,000
3.10	Removal of concrete encasement over existing water supply main (east shore of Florence Lake)	Lump Sum	1	5,000.00	$ 5,000
3.11	Remove existing water reservoir and booster pump station, and removal of existing tee.	Lump Sum	1	5,000.00	$ 5,000
3.12	Leakage test of existing watermain and leak repair contingency	Lump Sum	1	10,000.00	$ 10,000
3.13	Pigging of existing watermain	Lump Sum	1	20,000.00	$ 20,000
	Subtotal for Task				**$ 180,400**
	Tasks Subtotal				**$ 228,116**
	CRD Administration and Operations				**$ 15,000**
	Contingency	25%			**$ 57,029**
	Subtotal				**$ 72,029**
	TOTAL AMOUNT ROUNDED (excluding GST)				**$ 300,000**

This opinion of probable cost has been based on items shown on the current drawing set and reflects an estimate of the expected low tender price. As such, a suitable contingency should be added for use for other purposes. The unit prices reflect Colquitz Engineering's recent experience with similar work, and therefore represent the best prediction of actual costs as of the date prepared. Actual tendered costs will depend on such things as market conditions generally, competitiveness of the tendering process, the time of year, contractors' work loads, any perceived risk exposure associated with the work, and unknown conditions.

COLQUITZ ENGINEERING LTD.

Appendix D

CORRESPONDENCE WITH THE MINISTRY REGARDING THE SUPPLY MAIN

From: Donnelly, Nick FLNR:EX <Nick.Donnelly@gov.bc.ca>
Date: Thu, Jan 31, 2019 at 3:47 PM
Subject: RE: Florence Lake Improvement District - Waterline Under Florence Lake
To: Jeff Howard <jeff.howard@colquitz.ca>

Hi Jeff,

As discussed, it is currently the opinion of West Coast Authorizations – Lands that the concrete at the shore of Florence Lake must be removed. However, the line itself, if as described (submerged in the sediment at the bottom of the lake) may be abandoned in place, provided it poses no hazard to swimmers or boaters.

Prior to any activities, you will be required to provide, at minimum, a workplan which addresses impacts to habitat and mitigation measures, and proof of insurance, to be reviewed and approved by this office.

As David Robinson mentioned, additional application for the in-stream (lake) works can be made through the FrontCounter BC website: https://portal.nrs.gov.bc.ca/web/client/-/change-approval-for-work-in-and-about-a-stream

Feel free to contact me if you have any further questions.

Regards,

Nick Donnelly
Sr. Authorizations Officer, West Coast Region Authorizations
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Suite 142 - 2080 Labieux Road
Nanaimo, BC V9T 6J9
Ph: (250) 751-7239

From: Jeff Howard [mailto:jeff.howard@colquitz.ca]
Sent: Thursday, January 24, 2019 1:41 PM
To: Donnelly, Nick FLNR:EX
Cc: Robinson, David FLNR:EX
Subject: Re: Florence Lake Improvement District - Waterline Under Florence Lake

Hi Nick:

Please let me know if there is anything I can do to help you in determining if the existing line can be abandoned in place or if it has to be removed.

Thanks,

Jeff

Jeff Howard, P.Eng. | Founder / Water Resources Engineer

colquitz.ca

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Victoria, BC V8Z 6N6
Office: (778) 749-1114
Cell: (250) 634-8693

On Tue, Jan 8, 2019 at 3:13 PM Jeff Howard <jeff.howard@colquitz.ca> wrote:
Hi David:

Thank you.

Nick: It is my understanding that the waterline is on Crown Land. Do you have anything to add to what David has said?

Thanks,

Jeff

Jeff Howard, P.Eng. | Founder / Water Resources Engineer

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On Tue, Jan 8, 2019 at 1:59 PM Robinson, David FLNR:EX <David.Robinson@gov.bc.ca> wrote:
Hi Jeff,

Further to our phone discussion yesterday, I can confirm that Florence Lake Improvement District (FLID) does not hold any current water licences, nor do we have any record of them holding a water authorization, that would include the water works that cross Florence Lake. There are several active domestic water licensees within the FLID boundaries, but these are individual authorization holders that draw water directly from the lake to their lots. I have also been unable to locate any record of a change approval that may have been issued, either in 1976 or 1993, that would have provided the authority to make changes in and about the lake.

Section 29 (3) of the *Water Sustainability Act* (WSA) sets out the rights and responsibilities of authorization or change approval holders, including former holders, and includes the potential provision for works to be deactivated or decommissioned:

3) When an authorization, change approval or permit that authorizes the construction or use of works is abandoned, cancelled or expires, the holder or former holder, as applicable, of the authorization, change approval or permit must ensure that the works are deactivated or decommissioned in accordance with the regulations and orders.

Since I am unable to establish a link between the submerged water works and any past or present water licence or change approval, I have concluded that I cannot impose any decommissioning requirements per the WSA. I will defer to Nick to advise if there are any *Land Act* considerations at play, assuming that the works are resting on Crown Land at the bottom of the lake. Should FLID or the CRD opt to remove or decommission any of the existing in-stream (lake) works, application can be made through the FrontCounter BC website:

https://portal.nrs.gov.bc.ca/web/client/-/change-approval-for-work-in-and-about-a-stream

Please let me know if you have any further questions.

Regards,

David Robinson
Senior Authorizations Specialist – Water
West Coast Region
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Phone: 250-751-7028

From: Donnelly, Nick FLNR:EX
Sent: Monday, December 24, 2018 11:12 AM
To: Robinson, David FLNR:EX
Subject: FW: Florence Lake Improvement District - Waterline Under Florence Lake

Hi Dave,
I believe this issue below may be the responsibility of your team. I had been researching the area discussed below and I could not find any land act tenure associated with it. I understand that these type of water works may have been authorized under the water act.

Can you please review the email and let me know if it's something that your shop would handle, and if there are any associated water tenures on file for it?

Thanks,

Nick Donnelly
Sr. Authorizations Officer, West Coast Region Authorizations
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Suite 142 - 2080 Labieux Road
Nanaimo, BC V9T 6J9
Ph: (250) 751-7239

From: Jeff Howard [mailto:jeff.howard@colquitz.ca]
Sent: Tuesday, December 4, 2018 3:38 PM
To: Donnelly, Nick FLNR:EX
Subject: Florence Lake Improvement District - Waterline Under Florence Lake

Hi Nick:

As discussed, we are preparing a study for the Florence Lake Improvement District (FLID) outlining the works required to dissolve the FLID.

The FLID is on the west side of Florence Lake and was established in 1975. The FLID currently gets their water from a CRD connection on the east side of the lake. This work was originally installed in 1976 when water was not available on the west side of the lake. Now that there is water on the west side of the lake, the watermain under the lake will not be required if the FLID connects to the CRD system on the west side.

We are trying to determine the scope of work and an estimated cost for the FLID. From our discussions with the CRD, it is not clear if the existing watermain under the lake is to be removed or if it can be abandoned.

The attached drawings illustrates the original watermain under the lake. This line have since been replaced (around the year 1993) with a 50 mm diameter polyethylene waterline. We do now have details of the installation but through discussions with FLID members involved with the construction of the water works, we understand that the watermain is attached to a rope/cable which is anchored to the bottom with concrete approximately every 3 m. The FLID member believes the waterline will be submerged in the sediment at the bottom of the lake.

At the east side of the lake, a portion of the supply main is encased in concrete below the lake water surface. You can see the concrete in the attached photo. FLID stated during our field visit that the concrete does not go past the lake grass shown in the photo.

Assuming the FLID can connect to the CRD system on the west side of the lake and the existing watermain under the lake will not be required, can you please tell us if the existing watermain can be abandoned in place or if it has to be removed?

Thanks,

Jeff

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