LAKE COUNTRY

Life. The Okanagan Way.

1577.0063.01

WARNING NOTICE - The District of Lake Country has been made aware of potential fire safety hazards due to old water distribution infrastructure that does not meet current fire standards in certain older neighbourhoods that were amalgamated with the District. The District is undergoing a review of the required repairs to bring all water distribution systems up to standard. The District has posted more information regarding the location of potential risk areas, as well as the District's efforts to address these hazards at lakecountry.bc.ca.

Small Diameter Watermains

URBAN systems

Business Reg. #: 105465988
304 - 1353 Ellis Street, Kelowna,
BC V1Y 1Z9 | T: 250.762.2517

Contact: Steve Brubacher
sbrubacher@urbansystems.ca

urbansystems.ca

March 2016

Table of Contents

Appendices

URBAN systems

1 Introduction

The purpose of this report is to identify existing watermains and pressure reducing valve (PRV) stations that do not meet fire protection requirements as set out by the District of Lake Country (District) and to identify and prioritize upgrades to address these deficiencies.

Urban Systems Ltd. (Urban) met with the District to confirm design constraints, review pipe failure history and inspect proposed alignments to determine preferred upgrade concepts. The criteria and methodology used to identify deficient areas is outlined in Sections 2. The deficient areas are identified in Appendix B. Proposed upgrades and estimated costs are identified in Section 4. The proposed works are summarized and prioritized in Section 5 of the report.

2 Design Criteria and Methodology

The District identified six areas within the water system as identified in **Appendix A** that were to be reviewed for this project. The key design criteria used for this project are listed below:

- Minimum available fire flow of 5,000 L/min must be provided in all areas with the exception of two areas listed below where a minimum fire flow of 10,000 L/min is required;
  - Oyama Road (between Pelmewash Parkway and Sawmill Road Booster Station
  - OK Centre Area, downstream of existing 6th Street PRV Station
- Fire flow demands are to be added to Maximum Day Demands (MDD);
- Minimum residual pressure under fire flow conditions is 140 kPa; and,
- Maximum velocity in pipes under MDD plus fire flow conditions shall not exceed 4 m/s.

In addition to the above criteria, the District provided mark-ups of other pipes and fire hydrants that are to be replaced because of age, capacity, material or likelihood of failure. These pipes are included in the proposed upgrades identified in subsequent sections of this report.

The District's Subdivision and Development Bylaw requires new subdivisions provide a minimum of 3,600 L/min unless additional flow is required per Fire Underwriter's Survey (FUS) Guidelines.

It should be noted that a detailed assessment was not completed to confirm that the 5,000 L/min and 10,000 L/min fire flows meet the Fire Underwriter's Survey recommendations for all existing land uses. Rather this value was arrived at through direction from the District based on balancing risk with costs.

Existing fire hydrant spacing was reviewed to ensure that the maximum distance between hydrants did not exceed 180 meters.

Urban used the above design criteria and the future conditions (2032) hydraulic water model to identify deficiencies in the existing available fire flow and required upgrades to address these deficiencies.

3 Results

Appendix B identifies areas where existing available fire flow is deficient. The next section of the report identifies upgrades to address these deficient areas.

4 Proposed Upgrades

Eleven (11) upgrades are proposed to address existing fire flow deficiencies. A summary of each project is identified in this section along with the estimated cost. Detailed cost estimates are provided in **Appendix F**. Miscellaneous upgrades to address concerns the District has with the water system are also identified in this section of the report.

4.1 Okanagan Centre Area

The Okanagan Centre Area is currently supplied by the Beaver Lake source. The distribution mains within the review area vary in diameter between 50 mm and 250 mm. Fire flow to the area is limited by the fact that the entire area is fed via a single supply main along Camp and Hare Roads, meaning most of the hydrants in the area are unable to supply a fire flow of more than 2,000 L/min.

The area was previously reviewed by Mould Engineering in their August 2009 report entitled "Okanagan Centre Area Water Supply Review". The report used a maximum required fire flow rate of 5,400 L/min but did not address any offsite impacts east of Hare Road that could restrict flow.

There are four PRV stations within the study area and their capacities and demand are listed in **Table 1** below. The existing capacity of each station is sufficient to provide maximum day demands plus design fire flows.

Table 1: Okanagan Centre PRV Stations Demands vs. Capacities

Station Name	Valve Sizes (mm)	Estimated Demands (L/min)			Required FF (L/min)	Maximum Required Flow (L/min)	Maximum Capacity (L/min)
		2032 WDD	2032 MDD	2032 PHD			
Davidson (#18)	150 and 75	262	2,181	2,990	10,000	12,181	12,500
Camp (#17)	150 and 75	224	1,721	2,416	10,000	11,721	12,400
Hare (#14)	100 and 50	9	89	118	5,000 (1)	5,089	5,800
6th Street (#15)	100 and 50	130	841	1,244	10,000	10,841	6,000 (2)

(1) There are no fire hydrants currently installed downstream of PRV. At least one hydrant should be installed

(2) Existing station capacity does not meet required fire flow plus maximum day demand

Two upgrade options were reviewed for improving fire flow to the Okanagan Centre Area. Optional pricing for replacing the existing PRVs with above ground structures and replacing asbestos cement (A/C) watermain were also reviewed at the District's request.

Option 1

A new distribution main along Okanagan Centre Road and upsizing of the existing supply main from 6th Street to Davidson Road is recommended in order to supply the minimum required fire flow to the area.

The estimated cost allows for the existing rear-yard watermain between 5th Street and Camp Road to be abandoned per the District's request. The estimated cost to construct these upgrades is **$4,300,000** and is shown on **Figure 1-1**. The figure also lists the fire flow required for each roadway within the service area. The cost estimate includes the replacement cost for the 6th Street PRV Station.

Option 2

The upgrades under Option 2 west of Hare Road are identical to Option 1. This option improves system looping and redundancy with a second supply main into the area and a new PRV station. The new supply main reduces the diameter of the Hare Road watermain upgrade required north of Withers Road and eliminates Camp Road watermain upgrades east of Cheesman Road. The estimated cost to construct the twin supply option is **$4,020,000** (inclusive of the costs in Option 1 for upgrades west of Hare Road) and is shown on **Figure 1-2**. The figure also lists the fire flow required for each roadway within the service area. The cost estimate includes the replacement cost for the 6th Street PRV Station.

Preferred Option

The District will select a preferred option at the predesign stage. Option 2 provides more system redundancy than Option 1 but has higher operational costs as it requires a new PRV facility. Option 2 will require a utility easement from Hare Road to Camp Road across private property.

Optional Items

Optional A/C watermain replacement costs for two sections of watermain as shown on both Figures 1-1 and 1-2 has been provided in Table 2 per the District's request. Table 2 also includes optional pricing for PRV replacements.

Table 2: Okanagan Centre Area Upgrade Costs

Project	See Figure	See Cost Estimate (Appendix F)	Project Cost
Optional AC Watermain Replacement – Davidson PRV to Camp PRV	1-1 or 1-2	1.4 (1)	$670,000
Optional AC Watermain Replacement – Tyndall Road to Davidson PRV	1-1 or 1-2	1.5	$550,000
Optional PRV Replacement – Davidson Road	1-1 or 1-2	1.6	$320,000
Optional PRV Replacement – Camp Road	1-1 or 1-2	1.7	$320,000
Optional PRV Replacement – Hare Road	1-1 or 1-2	1.8	$320,000

(1) This watermain segment is replaced under Option 1 and is only considered an optional cost should Option 2 be chosen

Okanagan Lake

Proposed Main along OK Centre Road shoulder. See Cost Estimate 1.2

Abandon existing back lane watermain from 5th Street to Camp Road

Proposed 250mm system valve (typical) See Cost Estimate 1.2

New laterals on side streets for improved fire flow & water quality. See Cost Estimate 1.2

6th St PRV Replacement See Cost Estimate 1.1

Hare PRV Optional Replacement See Cost Estimate 1.8

Replace existing hydrant assembly and lead (Typical for 9) See Cost Estimate 1.2

Proposed hydrant assembly (Typical for 15) See Cost Estimate 1.2

Proposed watermain installed in shoulder. See Cost Estimate 1.2

Camp Road AC Watermain Optional Replacement (Davidson PRV to Tyndall Road) See Cost Estimate 1.5

Proposed 250mm system valve. See Cost Estimate 1.5

Davidson PRV Optional Replacement See Cost Estimate 1.6

Camp PRV Optional Replacement See Cost Estimate 1.7

Target Fire Flow Rate	
FF Rate (L/min)	Street Name
5,000	Cheesman Rd
5,000	Hare Road, North of Camp
5,000	Hare Road, South of Withers
5,000	Stokepoges Rd
10,000	Camp Rd
10,000	Hare Road, Camp to Withers
10,000	Maddock Rd
10,000	OK Centre Rd West
10,000	Withers Rd

10th St, 9th St, 8th St, 7th St, 6th St, 5th St, 4th St, 3rd St, Maddock Rd, Withers, Stokepoges Rd, Hare Rd, OK Centre Road West, Camp Rd, Cheesman Rd, Tyndall Rd, Lang Rd, Davidson Rd

Ex 100 Wat, Ex 150 Wat, Ex 200 Wat, Ex 250 Wat, Ex 300 Wat

0 50 100 200 Meters

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

- Reservoir
- Pump Station
- Power Generation
- Chlorinator
- Intake
- Pressure Tank
- Cistern
- PRV Station
- Existing Hydrants
- Proposed Hydrants
- System Valves
- Proposed System Valves
- District Lots

Existing Watermains

- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades

- 200mm
- 250mm
- 250mm (Optional)
- 300mm
- Mains to be Abandoned

Okanagan Centre Upgrades Option #1

1:5,000

Jun 15, 2016

Figure 1-1

Okanagan Lake

Proposed Main along OK Centre Road shoulder. See Cost Estimate 1.3

Abandon existing back lane watermain from 5th Street to Camp Road

Proposed 250mm system valve (typical) See Cost Estimate 1.3

New laterals on side streets for improved fire flow & water quality. See Cost Estimate 1.3

6th St PRV Replacement See Cost Estimate 1.1

Replace existing hydrant assembly and lead (Typical for 9) See Cost Estimate 1.3

Hare PRV Optional Replacement See Cost Estimate 1.8

Proposed PRV Station. See Cost Estimate 1.3 See 10 psi below Camp PRV

Proposed hydrant assembly (Typical for 15) See Cost Estimate 1.3

Proposed watermain installed in shoulder. See Cost Estimate 1.3

Utility Easement Required. Land cost not included in estimates

Camp Road AC Watermain Optional Replacement (Davidson PRV to Camp PRV) See Cost Estimate 1.4

Camp PRV Optional Replacement See Cost Estimate 1.7

Camp Road AC Watermain Optional Replacement (Davidson PRV to Tyndall Road) See Cost Estimate 1.5

Davidson PRV Optional Replacement See Cost Estimate 1.6

Target Fire Flow Rate	
FF Rate (L/min)	Street Name
5,000	Cheesman Rd
5,000	Hare Road, North of Camp
5,000	Hare Road, South of Withers
5,000	Stokepoges Rd
10,000	Camp Rd
10,000	Hare Road, Camp to Withers
10,000	Maddock Rd
10,000	OK Centre Rd West
10,000	Withers Rd

10th St
9th St
8th St
7th St
6th St
5th St
4th St
3rd St
Maddock Rd
Withers
Stokepoges Rd
OK Centre Road West
Camp Rd
Hare Rd
Cheesman Rd
Tyndall Rd
Lang Rd
Davidson Rd

Ex 100 Wat
Ex 150 Wat
Ex 200 Wat
Ex 250 Wat
Ex 300 Wat

0 50 100 200 Meters

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

- Reservoir
- Pump Station
- Power Generation
- Chlorinator
- Intake
- Pressure Tank
- Cistern
- PRV Station
- Existing Hydrants
- Proposed Hydrants
- System Valves
- Proposed System Valves
- Proposed PRV
- District Lots

Existing Watermains

- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades

- 200mm
- 250mm
- 250mm (Optional)
- 300mm
- Mains to be Abandoned

Okanagan Centre Upgrades Option #2

1:5,000

Jun 15, 2016

Figure 1-2

URBAN systems

U:\Projects_KEL\1577006301\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 1-2.mxd Last updated by jbarta on June-15-16 at 12:03:55 PM

4.2 Oyama Isthmus Area

The Oyama Isthmus Areas is supplied by Kalamalka Lake source. The proposed Oyama Isthmus Upgrade is broken down into two components based on fire flow requirements:

1) Oyama Road Upgrade (supply to the isthmus), requiring a minimum fire flow of 10,000 L/min; and
2) Isthmus Upgrades, requiring a minimum fire flow of 5,000 L/min.

Refer to **Figure 2** for all proposed upgrades noted below.

The existing distribution main along Oyama Road, between Trask and Greenhow Roads, currently restricts the available fire flow to the isthmus and Sawmill Road areas, when drawing solely from the Irvine Reservoir. The proposed watermain must be upgraded to 300 mm diameter to meet fire flow requirements of the isthmus. The upgrades allow for a maximum fire flow of 8,700 L/min along Oyama Road when drawing solely from the Irvine Reservoir. When drawing from both the Irvine Reservoir and the Oyama Lake water source (via the Sawmill Booster and PRV station), the available fire flow along Oyama Road increases to 20,000 L/min. The estimated cost to construct the Oyama Road upgrade is **$360,000**.

The existing water system within the isthmus is well looped with the exception of the dead-end mains on Trask and Greenhow Roads. It is proposed to upgrade the existing watermains for portions of Trask, Ackerman, Roberts and Greenhow Roads. In addition to upsizing the undersized mains shown in the figure, it is suggested to replace the existing galvanized iron watermain in Harris Lane. The estimated cost to construct the isthmus upgrades is **$870,000**.

A future subdivision between Greenhow and Trask Roads will also improve fire flow availability to the outlying parts of the isthmus. A watermain connection between Trask and Greenhow Roads must ultimately be constructed to ensure minimum fire flow requirements are met. The future watermain, shown on **Figure 2**, was assumed to be 200 mm in diameter, but was not included in the above cost estimate as it is assumed to be developer funded.

Tie-in to existing c.w
300mm system valve
See Cost Estimate 2.2

Proposed watermain
installed in shoulder

Proposed loop &
400x200mm hot-tap
See Cost Estimate 2.1

Proposed watermain
installed in shoulder

Tie-in to existing c/w
200mm system valve
See Cost Estimate 2.1

Tie in to existing c/w
200mm system valve
See Cost Estimate 2.1

Kalamalka Lake
Pump Station

Remove and replace existing main
with 200mm PVC water main
See Cost Estimate 2.1

Reconnect existing
services and hydrant
leads

Tie in to existing c/w
150mm system valve
See Cost Estimate 2.1

Tie in to existing
See Cost Estimate 2.1

Tie-in to existing c/w
300mm system valve
See Cost Estimate 2.2

Tie-in to existing
See Cost Estimate 2.1

Remove and replace existing main
with 200mm PVC water main
See Cost Estimate 2.1

Future development
and 200mm loop
(not in cost estimate)

200x150 Tee
New 150mm hydrant
assembly and lead
See Cost Estimate 2.1

Tie-in to existing c/w
200mm system valve
See Cost Estimate 2.1

Tie-in to existing
See Cost Estimate 2.1

Replace GI main
with 50mm PVC
See Cost Estimate 2.1

Tie-in to existing
See Cost Estimate 2.1

Replace hydrant assembly and
lead. Connect to existing 200mm
main on Greenhow Rd
See Cost Estimate 2.1

Tie-in to existing c/w
200mm system valve
See Cost Estimate 2.1

Tie-in to existing c/w
200mm system valve
See Cost Estimate 2.1

Wood Lake

Kalamalka Lake

Ex 350
Ex 400 Wat
Trask Rd
Ex 100 Wat
Roberts Rd
Ex 50 Wat
Young Rd
Ex 200 Wat
Oyama Rd
Ackerman Rd
Ex 150 Wat
McDonagh Rd
Ex 300 Wat
Harris Ln
Greenhow Rd
Lloyd Rd

Target Fire Flow Rate	
FF Rate (L/min)	Street Name
5,000	Ackerman Rd
5,000	Greenhow Rd
5,000	McDonagh Rd
5,000	Roberts Rd
5,000	Trask Rd
5,000	Young Rd
10,000	Oyama Rd

0 25 50 100 Meters

URBAN systems

U:\Projects_KEL\1577006301\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 2.mxd Last updated by lbarta on June-27-16 at 3:12:21 PM

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- System Valves
- Existing Hydrants
- Proposed System Valve
- District Lots

Existing Watermains

Watermain	*Watermain*
Hydrant Lead	*Hydrant Lead*
Drain Lines	
Domestic Service	*Domestic Service*
Irrigation Service	*Irrigation Service*

Watermain Upgrades
- 50mm
- 200mm
- 300mm
- Future Watermains

Oyama Isthmus Area Upgrade

1:2,500
Mar 10, 2016

Figure 2

4.3 Irvine Boosted Zone

The Irvine Boosted Zone is fed by booster pumps which draw water from the Irvine Reservoir (Kalamalka Lake source). Many of the pressure and fire flow issues in this area were addressed in the Urban Systems report "Kalamalka Lake Water Distribution System – Upper Pressure Zone Review" (Irvine report), dated January 2013 and is included as **Appendix C**. The Irvine report used a minimum fire flow of 3,600 L/min as identified in the *MMCD Design Guidelines Manual 2005*, based on low density residential land use, which differs from the criteria in this document. The cost estimate for the booster station was updated to reflect the higher required fire flow rate of 5,000 L/min of this report.

The proposed Irvine Booster Zone Upgrade allows for:

- Replacing the existing watermain from the Irvine Booster site to the south end of Old Mission Road with a 200 mm watermain to improve fire protection (per the Irvine report); and,
- Replacing the existing 100 mm AC watermain between Old Mission and Highland Roads with a 150 mm PVC watermain.

The proposed upgrades are shown in **Figure 3**. The estimated cost for the Irvine Boosted Zone Watermain Upgrade is **$1,140,000**. In addition to the proposed watermain upgrades, it is recommended that the Irvine Booster Station be upgraded per the 2013 Irvine report. The estimated cost for upgrading the booster station is **$1,070,000**.

The watermains to the north of the Irvine Reservoir and Booster station serve only agricultural parcels and are not intended to provide fire protection. No upgrades have been identified for these mains.

The District enquired as to the possibility of removing the existing rear-yard watermain between Old Mission and Highland Roads. This idea was dismissed for the following reasons:

- pressure for Highland Road customers serviced from the Irvine boosted zone would drop;
- the restoration costs to re-align the water service was deemed prohibitive given the extent of retaining walls and landscaping present; and
- water quality is improved by creating a new loop at the south end of Old Mission Road

Create loop c/w
200mm system valve
See Cost Estimate 3.2

Proposed watermain in shoulder
See Cost Estimate 3.2

2-200mm system valves
See Cost Estimate 3.2

Replace hydrant assembly
and leads (typical for 3)
See Cost Estimate 3.2

For booster station and reservoir upgrades, refer to Kalamalka Lake Water Distribution System - Upper Pressure Zone Review (Jan 2013) included as Appendix C
See Cost Estimate 3.1

Booster and Reservoir
to be decommissioned
See Cost Estimate 3.1

Remove and replace existing
100mm AC watermain with 200mm PVC
See Cost Estimate 3.2

Private Hydrant (typical for 2)
Refer to Appendix C Report
See Cost Estimate 3.2

Tie in to existing
See Cost Estimate 3.2

Upgrade available fire flow to
Greenhow and Sawmill Road areas.
Included in Irvine Boosted Zone project
per District request due to proximity.
See Cost Estimate 3.2

Tie in to existing c/w
300mm system valve
See Cost Estimate 3.2

Ex 200 AC Wat
Ex 100 AC Wat
Ex 200 AC Wat
Ex 200 AC Wat
Ex 250 Wat
Highland Rd
Old Mission Rd
Sheldon Rd
Cornwall Rd
Pelmewash Parkway
Old Mission Rd
Irvine Rd
PS

0 50 100 200 Meters

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake

PRV Stations
- PRV Station
- Existing Hydrants
- Proposed Hydrants
- System Valves
- Proposed System Valves
- District Lots

Existing Watermains

Watermain	*Watermain*
Hydrant Lead	*Hydrant Lead*
Drain Lines	
Domestic Service	*Domestic Service*
Irrigation Service	*Irrigation Service*

- 150mm
- 200mm
- 300mm

Irvine Boosted Zone Upgrades

1:3,000

Mar 10, 2016

Figure 3

U:\Projects_KEL\1577\0063\01D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 3.mxd Last updated by jbarta on June-28-16 at 10:28:20 AM

4.4 Cornwall Road Area

The Cornwall Road area is gravity-fed by the Irvine Reservoir (Kalamalka Lake source), through a single supply main that varies in diameter between 150 mm and 200 mm. There is no looping in the area and the existing hydrant leads were assumed to be 100 mm in diameter.

The existing 200 mm and 150 mm supply mains must be upsized to 250 mm and 200 mm respectively to ensure adequate fire flow can be supplied to the existing The District suggested adding a loop between Highland and Sheldon Roads as shown on **Figure 4-1**. This proposed loop will improve water quality. Two upgrade options were reviewed for the Cornwall Road area as noted below.

Option 1

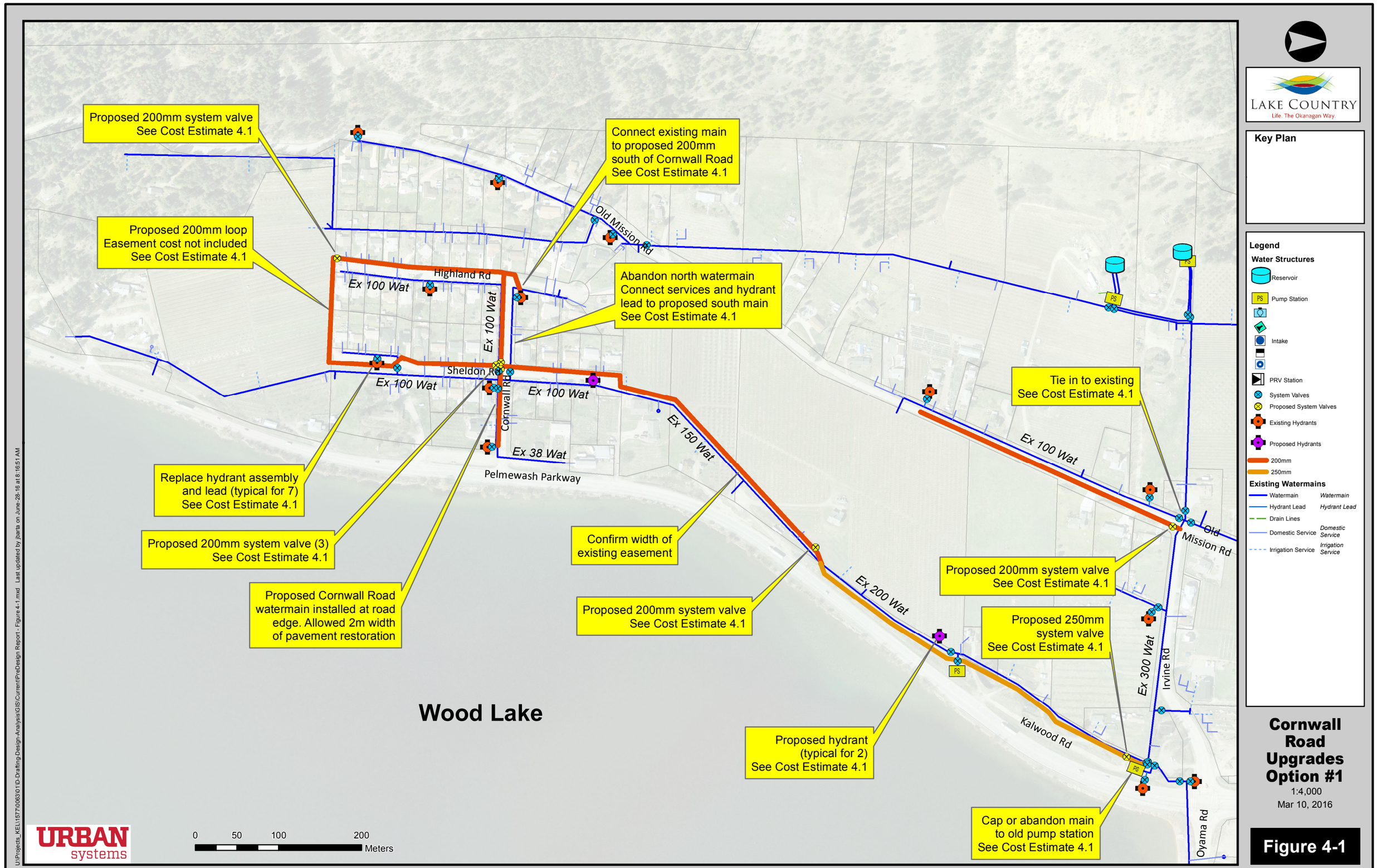
The proposed upgrade, which incorporates the items described above, for the area is shown on **Figure 4-1**. The estimated cost to construct the upgrade is **$1,430,000**.

Option 2

An optional loop from Old Mission Road to Pelmewash Parkway can be constructed to avoid upsizing the existing 200 mm main to 250 mm along Pelmewash Parkway as shown on **Figure 4-2**. The estimated cost to construct this option is **$1,290,000**.

Preferred Option

The District will select a preferred option at the predesign stage. Option 2 provides better system redundancy and has a lower capital cost than Option 1.



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures

- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Proposed System Valves
- Existing Hydrants
- Proposed Hydrants
- 200mm
- 250mm

Existing Watermains

Watermain	*Watermain*
Hydrant Lead	*Hydrant Lead*
Drain Lines	
Domestic Service	*Domestic Service*
Irrigation Service	*Irrigation Service*

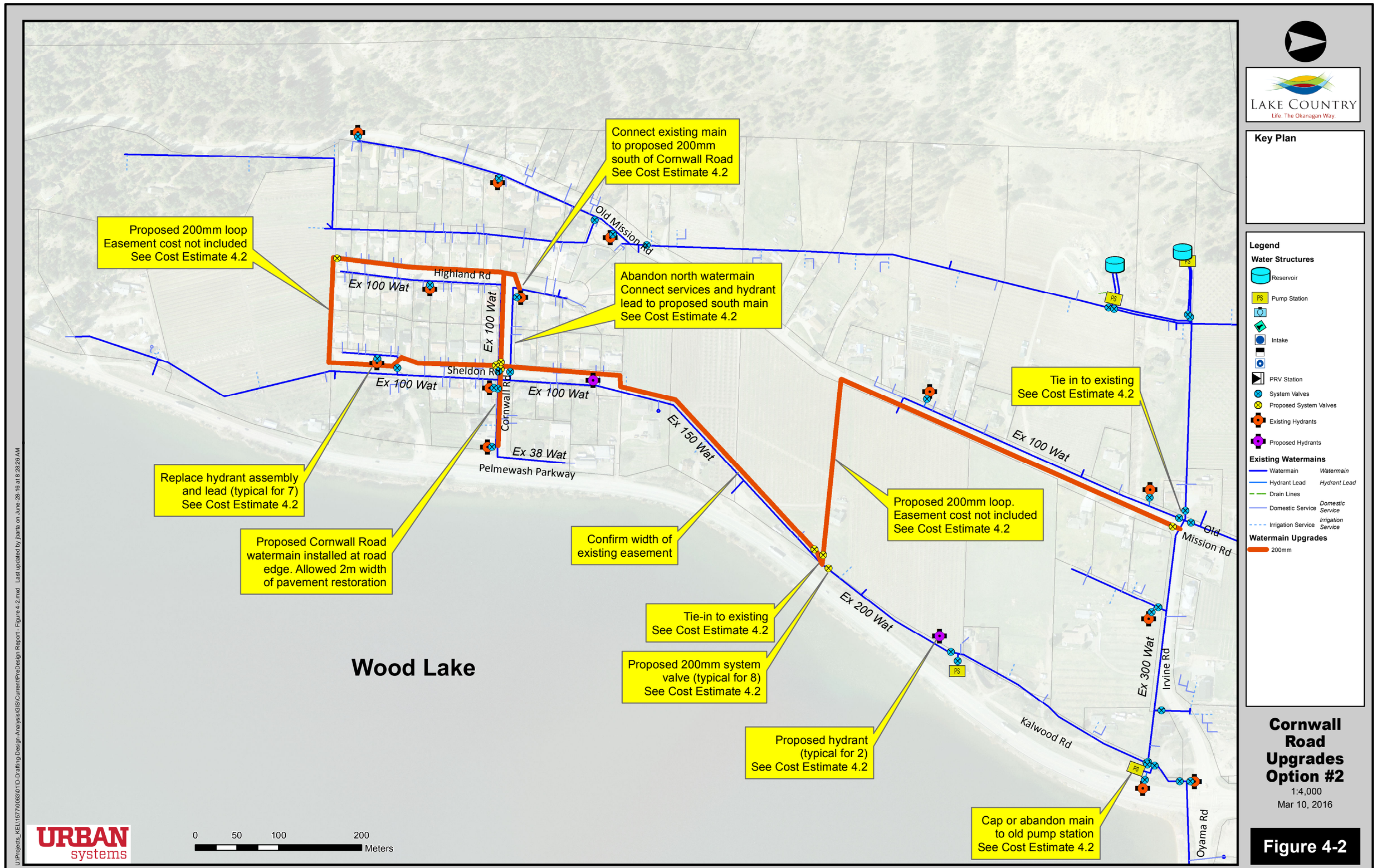
Cornwall Road Upgrades Option #1

1:4,000

Mar 10, 2016

Figure 4-1

URBAN systems



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Proposed System Valves
- Existing Hydrants
- Proposed Hydrants

Existing Watermains
- Watermain — *Watermain*
- Hydrant Lead — *Hydrant Lead*
- Drain Lines
- Domestic Service — *Domestic Service*
- Irrigation Service — *Irrigation Service*

Watermain Upgrades
- 200mm

Cornwall Road Upgrades Option #2

1:4,000

Mar 10, 2016

Figure 4-2

URBAN systems

4.5 Carrs Landing Area

The Carrs Landing area is primarily supplied by a single watermain from the Beaver Lake water source. The majority of the existing watermains downstream of the Carrs Landing PRV station are 100 mm and 150 mm in diameter and there is minimal looping in this area.

There is also a private water system which supplies water to users along Moberly Road and the Raven Ridge water system (also known as the Lakepine system). Refer to **Figure 5-3**. These areas could be supplied by the Beaver Lake source in the future. As such, the demands for this area where considered in the sizing of the proposed PRV and watermain upgrades for Carrs Landing.

Table 3 below highlights the capacity of the existing PRV stations in the Carrs Landing Area and reflects the ultimate system demands that include the private water system customers being supplied via the Beaver Lake source. Per the table below, the Carrs Landing Road PRV station must be upgraded. Refer to **Table 4** for the Carrs Landing replacement PRV station cost estimate. It has been assumed that existing buried PRV chamber can be replaced with an above ground station. Land acquisitions costs are not included in the estimate. An estimate has also been included for the Goldie PRV Station replacement as per the District's request.

Table 3: Carrs Landing PRV Station Demands vs. Capacities

Station Name	Valve Sizes (mm)	Estimated Demands (L/min)			Required FF (L/min)	Maximum Required Flow (L/min)	Maximum Capacity (L/min)
		2032 WDD	2032 MDD	2032 PHD			
Goldie (#22)	150 and 50	190	4,130	6,195	5,000	9,130	16,650
Carrs Landing (#23)	100 and 50	177	3,750	5,625	5,000 (1)	8,750	5,700

(1) PRV capacity of 5,700 L/min is not sufficient to convey MDD+FF of 8,750 L/min

Additional fire hydrants were added along Carrs Landing Road and Pixton Road to ensure the maximum spacing between hydrants did not exceed 180 meters.

Two upgrade options were reviewed for the Carrs Landing Area as noted below.

Option 1 (not including demands from private water system)

The existing Carrs Landing Road watermain must be upsized to 250 mm in diameter (from Broadbent Road to Moberly Road) in order to meet the minimum fire flow requirements. In addition, the existing watermains on Pixton Road, McCreight Road and Carrs Landing north of Moberly Road must be upgraded to 200 mm diameter.

The proposed upgrade, which incorporates the items described above, for the area is shown on **Figure 5-1**. The estimated cost to construct the upgrade is **$2,580,000** (including the Carrs Landing PRV replacement).

Option 2 (not including demands from the private water system)

An optional 200 mm watermain loop can be installed along Pixton Road as shown on **Figure 5-2**. The proposed loop would preclude the need to upgrade some of the existing 150 mm diameter piping at the north end of Pixton Road. The estimated cost to construct these upgrades is **$2,520,000** (including the Carrs Landing PRV replacement). Land acquisition costs for an easement for the proposed watermain is not included in the estimate.

Preferred Option

The District will select a preferred option at the predesign stage. While Option 2 provides better system redundancy and has a lower capital cost than Option 1 (not including land acquisition costs), it will require land acquisition for utility easements.

Required Upgrades to Supply Private Water System from Beaver Lake

If the users that are currently supplied by the private water system switch over to the Beaver Lake source, an additional upgrade beyond those identified in Option 1 and 2 will be required to ensure adequate fire flow is available. The additional upgrade will involve upsizing a section of watermain along Carrs Landing Road and Goldie Road to 300 mm as shown on **Figure 5-3**. Additional discussion regarding the Moberly Road watermain extension is provided through a technical memorandum included under **Appendix E**.

Table 4 summarizes the various upgrade options for the Carrs Landing area water system.

Table 4: Carrs Landing Area Upgrade Costs

Project	See Figure	See Cost Estimate (Appendix F)	Project Cost
Replace Carrs Landing PRV Station (req'd both Options)	5-1 or 5-2	5.1	$320,000
Option #1 Watermain Upgrades	5-1	5.2	$2,260,000
Option #2 Watermain Upgrades	5-2	5.3	$2,200,000
Additional Upgrades to Supply Private Water System	5-3	5.4	$270,000
Optional Goldie PRV Replacement	5-1 or 5-2	5.5	$320,000

Okanagan Lake

Proposed watermain installed in shoulder

Tie in to existing See Cost Estimate 5.2

Proposed watermain installed in shoulder

Proposed 200mm system valve See Cost Estimate 5.2

Tie in to existing See Cost Estimate 5.2

Proposed 250mm system valve See Cost Estimate 5.2

Proposed 200mm system valve See Cost Estimate 5.2

Proposed watermain installed in shoulder

Proposed 250mm system valve See Cost Estimate 5.2

Proposed 250mm system valve See Cost Estimate 5.2

Tie-in to existing See Cost Estimate 5.2

Carrs Landing PRV to be re-constructed See Cost Estimate 5.1

Proposed Hydrant Assembly (typical for 8) See Cost Estimate 5.2

Goldie PRV Optional Replacement See Cost Estimate 5.5

Ex 100 Wat

Ex 150 Wat

Ex 200 Wat

Ex 250 Wat

Pixton Rd

Pixton Strata

Okanagan Centre Rd

Broadbent Rd

Goldie Rd

McFarlane Rd

Carrs Landing Rd

McCreight Rd

Moberly Rd

Lakepine Rd

Pow Rd

PS

0 125 250 500 Meters

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Proposed System Valves
- Existing Hydrants
- Proposed Hydrants
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service
- 200mm
- 250mm

Carrs Landing Area Upgrades Option #1

1:6,500

Mar 10, 2016

Figure 5-1

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting\Design-Analysis\GIS\Current\PreDesign Report - Figure 5-1.mxd Last updated by jbarta on June-28-16 at 11:08:48 AM

Okanagan Lake

Tie in to existing
See Cost Estimate 5.3

Proposed watermain
installed in shoulder

Proposed 200mm system valve
See Cost Estimate 5.3

Tie in to existing
See Cost Estimate 5.3

Proposed watermain
installed in shoulder

Ex 100 Wat

Ex 100 Wat

Ex 100 Wat

Ex 150 Wat

Ex 150 Wat

Ex 150 Wat

Proposed 250mm
system valve
See Cost Estimate 5.3

Proposed watermain
installed in shoulder

Proposed 200mm loop.
Easement cost not included.
See Cost Estimate 5.3

Proposed 250mm system valve
See Cost Estimate 5.3

Proposed 200mm
system valve
See Cost Estimate 5.3

Ex 200 Wat

Ex 250 Wat

Tie-in to existing
See Cost Estimate 5.3

Proposed 250mm
system valve
See Cost Estimate 5.3

Carrs Landing PRV
to be re-constructed
See Cost Estimate 5.1

Proposed Hydrant
Assembly (typical for 8)
See Cost Estimate 5.3

Goldie PRV
Optional Replacement
See Cost Estimate 5.5

Pixton Rd
Pixton Strata
Okanagan Centre Rd
Broadbent Rd
Goldie Rd
McFarlane Rd
Okanagan Centre Rd
Pow Rd
Carrs Landing Rd
McCreight Rd
Moberly Rd
Moberly Rd
Lakepine Rd

0 125 250 500 Meters

U:\Projects_KEL\1577\0063\01\D-Drafting\Design-Analysis\GIS\Current\PreDesign Report - Figure 5-2.mxd Last updated by jbarta on June-28-16 at 11:11:13 AM

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Proposed System Valve
- Existing Hydrants
- Proposed Hydrants
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades
- 200mm
- 250mm

Carrs Landing Area Upgrades Option #2

1:6,500

Mar 10, 2016

Figure 5-2

Okanagan Lake

RavenRidge (Lakepine) Booster Station & Intake

private water system boundary (Moberly Road)

Carrs Landing PRV

Goldie PRV

RavenRidge water system boundary

Extent of Carrs Landing watermain to be oversized from 250mm to 300mm to accommodate future connection of Moberly Road and/or Ravenridge customers to Beaver Lake source.
See Cost Estimate 5.4
See Appendix E for additional details
See Figures 5-1 and 5-2 for all other Carrs Landing upgrades.

Pixton Rd
Pixton Strata
Okanagan Centre Rd
Broadbent Rd
McFarlane Rd
Goldie Rd
Okanagan Centre Rd
Pow Rd
McCaffrey Rd
Carrs Landing Rd
Barkley Rd
Lakepine Rd
Moberly Rd
Forest Hill Dr
PS

0 125 250 500 Meters

U:\Projects_KEL\1577\0063\01\D-Drafting\Design-Analysis\GIS\Current\PreDesign Report - Figure 5-3.mxd Last updated by jbarta on June-28-16 at 9:08:04 AM

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Existing Hydrants
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service
- 300mm
- Other Water Systems

Carrs Landing Area Moberly Oversizing

1:10,000
Mar 10, 2016

Figure 5-3

4.6 Ponderosa Road Area

The Ponderosa Road area is fed from the Okanagan Lake source water via a distribution main from the Lakes subdivision and has two pressure zones. Both zones are controlled by a PRV station, installed two hundred meters from the north end of Old Mission Road during the 2014 realignment of Highway 97. As shown in **Table 5**, the PRV station was adequately designed to meet the fire flow requirements of the area.

Table 5: Maximum Flow through PRV Stations

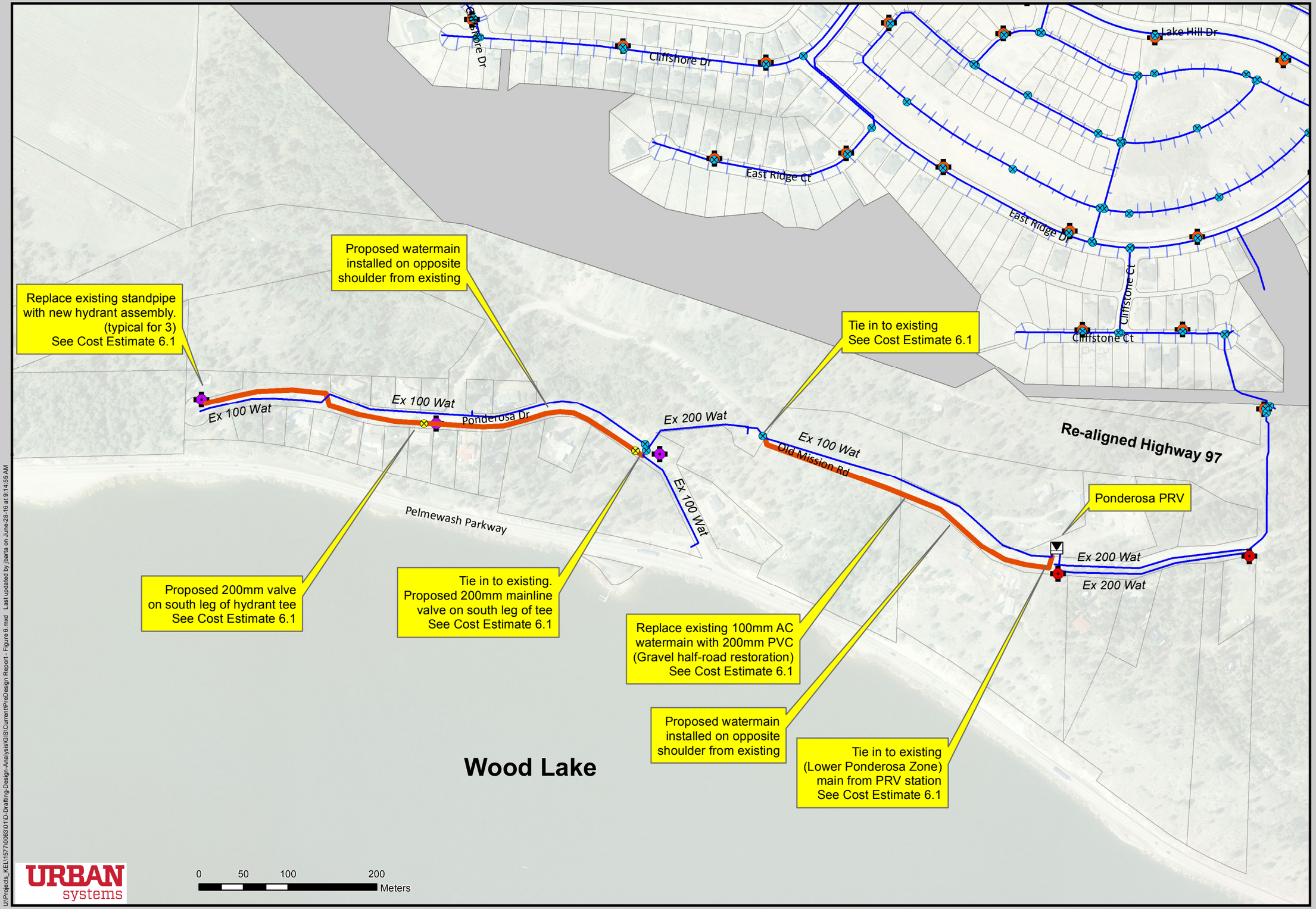
Station Name	Valve Sizes (mm)	Estimated Demands (L/min)			Required FF (L/min)	Maximum Required Flow (L/min)	Maximum Capacity (L/min)
		2032 WDD	2032 MDD	2032 PHD			
Old Mission Road Upper (North) (#30)	150 and 50	3	16	24	5,000	5,016	17,800
Old Mission Road Lower (South) (#30)	150 and 37.5	60	199	302	5,000	5,199	12,100

The upper pressure zone is located at the north end of Old Mission Road is fed by a 200 mm watermain and has two hydrants. This portion of the water system is sufficient to meet the fire flow and pressure requirements set out in this report.

The lower pressure zone is comprised of the existing watermains along Old Mission Road, south of the PRV station, and the watermain along Ponderosa Road. The majority of the lower pressure zone watermains are 100 mm in diameter. The lower pressure zone also has three standpipes that can be used by the fire department.

In order to provide the required fire flow to the lower pressure zone, all watermains must be upgraded to 200 mm pipe size and the existing hydrant assemblies (standpipes) and leads should be replaced with new units meeting the current District standards. The existing spacing between the standpipes is 260 meters and new hydrant assemblies will be installed at the same locations.

The proposed upgrades to the Ponderosa Road area water system are shown in **Figure 6**. The estimated cost to construct these upgrades is **$670,000**.



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- Ponderosa PRV (Hwy97 Project)
- System Valves
- Existing Hydrants
- Existing Hydrants (Hwy97 Project)
- Proposed Hydrants
- Proposed System Valves
- District Lots

Existing Watermains
- Watermain, AC
- Watermain, GI
- Watermain, All Other
- Irrigation Service
- Domestic Service
- Hydrant Lead
- Drain Lines
- Ponderosa Mains (Hwy97 Project)

Diameter
- 200mm

Ponderosa Road Area Upgrades

1:4,000
Mar 10, 2016

Figure 6

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 6.mxd Last updated by jbarta on June-28-16 at 9:14:55 AM

4.7 Coral Beach Area

The Coral Beach Area is supplied by a small water system the draws water from Okanagan Lake. The Coral Beach water system provides service to approximately 65 lots and consists of a lake intake, booster station, chlorinator, a ninety (90) cubic meter reservoir, three (3) fire hydrants and distribution piping that varies in diameter between 50 mm and 250 mm.

The existing fire hydrants are not adequately spaced to provide fire flow coverage to the existing customers on the system. The hydrant assemblies are connected to the distribution system with 100 mm diameter leads and each assembly and hydrant lead should be replaced with a hydrant meeting the current District standards. Three additional hydrant assemblies will be added to provide suitable coverage.

The existing 75 mm and 100 mm distribution mains along Coral Beach Road that supply the hydrant assemblies should be abandoned and replaced with 200 mm diameter watermains. The supply main to the reservoir should also be abandoned and replaced with a 200 mm watermain. The District could consider converting the existing reservoir common inlet and outlet pipe to a dedicated fill line after the upgrades are completed to improve reservoir turnover times.

The existing reservoir is not sufficient to meet the balancing, fire flow and emergency storage requirements of the system. The District provided the 2015 maximum daily consumption of 300 L/min for the Coral Beach system. The typical reservoir sizing methodology is S = A + B + C, where:

A = equalization storage (25% of maximum day demands);

B = fire flow storage (per FUS requirements); and

C = emergency storage (25% of A plus B).

A = 0.25 x 300 L/min x 1,440 min/day x 1 cubic meter/1000 L = 108 m^3

B = 5000 L/min X 1.75 hours x 60min/hr x 1 cubic meter/1000 L = 525 m^3

C = 0.25 * (108 + 525) = 158 m^3

S = 791 m^3

This report assumes that the existing valve chamber and reservoir inlet/outlet piping will be replaced with 200 mm piping. An expansion of 700 cubic meters will be required to provide adequate storage.

The proposed upgrades to the Coral Beach Water System are shown on **Figure 7**. The estimated cost to construct these upgrades is **$1,370,000**. This estimate does not include any treatment upgrades that the District may want to consider (e.g., UV disinfection).

Okanagan Lake

Tie in to existing
See Cost Estimate 7.1

Proposed watermain installed at road edge (half road restoration)

Watermain upgrades to be confirmed by hydraulic modeling at detailed design stage.
See Cost Estimate 7.1

Tie in to existing
See Cost Estimate 7.1

Replace hydrant assembly hydrant tee c/w 200mm mainline valve
See Cost Estimate 7.1

Tie in to existing
See Cost Estimate 7.1

Coral Beach Road

Ex 50 Wat

Ex 75 Wat

Ex 100 Wat

Ex 250 Wat

Ex 75 Wat

Ex 50 Wat

PS

Proposed watermain installed in shoulder

Replace hydrant assembly
See Cost Estimate 7.1

Ex 150 Wat

200mm mainline valve on each leg of tee

Proposed watermain installed in shoulder

Replace hydrant assembly hydrant tee c/w 200mm mainline valve
See Cost Estimate 7.1

Juniper Cove Road

Terrace Road

Ex 100 Wat

Proposed 700 m3 reservoir expansion.
See Cost Estimate 7.1

0 50 100 200 Meters

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures

- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Existing Hydrants
- Proposed System Valve
- District Lots

Existing Watermains

- Watermain
- Hydrant Lead
- Domestic Service
- Irrigation Service

Watermain Upgrades

- 200mm

Coral Beach Area Upgrades

1:2,500
Mar 10, 2016

Figure 7

4.8 Owls Nest Road Area

The Owls Nest Road area is currently supplied by a single distribution main, varying in size from 150 mm to 200 mm from the Irvine Reservoir (Kalamalka Lake source). The existing main crosses through an orchard between Owls Nest Road and Pelmewash Parkway which presents maintenance and access issues. The District has also requested the replacement of several watermain segments along Old Mission Road due to the pipe material being series 160 PVC.

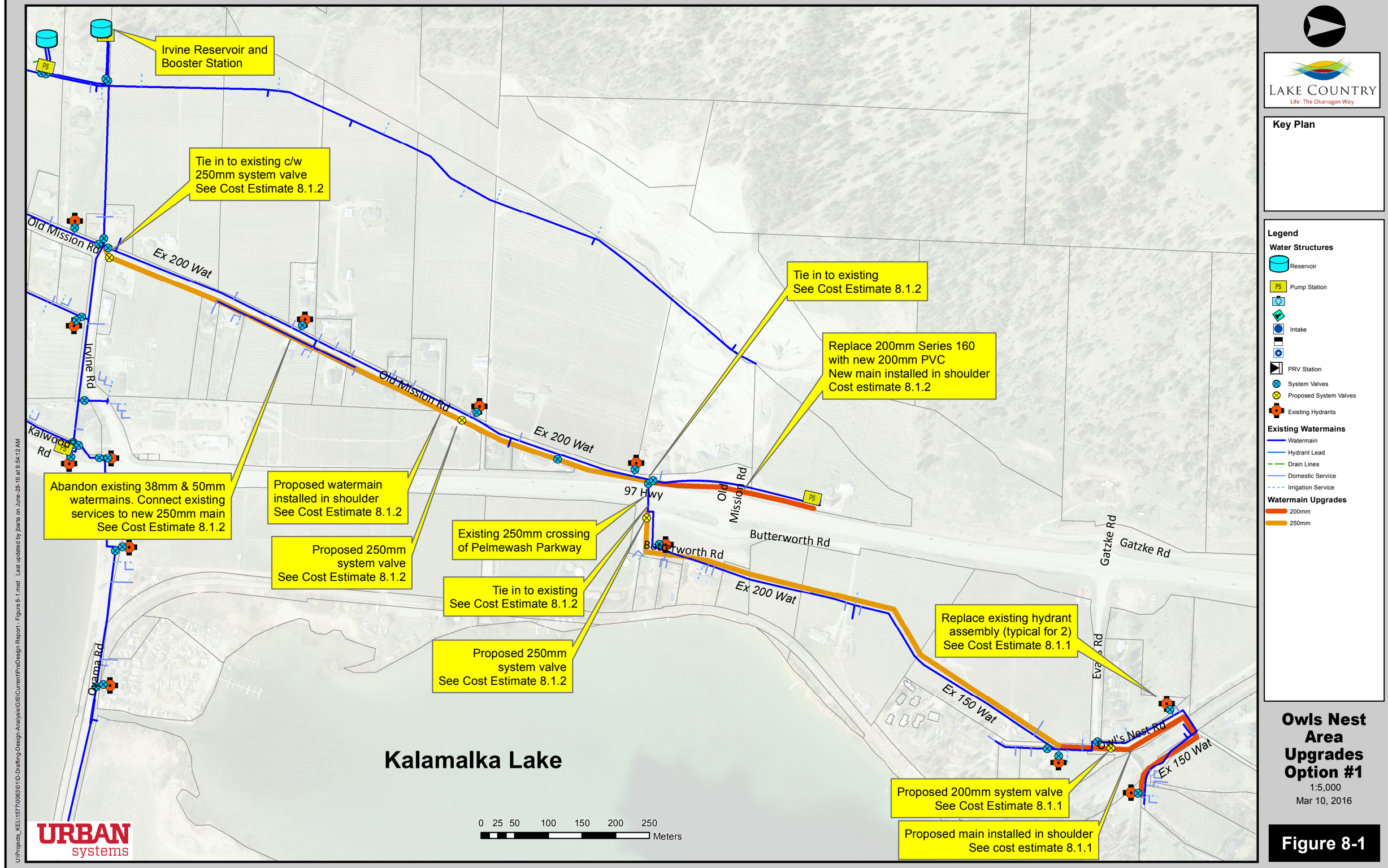
Two options were reviewed for supplying the Owls Nest Road area with the minimum required fire flow as noted below.

Option 1

The existing watermain from Irvine Road to Evans Road can be upgraded 250 mm pipe and the remainder of Owls Nest Road can be upgraded to 200 mm pipe as is shown on **Figure 8-1**. The estimated cost to construct these upgrades is **$1,590,000**.

Option 2

The second option is to create a new 200 mm loop from Old Mission Road to Owls Nest Road via Pelmewash Parkway and Evans Road. The loop removes the need to upgrade any piping through the existing orchard between Pelmewash Parkway and Owls Nest Road. This option still requires the Old Mission Road watermain to be upgraded to 250 mm from Irvine Road to Pelmewash Parkway. This second option is shown on **Figure 8-2**. The estimated cost to construct these upgrades is **$1,730,000**.



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Proposed System Valves
- Existing Hydrants

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades
- 200mm
- 250mm

Owls Nest Area Upgrades Option #1

1:5,000

Mar 10, 2016

Figure 8-1

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 8-1.mxd Last updated by jbarta on June-28-16 at 9:54:12 AM

Irvine Reservoir and Booster Station

Tie in to existing c/w 250mm system valve See Cost Estimate 8.1.3

Tie in to existing See Cost Estimate 8.1.3

Replace 200mm Series 160 with new 200mm PVC New main installed in shoulder Cost estimate 8.1.3

Abandon existing 38mm & 50mm watermains. Connect existing services to new 250mm main See Cost Estimate 8.1.3

Proposed watermain installed in shoulder See Cost Estimate 8.1.3

Proposed 250mm system valve See Cost Estimate 8.1.3

Proposed 250mm system valve See Cost Estimate 8.1.3

Replace existing hydrant assembly (typical for 2) See Cost Estimate 8.1.1

Proposed 250mm system valve See Cost Estimate 8.1.3

Tie in to existing See Cost Estimate 8.1.3

Proposed 200mm system valve See Cost Estimate 8.1.1

Proposed main installed in shoulder See cost estimate 8.1.1

Old Mission Rd

Irvine Rd

Kalwood Rd

Okana Rd

97 Hwy

Butterworth Rd

Gatzke Rd

Evans Rd

Owl's Nest Rd

PS

Kalamalka Lake

0 25 50 100 150 200 250 Meters

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures

- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Existing Hydrants
- Proposed System Valve

Existing Watermains

- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades

- 200mm
- 250mm

Owls Nest Area Upgrades Option #2

1:5,000

Mar 10, 2016

Figure 8-2

U:\Projects_KEL\1577\0063\01\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 8-2.mxd Last updated by jbarta on June-28-16 at 9:54:31 AM

4.9 Seaton Road Area

Urban Systems prepared a technical memorandum in September of 2014 to address servicing to 10011 Seaton Road as well as the existing undersized mains in the roadway. The memorandum has been included in **Appendix D** of the pre-design report. The estimated cost to construct these upgrades is **$390,000** and is illustrated in **Figure 8-3**.

4.10 Woodsdale-Oceola Road Interconnect

The existing Oceola Road watermain south of Pretty Road is currently undersized being 100 mm in diameter. Supply to the area is currently being improved via a connection to the Lakes subdivision watermain at Okanagan Centre Road.

System redundancy, fire flow protection and water quality can be significantly improved by interconnecting the Oceola Road watermain to the Woodsdale Area. The proposed watermain should be 250 mm in diameter and will require a trenchless crossing of Highway 97. The existing fire hydrant near Turtle Bay pub should be replaced and a new hydrant assembly should be constructed at Woodsdale Court. A new 250 mm diameter mainline valve at each hydrant location should be added to assist the District with flushing operations.

The estimated cost to construct these upgrades is **$1,170,000** and is illustrated in **Figure 8-4**.

4.11 Oyama Road Area

The Oyama Road Area is fed from the Oyama Lake source. Much of the Oyama Road water system is not looped and many adjacent roadways are fed via different PRV stations, making looping a difficulty.

One area that could be easily looped is Oyama Road, between Broadwater and Towgood Roads. This area is on the outskirts of the existing water system and the upgrade would still provide value to the District in the future when the area is converted over to the Beaver Lake source.

The minimum required size for the proposed watermain loop is 200 mm. The estimated cost to construct these upgrades is **$950,000** and is illustrated in **Figure 8-5**.

Note that the Oyama Lake source distribution area review did not include assessing changes that will be required when the area is switched over to the Beaver Lake source in the future. It is our understanding that the District will complete a detailed assessment of the distribution system prior to doing this.

Proposed Watermain installed in shoulder

Tie in to existing main See Cost Estimate 8.2

Tie in to existing main See Cost Estimate 8.2

Proposed Hydrant See Cost Estimate 8.2

Proposed Hydrant See Cost Estimate 8.2

Proposed 200mm system valve See Cost Estimate 8.2

Tie in to existing main See Cost Estimate 8.2

Ex 200 Wat

Ex 100 Wat

Ex 150 Wat

Text

Chase Rd

Seaton Rd

Camp Rd

Private Strata

Wilson Rd

Kel-Vern Rd

I-Win Rd

0 50 100 200 Meters

URBAN systems

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures

- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Proposed System Valves
- Existing Hydrants
- Proposed Hydrants

Existing Watermains

- Watermain
- Hydrant Lead
- Domestic Service
- Irrigation Service

Watermain Upgrades

- 200mm

Seaton Road Area Upgrades

1:3,000
Mar 10, 2016

Figure 8-3

U:\Projects_KEL\1677\0063\01\D-Drafting\Design Analysis\GIS\Current\PreDesign Report - Figure 8-3.mxd Last updated by jbarta on June 28-16 at 10:01:04 AM

Highway 97 crossing by trenchless methods

Tie in to existing
See Cost Estimate 8.3

Proposed hydrant
See Cost Estimate 8.3

Proposed system valve
See Cost Estimate 8.3

Limit of Water DCC
Project W-10 (2015)

Replace hydrant lead
and assembly.
See Cost Estimate 8.3

280m of 250mm water
main per DCC project.
Portions may have been
constructed as part of
Turtle Bay Crossing.
See Cost Estimate 8.3

Proposed watermain installed
at existing road edge. Assume
2m wide asphalt restoration

Proposed system valve
See Cost Estimate 8.3

Tie in to existing
See Cost Estimate 8.3

97 Hwy
Ex 100 Wat
Ex 100 Wat
Ex 100 Wat
Ex 200 Wat
Pretty Rd
Oceola Rd
Oceola Rd
Ex 100 Wat
Pretty Rd
Woodsdale Rd
Woodsdale Ct
Seymour Rd
Turtle Bay Ct
Rogers Rd

0 50 100 200 Meters

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- System Valves
- Existing Hydrants
- Proposed Hydrants

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service
- Proposed Valves

Watermain Upgrades
- 250mm

Oceola Road Woodsale Road Interconnect

1:2,000
Mar 10, 2016

Figure 8-4

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting\Design-Analysis\GIS\Current\PreDesign Report - Figure 8-4.mxd Last updated by jbarta on June-28-16 at 10:03:58 AM

Wood Lake

0 50 100 200 Meters

Tie in to existing
See Cost Estimate 8.4

Replace hydrant lead and
assembly (typical for 4)
See Cost Estimate 8.4

Tie in to existing
See Cost Estimate 8.4

Proposed watermain
installed in shoulder

Proposed watermain
installed in shoulder

Tie in to existing
See Cost Estimate 8.4

Tie in to existing
See Cost Estimate 8.4

Tie in to existing
See Cost Estimate 8.4

Proposed system valve
(typical for 2)
See Cost Estimate 8.4

Ex 150 Wat

Ex 100 Wat

Ex 150 Wat

Ex 150 Wat

Ex 100 Wat

Ex 100 Wat

Ex 50 Wat

Ex 100 Wat

Ex 200 Wat

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- PS Pump Station
- Intake

PRV Stations
- PRV Station
- System Valves
- Proposed System Valves
- Existing Hydrants

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades
- 200mm

Broadwater/ Oyama Road Looping Upgrades

1:4,000

Mar 10, 2016

Figure 8-5

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 8-5.mxd Last updated by jbarta on June-28-16 at 10:08:20 AM

4.12 Miscellaneous Upgrades

The District provided additional mark-ups of locations within the water distribution system where there are undersized hydrant leads, watermains in poor condition and potential looping benefits. The following figures provide general locations for the District requests:

Figure 8-6 General Upgrades – Oyama Area
Figure 8-7 General Upgrades – Winfield Area
Figure 8-8 General Upgrades – Winfield Area
Figure 8-9 General Upgrades – Winfield Area
Figure 8-10 General Upgrades – Winfield Area

Wood Lake

See Cost Estimate 8.15
See Cost Estimate 8.14
See Cost Estimate 8.13
See Cost Estimate 8.20
Oyama PRV (Broadwater)
See Cost Estimate 8.9
Middle Bench PRV (Allison)
See Cost Estimate 8.8
Towgood Road PRV
See Cost Estimate 8.10
See Cost Estimate 8.24
See Cost Estimate 8.12
Middle Bench PRV (Harmen)
See Cost Estimate 8.7
See Cost Estimate 8.16
See Cost Estimate 8.22
Oyama PRV (Cemetery)
See Cost Estimate 8.6
Trewhitt Road PRV
See Cost Estimate 8.11
See Cost Estimate 8.23
See Cost Estimate 8.17
See Cost Estimate 8.25
See Cost Estimate 8.18
See Cost Estimate 8.32
See Cost Estimate 8.19
See Cost Estimate 8.21
See Cost Estimate 8.26
See Cost Estimate 8.30
See Cost Estimate 8.27
See Cost Estimate 8.31
See Cost Estimate 8.33
See Cost Estimate 8.28
See Cost Estimate 8.29
Todd Road PRV
See Cost Estimate 8.5

Trewhitt Rd
Ribbleworth Rd
Hebbert Rd
Eyles Rd
Broadwater Rd
Broadwater Rd
Broadwater Rd
Cliffe Rd
Towgood Rd
Oyama Rd
Trewhitt Rd
Middle Bench Rd
Middle Bench Rd
Allison Rd
Crawford Rd
Harman Rd
Talbot Rd
Talbot Rd
Pada Rd
Middle Bench Rd
East Hill Rd
East Hill Rd
Todd Rd
Hayton Rd
97 Hwy
PS

0 100 200 400 600 800 1,000 Meters

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting\Design Analysis\GIS\Current\PreDesign Report - Figure 8-6.mxd Last updated by jbarta on June 28-16 at 10:10:53 AM

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- Existing Hydrants

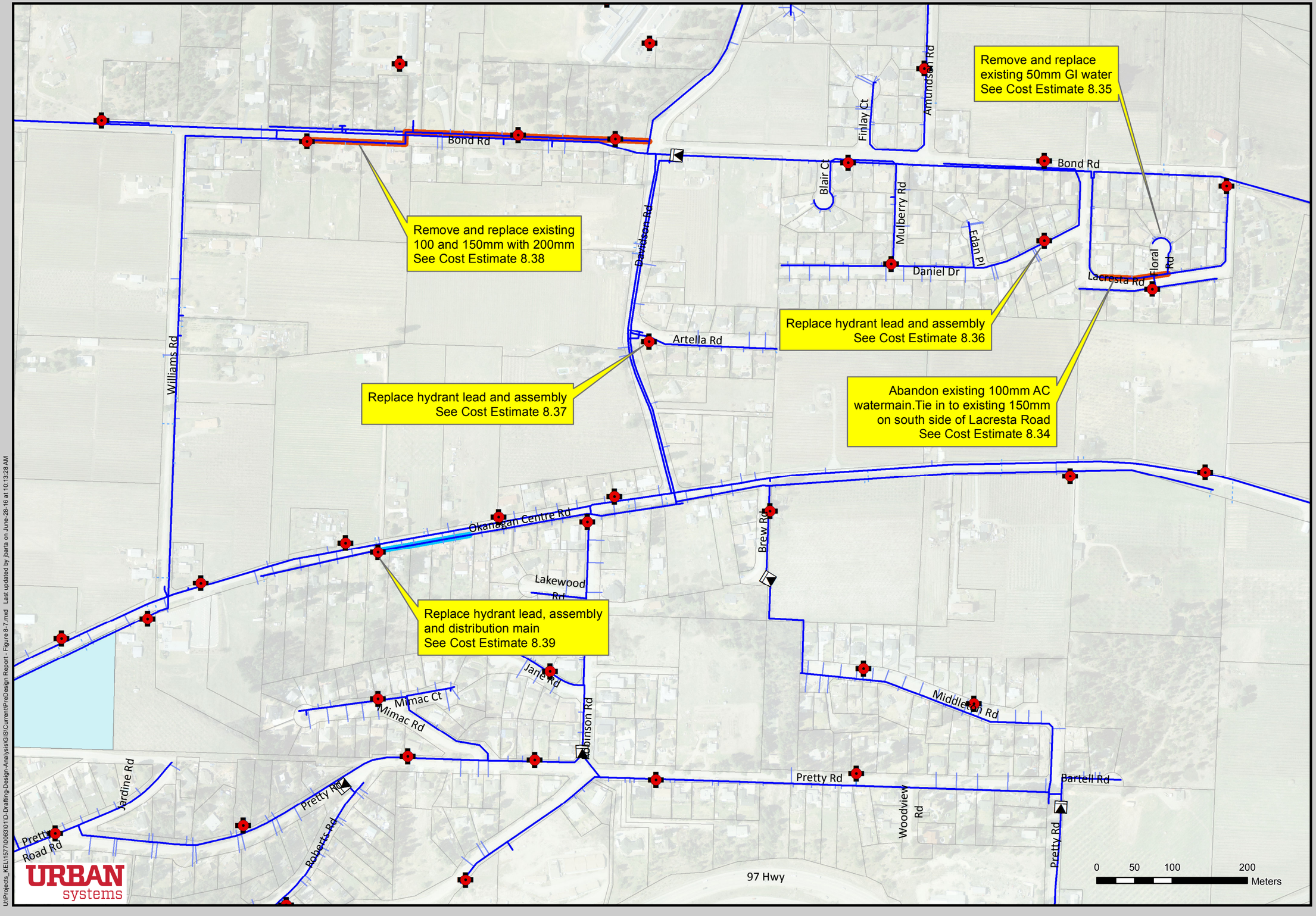
Existing Watermains

Watermain	*Watermain*
Hydrant Lead	*Hydrant Lead*
Drain Lines	
Domestic Service	*Domestic Service*
Irrigation Service	*Irrigation Service*

Oyama Water System Misc. Upgrades

1:12,500
Mar 10, 2016

Figure 8-6



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Intake
- PRV Station
- Existing Hydrants
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades
- 150mm
- 200mm

Beaver Lake System Misc. Upgrades

1:4,715

Mar 10, 2016

Figure 8-7

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting\Design-Analysis\GIS\Current\PreDesign Report - Figure 8-7.mxd Last updated by jbarta on June-28-16 at 10:13:28 AM

Abandon 50 GI watermain
Reconnect services (3)
to existing watermain
See Cost Estimate 8.40

Nighthawk Rd
Private
Strata
Tyndall Rd
Ex 150 Wat
Ex 150 Wat
Ex 50 Wat
Ex 150 Wat
Camp Rd
Camp Rd
Davidson Rd
Saldin Ct
Ivy Ct
Lehmann Rd
Klondike Ct
Camp Rd
Hallam Ct
Hallam Dr
Cemetery Rd
Nygren Rd

0 50 100 200 Meters

URBAN systems

U:\Projects_KELI\1577\0063\01D-Drafting\Design Analysis\GIS\Current\PreDesign Report - Figure 8-8.mxd Last updated by jbarta on June-28-16 at 10:15:41 AM

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Power Generation
- Chlorinator
- Intake
- Pressure Tank
- Cistern
- PRV Station
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Domestic Service
- Irrigation Service

Camp Road Watermain Upgrades

1:3,674
Mar 10, 2016

Figure 8-8

Refer to Figure 8-3 for Seaton Road upgrades

Replace hydrant lead and asembly See Cost Estimate 8.41

Replace existing 100mm main. Replace hydrant lead and assembly. See Cost Estimate 8.43

Replace existing 100mm watermain See Cost Estimate 8.42

Replace existing 100mm main. Replace hydrant lead and assembly. See Cost Estimate 8.44

Chase Rd
Seaton Rd
Private
Strata
Camp Rd
Wilson Rd
Kel-Win Rd
Kel-Vern Rd
Read Rd
Okanagan Centre Rd
Winview Rd
Pollard Rd
Berry Rd
Newene Rd
97 Hwy
Grant Cr
Main St
Hill Rd
Jensen Rd
Taiji Ct
Lodge Rd
Powley Ct
Bottom Wood Lake Rd

0 125 250 500 Meters

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Power Generation
- Chlorinator
- Intake
- Pressure Tank
- Cistern
- PRV Station
- Existing Hydrants
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Drain Lines
- Domestic Service
- Irrigation Service

Watermain Upgrades
- 150mm
- 200mm

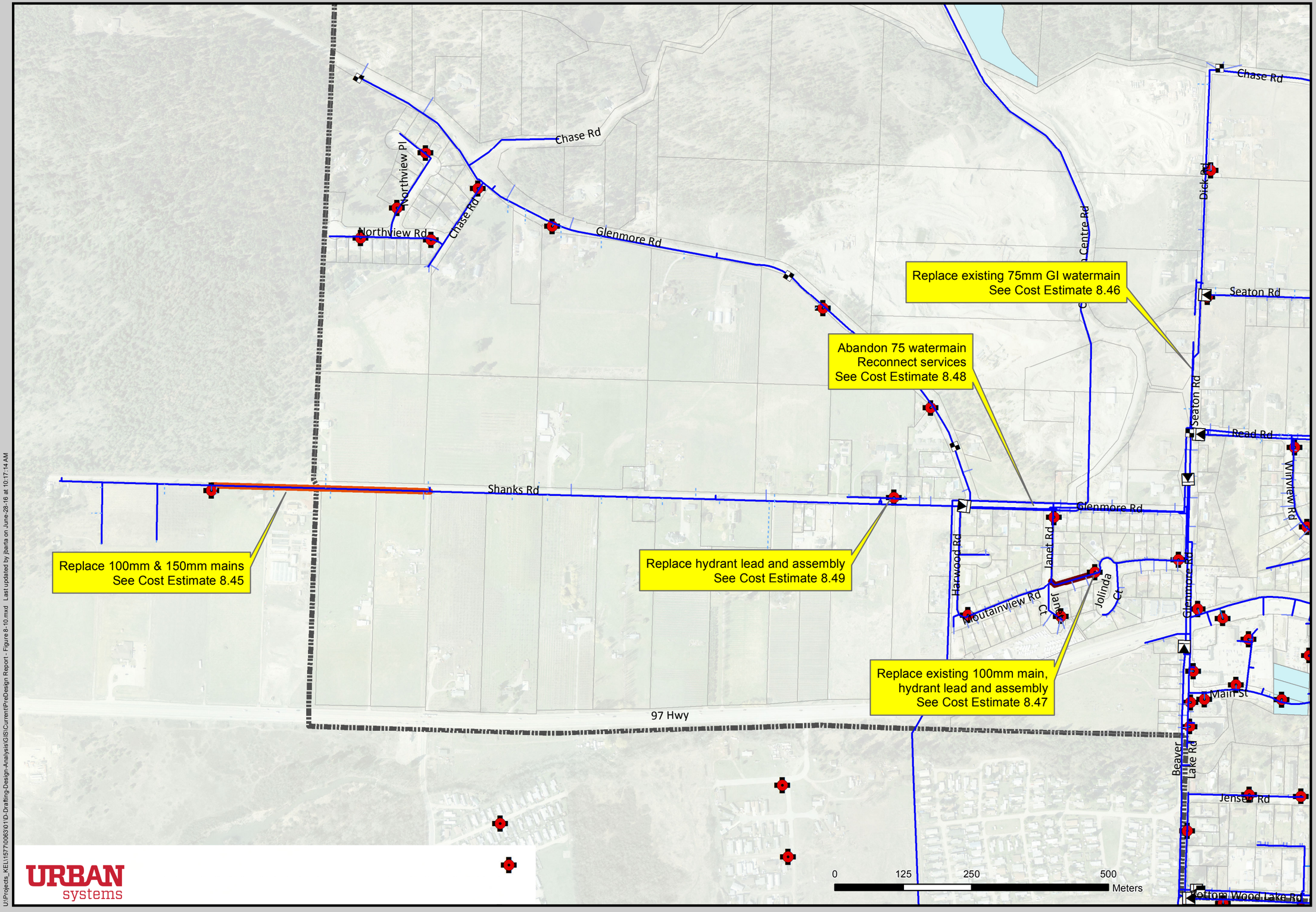
Downtown Area Misc. Upgrades

1:5,766
Mar 10, 2016

Figure 8-9

URBAN systems

U:\Projects_KEL\1577\0083\01\D-Drafting\Design-Analysis\GIS\Current\PreDesign Report - Figure 8-9.mxd Last updated by jbarta on June-28-16 at 10:16:29 AM



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

Water Structures
- Reservoir
- Pump Station
- Power Generation
- Chlorinator
- Intake
- Pressure Tank
- Cistern

PRV Stations
- PRV Station
- AirReleaseVacuum
- Existing Hydrants
- District Lots

Existing Watermains
- Watermain
- Hydrant Lead
- Domestic Service
- Irrigation Service

Watermain Upgrades
- 150mm
- 200mm

Glenmore & Shanks Road Area Misc. Upgrades

1:6,489
Mar 10, 2016

Figure 8-10

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting-Design-Analysis\GIS\Current\PreDesign Report - Figure 8-10.mxd Last updated by jbarta on June-28-16 at 10:17:14 AM

5 Prioritized Capital Plan

Table 6 summarizes the required, alternative and optional costs associated with each of the water system areas.

Table 6: Upgrade Costing

Area	See Figure	Cost Estimate Option #1	Cost Estimate Option #2 (1)	Optional Replacements
Okanagan Centre Area	1-1, 1-2	4,300,000	$4,020,000	$2,180,000 (2)
Oyama Isthmus Area	2	$1,230,000	$1,230,000	n/a
Irvine Boosted Zone	3	$2,210,000	$2,210,000	n/a
Cornwall Road Area	4-1, 4-2	$1,430,000	$1,290,000	n/a
Carrs Landing Area	5-1, 5-2, 5-3	$2,580,000	$2,520,000	$590,000 (3)
Ponderosa Road Area	6	$670,000	$670,000	n/a
Coral Beach Area	7	$1,370,000	$1,370,000	n/a
Owls Nest Road Area	8-1, 8-2	$1,590,000	$1,730,000	n/a
Seaton Road Area	8-3	$400,000	$400,000	n/a
Oceola-Woodsdale Interconnect	8-4	$1,170,000	$1,170,000	n/a
Oyama-Broadwater Looping	8-5	$950,000	$950,000	n/a
Sub-Total		**$17,900,000**	**$17,560,000**	**$2,770,000**
Miscellaneous Projects	8-6 to 8-10	$2,080,000	$2,080,000	$2,240,000 (4)
Total		**$19,980,000**	**$19,640,000**	**$5,010,000**

(1) Where applicable. Where second option does not exist, option #1 cost duplicated

(2) Optional PRV stations and optional AC watermain replacement projects

(3) Cost includes Carrs Landing watermain oversizing and optional Goldie PRV replacement

(4) Cost includes all eight major Oyama System PRV station replacements

The upgrades have been ranked and prioritized based on the number of deficient hydrants that are connected with each specific upgrade. Refer to Table 7 below.

Table 7: Prioritized Projects

Upgrade Area	Number of Existing Deficient Hydrants in Area	Total Number of Existing and Proposed Hydrants in Area	Priority for Upgrade
Okanagan Centre	12	27	1
Oyama Isthmus	14	14	2
Carrs Landing Road	6 (1)	10	3
Cornwall Road	6 (1)	8	4
Owls Nest Road	7	7	5
Coral Beach	3	6	6
Oyama Road	4	4	7
Irvine Boosted Zone	3	5	8
Ponderosa Road	3	3	9
Seaton Road	2	3	10
Woodsdale-Oceola	2	3	11

The prioritization of the major projects listed in table 7 above is a risk based on service area. Other factors that may change the priority of each project could be:

- Ability to combine with other capital works projects (roads and sewer);
- Available resources; or
- Watermain failure(s) within the project area.

In addition, a complete listing of all miscellaneous projects has been included in **Appendix G**. It is recommended that the District prioritize these upgrades.

6 Closure

This pre-design report identifies areas where the District can upgrade the water system to improve fire protection and water quality in a phased manner that aligns with the Water Master Plan.

Please contact the undersigned if you have any questions or require any clarification of the above information.

URBAN SYSTEMS LTD.

Jason Barta, B.Sc.
Municipal Infrastructure Analyst

Reviewed by:

Jeremy Clowes, P.Eng.
Water Engineer

/jb

U:\Projects_KEL\1577\0063\01\R-Reports-Studies-Documents\R1-Reports\Final\Word\2016-06-27-Small Diameter Watermains - Final.docx

Appendix A

Areas Reviewed for the Small Diameter Watermains Analysis

URBAN systems

Date:	March 10, 2016
To:	Greg Buchholz, Kiel Wilkie; District of Lake Country
cc:	Jeremy Clowes, Steve Brubacher; Urban Systems
From:	Jason Barta
File:	1577.0063.01
Subject:	**AREAS REVIEWED FOR SMALL DIAMETER WATERMAIN ANALYSIS**

This memo outlines the results of the data review and identifies high priority data gaps requiring further clarification or investigation by District staff.

Furthermore, this document sets out the analysis criteria to be used in conjunction with the hydraulic water models to determine existing and growth related deficiencies in the water system.

Scope of Analysis

The District of Lake Country (District) provided a list of six (6) discrete areas within the municipal boundary that are deficient in available fire flow as listed below:

- Okanagan Centre Area (Hare Road and to the west);
- Oyama Isthmus;
- Irvine Boosted Zone;
- Cornwall Road Area;
- Carrs Landing Area; and
- Ponderosa Road Area

These discrete areas are illustrated in **Figure A**. The District also requested a review of the Coral Beach water system.

Note: the fire flow analyses performed under this project focus only on the hydraulic limitations of the distribution system (main sizing and PRV capacities). A review of available supply (treated water storage and fire flow duration) is outside the scope of this work program.

Okanagan Lake

Area #1
Okanagan Centre

Area #5
Carrs Landing

Area #7
Coral Beach

Area #6
Ponderosa Road

Area #3
Irvine Boosted Zone

Wood Lake

Area #4
Cornwall Road

Kalamalka Lake

Area #2
Oyama Isthmus

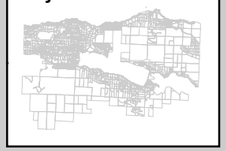
0 500 1,000 2,000
Meters

URBAN systems

U:\Projects_KEL\1577\0063\01\D-Drafting Design-Analysis\GIS\Current\Tech Memo 1 - Figure A.mxd Last updated by jbarta on February-02-16 at 8:34:15 AM

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan



Legend

Watermain

Analysis Areas

AreaLabel

- Carrs Landing
- Coral Beach
- Cornwall Road
- Irvine Boosted Zone
- Okanagan Centre
- Oyama Isthmus
- Ponderosa Road

Small Diameter Watermain Analysis

1:38,229

January 18, 2016

DRAFT

Figure A

Data Review

Urban Systems collaborated with the District to update their GIS infrastructure datasets during 2011 through 2013. The same data was used to constructed hydraulic water models for the Beaver/Okanagan Lake systems as well as the Kalamalka/Oyama Lake systems.

The Ravenridge (Lakepine) and Alto water systems were incorporated into the Beaver/Okanagan Lake hydraulic water model. The Coral Beach water system has not been modeled.

The marked-up maps provided by the District also included some corrections to the piping and valve infrastructure. The hydraulic models were updated to match the mark-ups.

Based on our review, the level of detail and quality of the data received is sufficient to undertake the hydraulic analyses and identify system deficiencies.

Analysis Criteria

The majority of the Districts small diameter watermains are located in established residential and rural neighbourhoods, which typically require only a minimum level of fire protection. The Districts' Subdivision and Development Servicing Bylaw #97-139 requires new subdivisions to provide a minimum fire flow of 3,600 L/min, unless additional flow is required per Fire Underwriters Survey (FUS) guidelines.

However, as noted in the start-up meeting notes - circulated January 7th, 2015 – the District has requested that the minimum available fire flow be set at 5,000 L/min for residential areas.

The same meeting notes also requested that the minimum fire flow to be provided to the Packing House area of 4th Street in the Okanagan Centre area, shall not be less than 10,000 L/min.

Update: The District has reduced the fire flow requirement for the Okanagan Centre area (Packing House) to 5,000 L/min since the fire department has the ability to supplement fire flow by pumping from Okanagan Lake.

All fire flow analyses will be conducted per the following criteria from the Districts current Subdivision and Development Servicing Bylaw #97-139 and its amendments:

- Fire flow demands shall be in addition to Maximum Day Demands (MDD);
- Minimum residual pressure at fire flow conditions 140 Kpa; and
- Maximum velocity in pipes under MDD+FF conditions shall not exceed 4.0 meters per second

Watermain looping shall be investigated, where possible, to minimize existing watermain upsizing.

URBAN systems

Cost Estimates

The cost estimates provided in the pre-design report and technical memorandums will vary depending on the type of infrastructure improvement. Typically, for high level analysis with limited site data, a class 'D' estimate is prepared.

Watermain upgrade cost estimates shall be provided at a Class 'C' level due to the uncertainty of other utilities in the ground and a lack of geotechnical information for each project. The estimates will include a 25% contingency allowance as well as 15% for engineering and construction.

Facility upgrades, such as a new PRV station, have fewer unknowns and uncertainties than in-ground pipe infrastructure projects. As such, facilities estimates will include a 20% contingency allowance as well as 15% for engineering and construction.

Cost estimates will not include land costs (such as securing new easements for a new watermain loop or purchasing land outside of the road right-of-way to construct a new above-ground PRV station on).

Please contact the undersigned if you have any questions or require any clarification of the above information.

URBAN SYSTEMS LTD.

Jason Barta, B.Sc.
Municipal Infrastructure Analyst

Reviewed by:

Jeremy Clowes, P.Eng.
Water Engineer

/jb

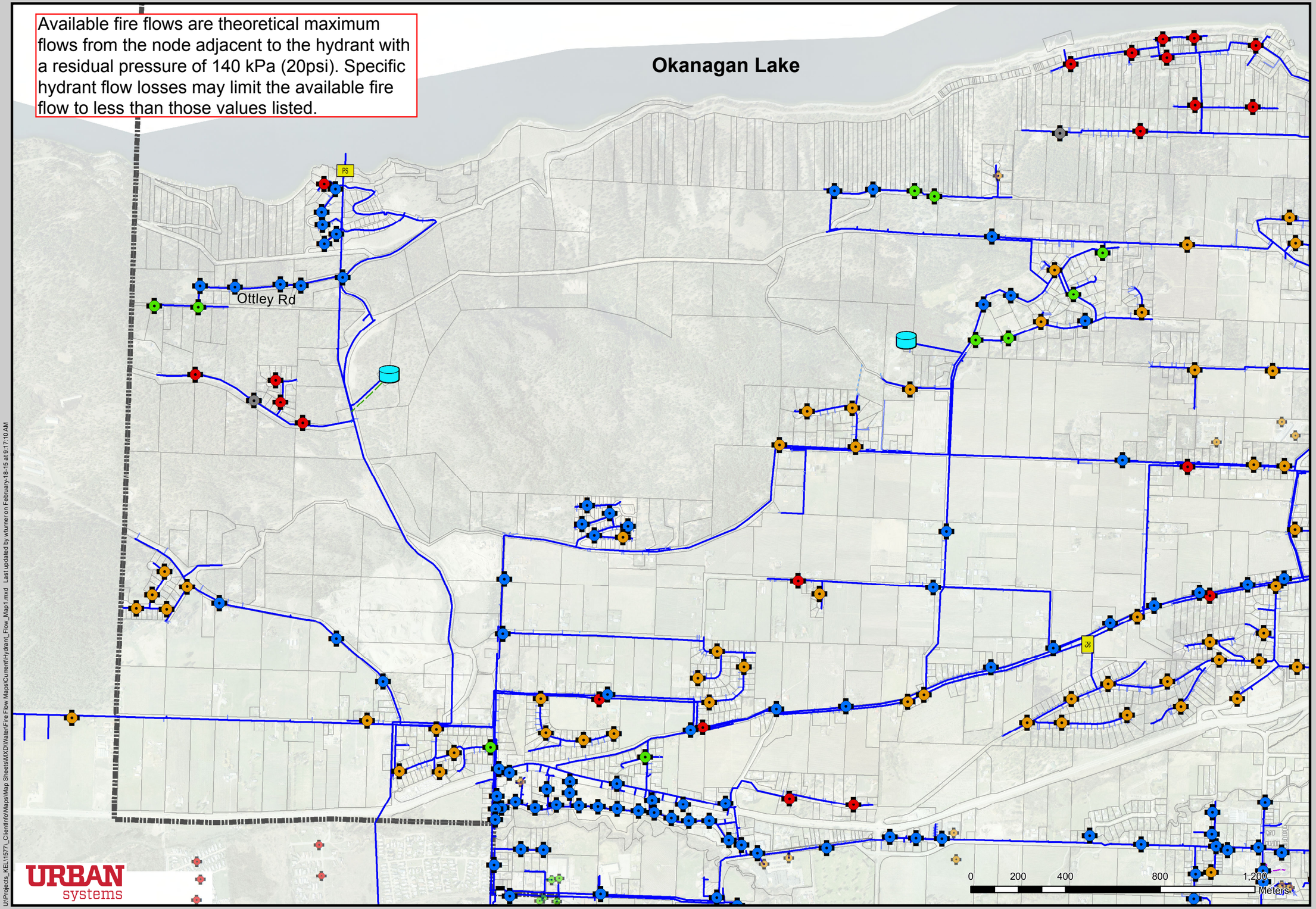
U:\Projects_KEL\1577\0063\01\R-Reports-Studies-Documents\R1-Reports\Draft\Appendices\Appendix A - Areas Reviewed for SDW Analysis\2016-03-10 Appendix A - Areas Reviewed.docx

Appendix B

Available Fire Flow Mapping

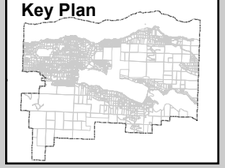
URBAN systems

Available fire flows are theoretical maximum flows from the node adjacent to the hydrant with a residual pressure of 140 kPa (20psi). Specific hydrant flow losses may limit the available fire flow to less than those values listed.



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan



Legend

District Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

Private Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

WATER SYSTEM FIRE FLOW

1:15,000

Last Updated: Nov, 2013

MAP SERIES

MAP FF-1

URBAN systems

U:\Projects_KEL\1677_Client\Info\Maps\Map Sheets\MXD\Water\Fire Flow Maps\Current\Hydrant_Flow_Map1.mxd Last updated by wturner on February-18-15 at 9:17:10 AM

Available fire flows are theoretical maximum flows from the node adjacent to the hydrant with a residual pressure of 140 kPa (20psi). Specific hydrant flow losses may limit the available fire flow to less than those values listed.

Okanagan Lake

Wood Lake

Okanagan Centre Rd
Maddock Ave
Stokepogis Rd
Hare Rd
Camp Rd
Cheesman Rd
Okanagan Centre Rd
Private Strata
Nighthawk Rd
Tyndall Rd
Camp Rd
Lang Ct
Ivy Ct
Klondike Rd
Camp Rd
Hallam Dr
Hallam Ct
Davidson Rd
McGowan Rd
Cemetery Rd
McGowan Rd
Nygren Rd
Bond Rd
Bond Ct
Flory Ct
Mowberry Rd
Bond Rd
Lacresta Rd
Flory Rd
Goldie Rd
Okanagan Centre Rd
Pow Rd
Broadbent Rd
McFarlane Rd
Pixton Rd
Pixton Strata
PS
McCreight Rd
Carrs Landing Rd
Moberly Rd
Lakepine Rd
Forest Hill Rd
Artella Rd
Williams Rd
Seaton Rd
Lakewood Rd
Brewer Rd
Okanagan Centre Rd
Lake Hill Dr
Driftwood Ct
Lakeshore Dr
Shoreline Way
Apex Ct
Sandy Cove Ct
Cliffshore Dr
East Ridge Ct
East Ridge Dr
Cliffstone Ct
Jardine Rd
Mimac Rd
Middleton Rd
Pretty Rd
Barcell Rd
Roberts Rd
Robinson Rd
Pretty Road Rd
Eva Rd
Woodsdale Rd
Woodsdale Ct
Oceola Rd
Pretty Rd
Seymour Rd
97 Hwy
Old Mission Rd
Ponderosa Dr
Bottom Wood Lake Rd
Deldor Rd
Maryvale Rd
Wagenman Rd
Bridge Rd
Rogers Rd
Element Rd

0 200 400 800 1,200 Meters

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

District Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

Private Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

WATER SYSTEM FIRE FLOW

1:15,000
Last Updated: Nov, 2013

MAP SERIES

MAP FF-1

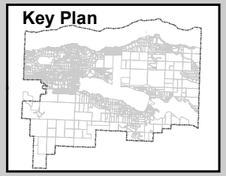
URBAN systems

U:\Projects_KAM\1577_Client\Info\Maps\Map Sheets\MXD\WaterHydrant_Flow_Map2.mxd Last updated by wturner on December-04-13 at 8:22:20 AM

Available fire flows are theoretical maximum flows from the node adjacent to the hydrant with a residual pressure of 140 kPa (20psi). Specific hydrant flow losses may limit the available fire flow to less than those values listed.

LAKE COUNTRY
Life. The Okanagan Way.

Key Plan



Legend

District Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

Private Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

WATER SYSTEM FIRE FLOW

1:15,000
Last Updated: Nov, 2013

MAP SERIES

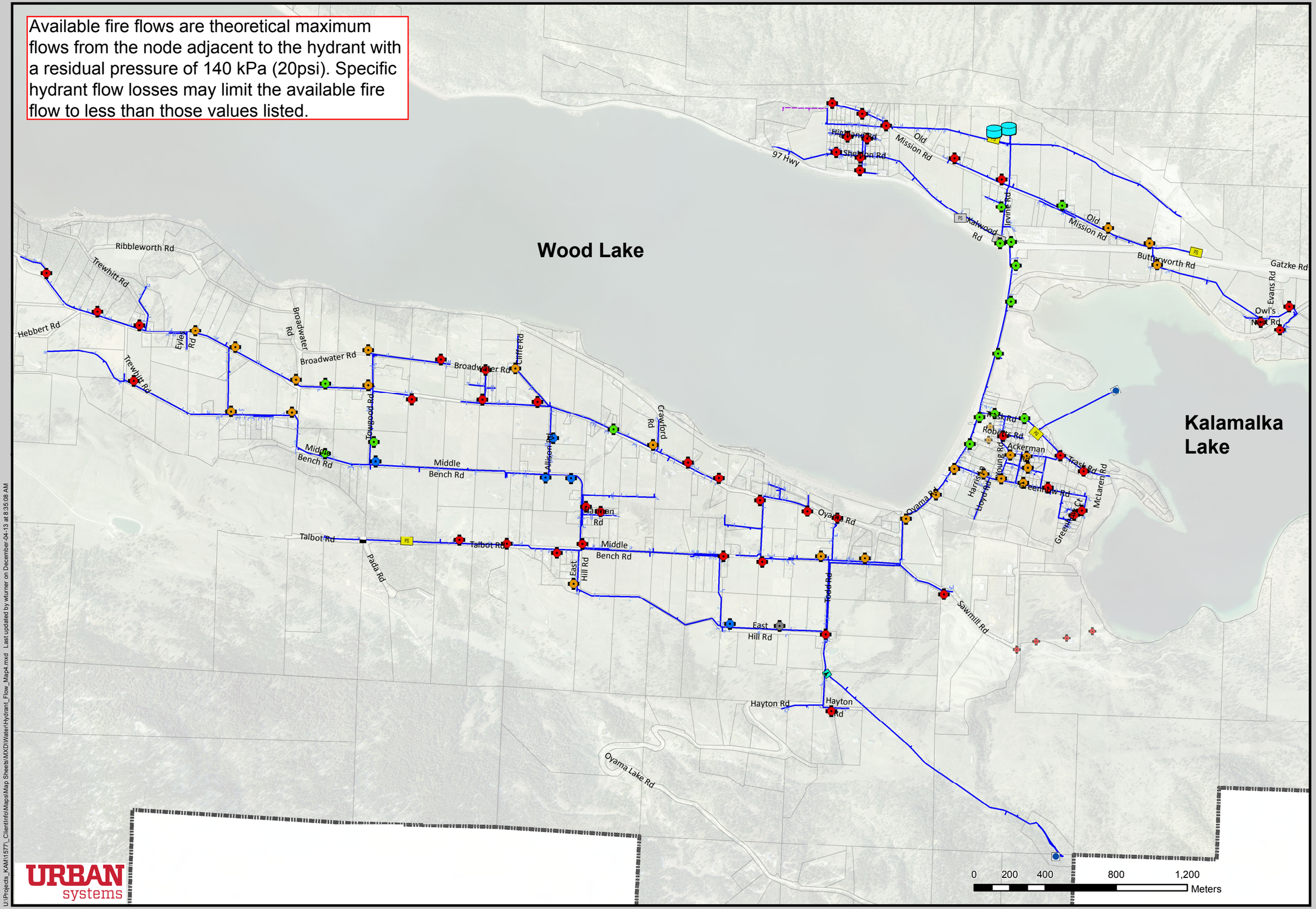
MAP FF-3

URBAN systems

0 200 400 800 1,200 Meters

Wood Lake

Available fire flows are theoretical maximum flows from the node adjacent to the hydrant with a residual pressure of 140 kPa (20psi). Specific hydrant flow losses may limit the available fire flow to less than those values listed.



LAKE COUNTRY
Life. The Okanagan Way.

Key Plan

Legend

District Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

Private Hydrants
- No Flow Data
- 0-499 IGPM
- 500-999 IGPM
- 1000-1499 IGPM
- 1500+ IGPM

WATER SYSTEM FIRE FLOW

1:20,000

Last Updated: Nov, 2013

MAP SERIES

MAP FF-4

URBAN systems

U:\Projects_KAM\1577\L_ClientInfo\Maps\Map Sheets\MXD\WaterHydrant_Flow_Map4.mxd Last updated by wturner on December-04-13 at 8:35:08 AM

Appendix C

Kalamalka Distribution System Upper Pressure Zone Review (Urban Systems)

URBAN systems

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01
January 2013

304 - 1353 Ellis Street, Kelowna, BC V1Y 1Z9 | T: 250.762.2517

Contact: Jeremy Clowes
T: 250 762 2517
jclowes@urbansystems.ca

urbansystems.ca

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01
January 2013

LAKE COUNTRY
Life. The Okanagan Way.

Table of Contents

URBAN systems

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01
January 2013

LAKE COUNTRY
Life. The Okanagan Way.

List of Tables

List of Figures

List of Appendices

URBAN systems

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01
January 2013

LAKE COUNTRY
Life. The Okanagan Way.

1.0 Introduction

Urban Systems Ltd. (Urban) was retained by the District of Lake Country (DLC) to review the Upper Pressure Zone (UPZ) located within the Kalamalka Lake Water Distribution System. The UPZ, which provides service to approximately 100 residents and has 18 irrigation services, is supplied by two booster stations that are located in buried chambers and draw water from the Irvine Reservoir. The two main objectives of the study are to:

- Identify any deficiencies within the UPZ distribution network (e.g., water quality concerns, inadequate fire protection, etc.)
- Complete the preliminary design of an above ground booster station to replace both existing booster stations and improve working conditions for DLC operators.

This report starts by providing an overview of the existing UPZ, then moves on to identify design criteria in Section 3, presents findings from the distribution network review in Section 4 and reviews the preliminary booster station design in Section 5. The report ends with cost estimate for the overall project.

URBAN systems

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01
January 2013

LAKE COUNTRY
Life. The Okanagan Way.

2.0 Existing System

2.1 Demands

The extents of the UPZ service area are shown in Figure 1. There are 38 residential and 18 irrigation services. The demands for the UPZ are summarized in Table 2-1. The methodology followed by Urban to establish the demands of the UPZ is included in Appendix 2-1. Irrigation demands account for over 95% of the maximum day demand. As such, the demands vary significantly throughout the year based on the seasonal irrigation use. There are three fire hydrants located at the south end of the UPZ. This area of UPZ contains single detached dwelling units. Accordingly, we have based our review of the distribution network on being able to deliver a minimum fire flow of 60 L/s which is consistent with the *MMCD Design Guideline Manual 2005* and also the minimum value permitted in the *DLC Subdivision and Development Servicing Bylaw No.97 – 139* (DLC SDSB).

Table 2-1 – UPZ Demands

Scenario	Demand (L/s)
Winter Average Day Demand[1]	0.4
Average Day Demand (ADD)[2]	2.3
Maximum Day Demand (MDD)	46.0
Peak Hour Demand (PHD)	46.0
PHD – Domestic Only	3.1
Minimum Fire Flow	60

Notes:
1. Based on domestic indoor use
2. Based on domestic indoor and domestic irrigation uses

2.2 Distribution Network

The UPZ distribution network contains approximately 2.8 km of watermain which varies in size from 100 to 200 mm. As shown in Figure 1, the residential area within the UPZ is serviced by 100 mm watermain.

URBAN systems

2.3 Booster Stations

The locations of the two booster stations that service the UPZ are shown on Figure 1. The Site 2 Booster Station supplies the UPZ under normal operating conditions whereas the Site 1 Booster Station is used as backup to the Site 2 Booster and to supplement fire flows. A brief summary each station is included below.

Site 2 Booster Station

The Site 2 Booster Station consists of a buried chamber structure that was constructed in 1996 and is equipped with a 40 HP inline booster pump and a 3 HP end suction pump.

Site 2 Booster Station

The structure and mechanical equipment appear to be in good condition but the buried chamber causes a number of concerns most notable of which are listed below:

- Safety – The station is only accessible through a hatch a ladder that is approximately 4 m long. If a staff member was injured inside the chamber, the restricted means of entry will make any emergency response action more complicated to execute.

- Operation and Maintenance – The chamber is a confined space as defined by the Occupational Health and Safety Regulation. Entering a confined space versus a non-confined space requires additional staff, safety equipment and training to complete routine tasks.

- Risk of Facility Being Damaged – If the chamber was ever flooded (from a natural event, pipe leak, etc.), it is likely that all electrical equipment will have to be replaced. The repairs to bring the station back online would

be time consuming, costly and impact DLCs ability to maintain service to users in the UPZ.

Site 1 Booster Station

The Site 1 Booster Station is equipped with a 60 HP horizontal split case pump and a 1.5 HP multi-stage booster pump. This facility is older than the Site 2 booster and the mechanical equipment is nearing the end of its service life.

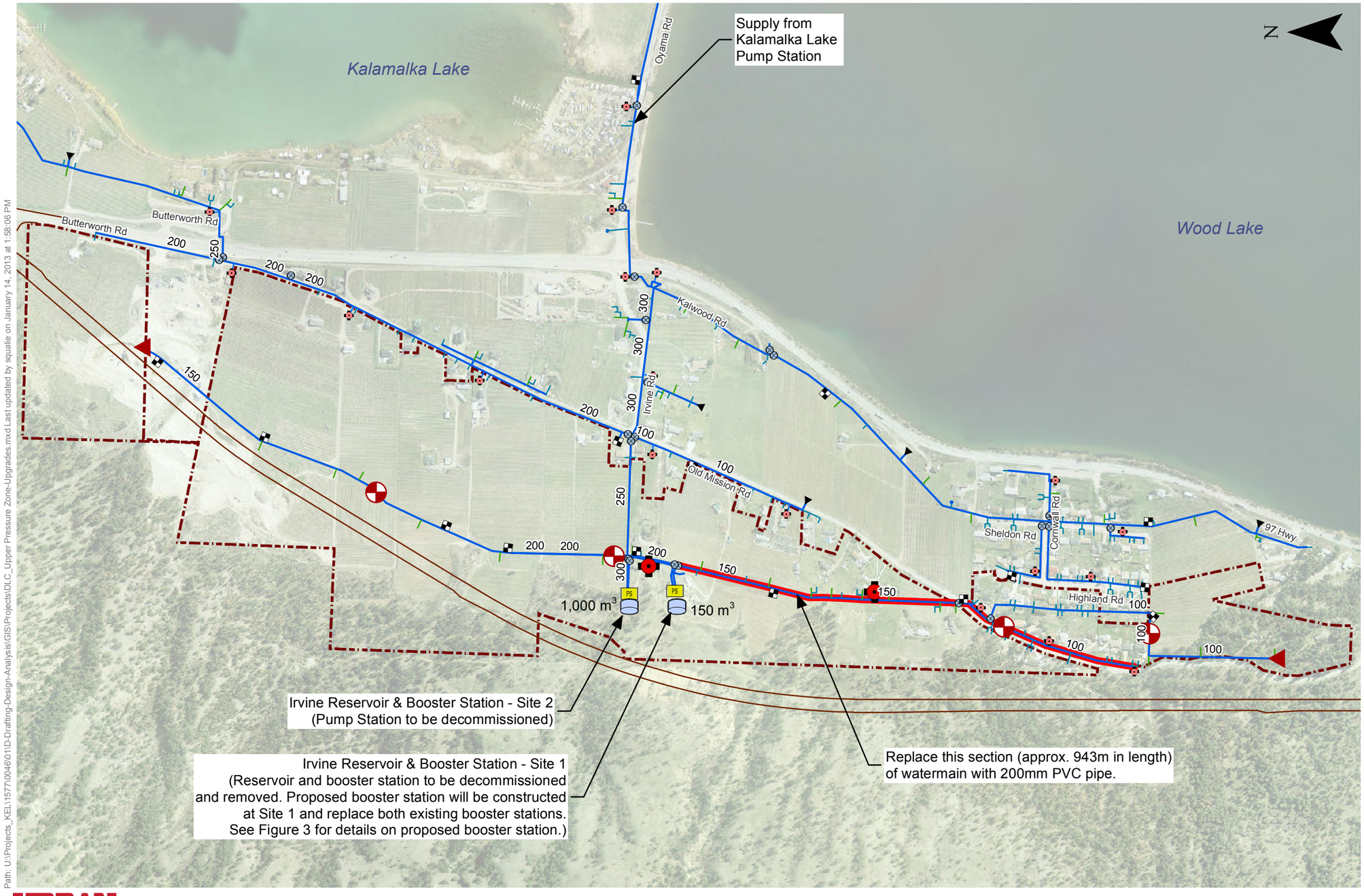
Site 1 Booster Station

The Site 1 Booster Station is also a buried chamber which raises the same concerns as identified above for the Site 2 Booster Station.

Site 1 Booster Station

LAKE COUNTRY
Life. The Okanagan Way.

Kalamalka Lake Distribution System
Upper Pressure Zone - Proposed Upgrades



Legend

- Proposed 200mm Watermain Upgrade
- Proposed Blowoff
- Proposed Private Hydrant
- Proposed Valve
- Pump Station
- Reservoir
- Air Release
- Blowoffs
- Water Hydrant
- Water System Valves
- Watermain
- Hydrant Lead
- Domestic Service
- Irrigation Service
- Pressure Zone Extents
- Future Highway

0 0.1 0.2 0.4 km

Path: U:\Projects_KEL\1577\0046\01\D-Drafting-Design-Analysis\GIS\Projects\DLC_Upper Pressure Zone-Upgrades.mxd Last updated by squalie on January 14, 2013 at 1:58:06 PM

URBAN systems

Figure 1

Water System
1577.0046.01 | January 2013

3.0 Design Criteria

Urban's review of the UPZ distribution network and preliminary booster station design is based on criteria identified in the following documents:

- DLC Subdivision and Development Servicing Bylaw No.97-139
- MMCD Design Guideline Manual 2005
- Hydraulic Institute Standards
- Fire Underwriters Survey Water Supply for Public Fire Protection 1999
- American Water Works Association

Specific sizing criteria that we followed are summarized below:

Pump Sizing

The proposed pumps have been designed to meet existing demands as presented in Table 2-1. This ensures that pumps will operate as efficiently as possible for existing conditions and can be upsized if future development occurs within the UPZ.

Watermain Sizing

All watermain (including booster station piping) has been sized to allow for a minimum 20% increase in demands. This approach provides DLC with the ability to accommodate some growth in the UPZ without undertaking significant capital works. Contrary to pump sizing, allowing for future growth in watermain sizing reduces energy consumption by decreasing frictional losses that have to be overcome by the pumping system.

4.0 Distribution Network Review

Urban completed a review of UPZ distribution network to identify potential water quality concerns, adequacy of fire protect provided and for general compliance with the DLC SDSB.

4.1 Water Quality

The UPZ is divided into two braches as shown on Figure 1. The north branch has 6 irrigation services. The south branch contains all 38 residential services and the remaining 12 irrigation services. The north branch is most likely to cause a water quality problem as it is stagnant outside of irrigation season. To address this concern, Urban recommends that DLC isolate and drain the north branch after irrigation season. In the spring and prior to DLC allowing irrigation, the north branch would be flushed and disinfected in accordance with AWWA C651.

The south branch terminates in two separate dead-end mains—the south-east dead-end and south-west dead-end. We estimate that the water ages a maximum of a half day under winter ADD conditions in the south branch. We typically do not expect any water quality issues to arise unless water age exceeds 5 days when free chlorine is utilized for a residual disinfectant. DLC staff advised that they do not have any problems maintaining chlorine residual in the UPZ as Urban expected. The only item pertaining to the south branch that Urban raises for DLCs consideration is the fact that the south-east dead-end terminates with a section approximately 337 m long with 4 irrigation services. As per the north branch, this portion of watermain will be stagnant outside of irrigation season which may cause water quality problems. Urban recommends that DLC consider taking the same action as recommend above for the north branch to mitigate potential issues with stagnant water in the south-east dead-end main.

4.2 Fire Protection

Urban reviewed available fire flow and hydrant coverage within the UPZ. Based on a past report prepared by Mould Engineering Services Ltd., the maximum available fire flow under existing conditions equals approximately 25 L/s at hydrant 530 (refer to Figure 2). The available fire flow will be less than this value at the other two hydrants due to the headloss caused by the 100 mm watermain in the residential area. As discussed under Section 2, we recommend that the UPZ be able to deliver a minimum fire flow of 60 L/s. In order to achieve this, the majority of the watermain in the south branch of the UPZ will have to be replaced with a larger 200 mm pipe—refer to the highlighted watermain in Figure 1. It is not feasible to convey the fire flow through the existing piping due to excessive amount of headloss that will occur.

Figure 2 shows the existing hydrant coverage based on the minimum recommended spacing (i.e., 180 m) identified by the Fire Underwriters Survey. Urban recommends that DLC consider adding at least 2 private hydrants, as shown on Figures 1 and 2 to improve hydrant coverage for existing structures.

4.3 Conformance to Subdivision and Development Servicing Bylaw

Urban reviewed Schedule C.5 of DLC SDSB and identified a few items that do not conform to the specified design criteria. These items relate to pipe sizing, dead-end watermains, blow-offs and valving.

The minimum permitted pipe size is 200 mm. The majority of the UPZ does not meet this criterion. As per Section 4.2, the critically undersized pipe as it relates to fire protection is identified for replacement on Figure 1.

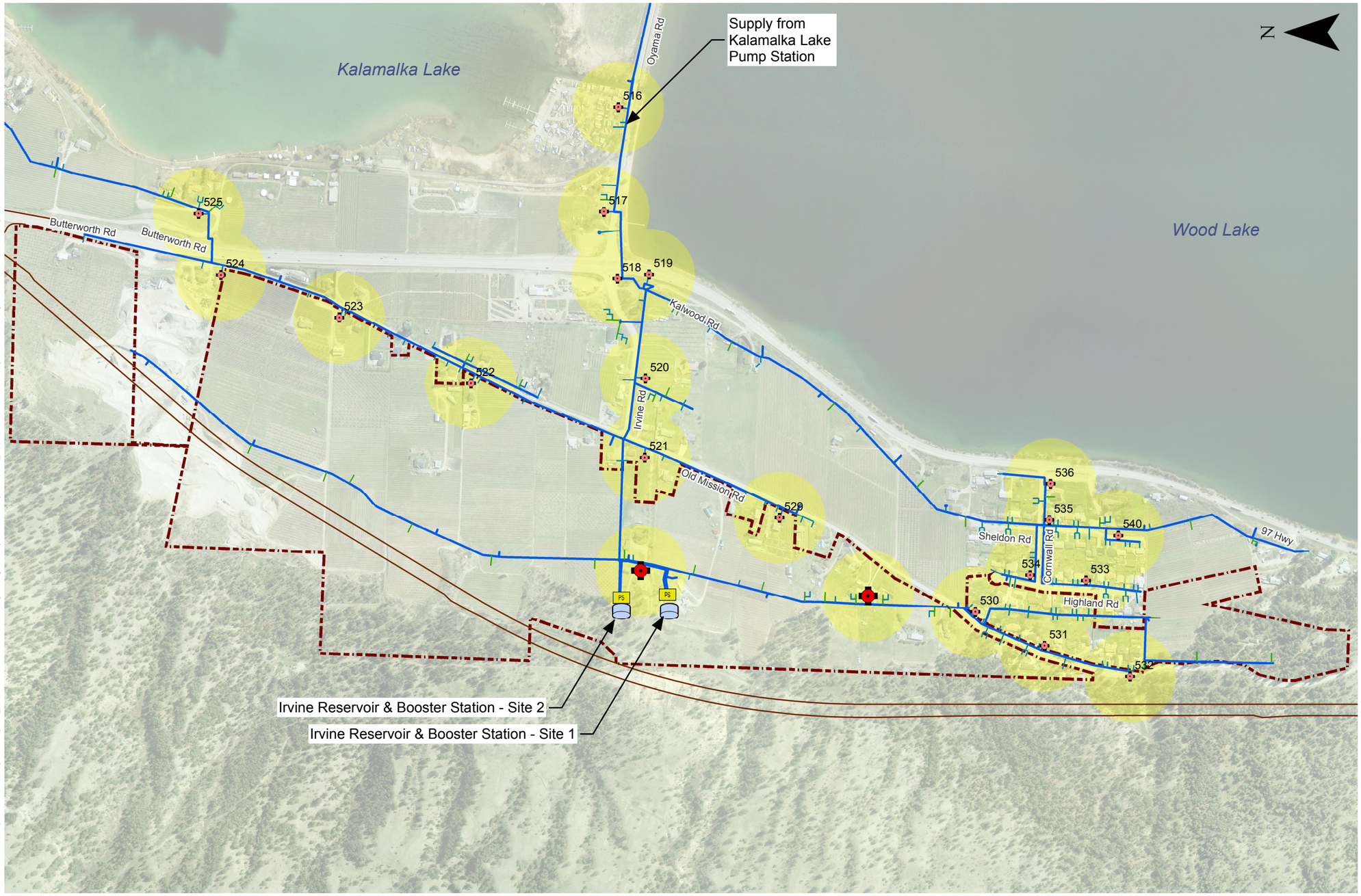
150 m is the maximum allowable length of a dead-end watermain. Section 4.1 identified two dead-ends of concern (north branch and south-east dead-end) and measures to mitigate potential water quality issues.

Blow-offs are required at the end of watermains. Urban recommends that a blow-off be added to the end of the north branch and the south-east dead end. The hydrant at the end of the south-west dead-end should eliminate the need for a blow off in that location.

If UPZ was constructed today, up to 10 additional valves would have been installed to comply with DLC SDSB. Urban has identified 4 additional valves that can be installed to add flexibility for operations and maintenance tasks.

LAKE COUNTRY
Life. The Okanagan Way.

Kalamalka Lake Distribution System
Upper Pressure Zone - Hydrant Coverage



Legend

- Proposed Private Hydrant
- Hydrant Coverage
- Pump Station
- Reservoir
- Water Hydrant
- Watermain
- Hydrant Lead
- Domestic Service
- Irrigation Service
- Pressure Zone Extents
- Future Highway

0 0.1 0.2 0.4 km

Path: \\usl.urban-systems.com\projects\Projects_KEL\1577\0046\01\D-Drafting-Design-Analysis\GIS\Projects\DLC_Upper Pressure Zone-Hydrant Coverage.mxd Last updated by squalie on November-29-12 at 2:59:12 PM

URBAN systems

Figure 2

Water System
1577.0046.01 | November 2012

4.4 Summary of Distribution Network Recommendations

Table 4-1 – Summary Distribution Network Recommendations

Review Focus	Recommendations
Water Quality	North branch and South-east dead end of UPZ – Isolate main outside of irrigation season when not in use and flush and disinfect before returning the watermain to service.
Fire Protection	Upsize watermain to all hydrants as shown in Figure 1.
	Install 2 private hydrants as shown on Figure 1. Additional coverage provided by these hydrants is shown on Figure 2.
Conformance to Subdivision and Development Servicing Bylaw	Install 2 blow-offs as shown on Figure 1.
	Add 4 valves as shown on Figure 1.

5.0 Booster Station – Proposed Upgrade

Urban has completed the preliminary design of a booster station that will replace both existing booster stations servicing the UPZ. The proposed booster will address concerns raised in Section 2.3. The preliminary design was aided by Interior Instrument Engineering Services and Advanced Surveying Ltd. Interior Instrument Engineering Services provided input on the electrical and instrumentation requirements. Advanced Surveying Ltd. completed a topographical survey of the proposed site for the replacement booster station. The preliminary design is summarized in this section.

5.1 System Analysis

Urban has identified pumping requirements with a Bentley WaterCad V8i water model. These results are preliminary and are to be verified at the detailed design stage. Duty pump sizing is based on being able to deliver PHD with a single pump. Fire flow conditions allow for both duty pumps to be operating in parallel. The jockey pump has been sized to provide the domestic PHD.

Table 5-1 – Pumping Requirements

Pump and Scenario	Flow (L/s)	Total Dynamic Head (m)	Estimated Power Requirement (HP)
Duty Pump			
PHD	46.0	41.5	36
MDD + Fire Flow	106.0	28.9	29[1]
Jockey Pump			
Domestic PHD	3.1	41.0	2.4

Notes:

1. Power requirement is per duty pump and based on maintaining a minimum system pressure of 20 psi (140 kPa).
2. Duty and jockey pump sized to maintain an equivalent system pressures to existing Site 2 facility (i.e., 64 psi at an elevation of approx. 469 m).
3. All scenarios are based on the Irvine Reservoir level being at 472.85 m (70% full) and all pumps at the Kalamalka Pump Station being turned off.
4. Total dynamic head estimates are based on watermain being replaced to all hydrants with 200 mm pipe as shown on Figure 1.

Urban has selected a duty pump (40 HP - Aurora 410) and jockey pump (3 HP – 15SVGoulds) that satisfy the requirements identified in Table 5-1. Refer to Appendix 5-1 for additional information on the selected pumps. The suitability of these pump selections should be reviewed again at the detailed design stage.

For transient conditions, it is expected that the impacts can be mitigated through air/vacuum valves located throughout the distribution network and pressure relief or surge anticipating valve located in the booster station. There are 8 existing air valves located in the distribution system. Urban has allowed for an additional 2 air/vacuum valves to be installed and for all existing valves to be replaced if needed (e.g., if valves are only air releases, undersized, in poor condition, etc.). Urban recommends that a transient analysis be completed at the detailed design stage to confirm if a pressure relief or surge anticipating valve is required and to identify the most critical air valves. Urban also recommends that DLC confirm the size, style (i.e., air release or air/vacuum) and condition of the existing air valves.

5.2 Site Design

Refer to Figure 3 for a preliminary site plan. The proposed booster station will be located next to the existing Site 1 booster station. Site 1 has been selected as the preferred location for the proposed booster station for two reasons: 1) Site has a lower elevation than Irvine reservoir which provides higher suction head for the pumps and 2) Site is relatively large and has sufficient space to accommodate the proposed building. Urban has proposed that the station be cut into the hillside near the east property limit. This has two benefits including: 1) Keeping the finished floor elevation as low as possible to ensure the pumps receive adequate suction pressure and 2) Limiting the amount of access road that has to be constructed. The proposed building location will require a retaining wall to maintain a floor elevation of 455.5 m and allow for ground level access. Urban recommends that the site layout be reviewed again when a geotechnical investigation has been completed. Urban notes that DLC is currently using a private driveway to access both Irvine Reservoir sites as shown in drawings of the existing facilities included Appendix 5-2. Urban recommends that DLC consider constructing an access road to the sites where they have secured a right-of-way. This is beyond the scope of this project and has not been allowed for in the estimated project costs provided in Section 6 of this report.

5.3 Booster Station Design

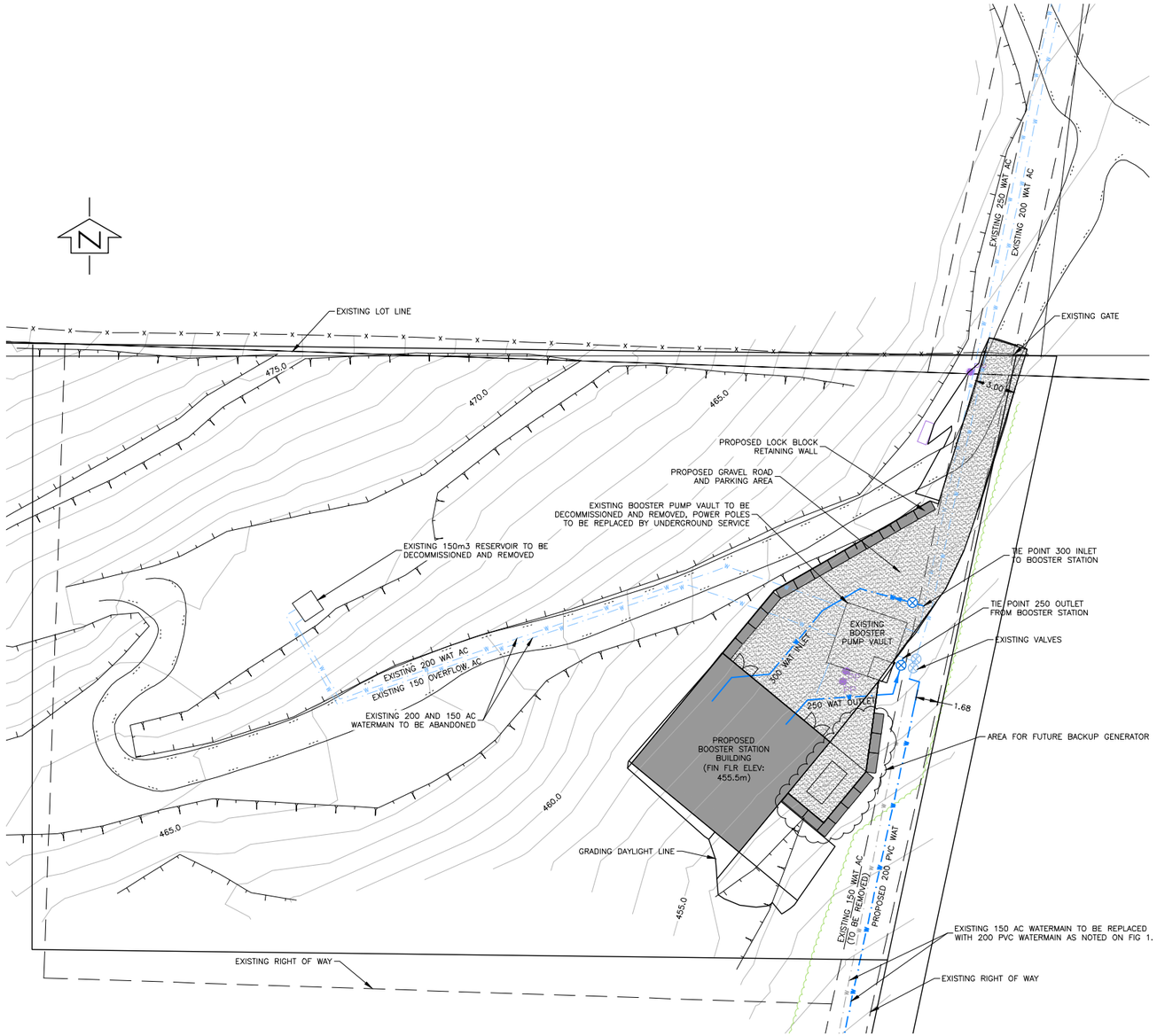
The booster station will be divided into two rooms, a mechanical room and an electrical room. This separation helps minimize the risk of electrical equipment being damaged from water in the event that any piping leaks or fails.

DLC has advised that minimal amenities are required at the station due to its proximity to other DLC facilities. As such, the preliminary layout does not include a washroom or have any designated space for an office or working station. The electrical room should have sufficient space to accommodate a working station if desired in the future.

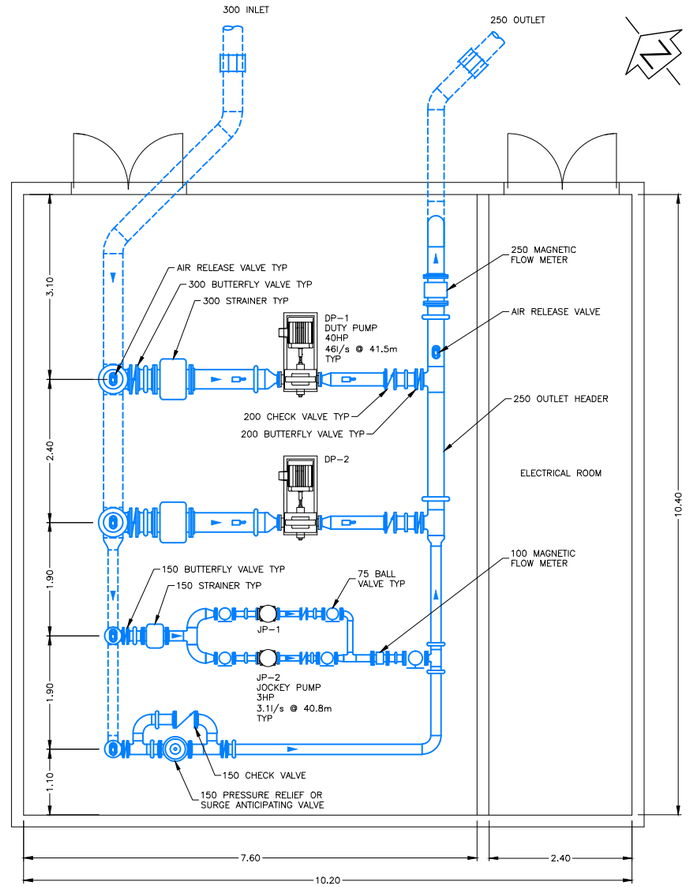
Full redundancy is provided for the duty and jockey pumps (i.e., one duty and one standby unit). Urban recommends using a horizontal split case style pump for the duty pumps based on the low head requirement. A vertical inline booster style pump is recommended for the jockey pumps. Strainers have been included to protect all pumps from solids. The process piping allows for a pressure relief or surge anticipating valve to be installed. The check valve shown on the relief line has been included so gravity flow can be maintained to residential users in the event of a power failure. Based on discussion with DLC staff, Urban has not provided space for a chlorine boosting system or allowed for any online analyzers.

Proposed booster will require a 600V, three phase 200A service from BC Hydro. Station will be equipped with a MCC that incorporates BC Hydro metering, surge arrestor, lighting panel and VFD motor control. Proposed PLC panel is to be installed to include SCADAPack PLC, radio equipment to interface with the District SCADA System, and UPS. PLC will be programmed to interface into the upgraded Kalamalka Lake Water Distribution System. Instrumentation will include 2-flowmeters, 2-pressure transmitters, and a room temperature transmitter. Provisions will be made to facilitate the installation of a future standby generator with minimal interference to the proposed building.

Costs identified in Section 6 allow for an HVAC system that includes energy efficient variable speed exhaust fan and intake damper.



SITE PLAN
1:200



BUILDING FLOOR PLAN
1:50

URBAN systems
urbansystems.ca

Client/Project	
DISTRICT OF LAKE COUNTRY IRVINE RESERVOIR	
Scale	**Date** / **Figure**
AS NOTED	2012/11/09 / FIG 3
1577.0046.01	**Title**

BOOSTER STATION
SITE AND BUILDING LAYOUT

5.4 Constructability

The pumps are sized based on the watermain, as highlighted in Figure 1, being replaced. As such, the proposed watermain will have to be installed and put into service before the proposed booster station is commissioned. Construction of both the watermain and booster station can occur at the same time but appropriate completion dates will have to be coordinated to address this matter.

Maintaining service to the UPZ while the proposed booster station is constructed will be relatively straightforward. Refer to Figure 1. The Site 2 existing booster station adjacent to the Irvine Reservoir will be able to operate for the duration of the project. The Site 1 existing booster, which acts as back up to the Site 2 booster, can be left in service for the majority of the project.

A portion of the watermain that is to be replaced (approximately 250 of 943 m shown on Figure 1) will disturb agricultural land and require the removal of fruit trees. This section of pipe could be installed with a trenchless method if needed to minimize surface disturbance.

5.5 Regulatory

Urban recommends providing Interior Health (IH) with the finalized copy of this report so they are aware of this upcoming project. If IH is able to provide feedback at this stage it should help expedite the construction permit application.

6.0 Cost Estimate

Table 6-1 contains a preliminary cost estimate for the UPZ proposed upgrades. A detailed cost estimate breakdown has been included in Appendix 6-1.

Table 6 -1 – UPZ Proposed Upgrades Cost Estimate

Item	Description	Total
1	Removals	$70,000
2	Booster Station	$640,000
3	Watermain Replacement	$355,000
	Subtotal	$1,065,000
	Contingency and Engineering (35%)	$372,750
	Total (Rounded)	$1,440,000

Notes

1. Item No.1 includes decommissioning and removal of the 150 m^3 reservoir and booster station from Site 1 and removal of mechanical and electrical equipment from the Site 2 booster station. Refer to Figure 1.
2. Watermain replacement includes allowance for replacing existing air/vacuum valves and installation of proposed air/vacuum valves as noted in Section 5.1.
3. Watermain replacement does not include any costs related to compensation for fruit trees that will be disturbed or removed when the watermain is installed.
4. Costs for optional proposed distribution network upgrades are included in Appendix 6-1. The optional items include the 2 private hydrants, 2 blow-offs and 4 isolation valves as shown on Figure 1.

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01

January 2013

LAKE COUNTRY

Life. The Okanagan Way.

Appendix 2-1

Water Model Background

URBAN systems

MEMORANDUM

URBAN systems

Date:	January 14, 2013
To:	District of Lake Country
From:	Jonathan Lowe, P.Eng., Jeremy Clowes, P.Eng.
File:	1577.0046.01
Subject:	Model Notes – Kalamalka Lake Distribution System - Upper Pressure Zone

1.0 INTRODUCTION

The purpose of this memorandum is to summarize:

- The methodology used for allocating the water demands across the upper pressure zone within the existing computer model of the Kalamalka Lake Water System and
- The analysis that was completed to determine pumping requirements for the proposed Irvine Booster Station.

2.0 WATER DEMANDS

The serviced lots/parcels within the Kalamalka Water System are not metered; therefore water demands were calculated based upon theoretical values provided by the DLC. The water demands were divided as follows:

- Indoor domestic – water used indoors for washing, drinking etc.
- Outdoor domestic – residential irrigation for lawns, landscaping etc.
- Agricultural irrigation – irrigation for agricultural crops within the ALR.

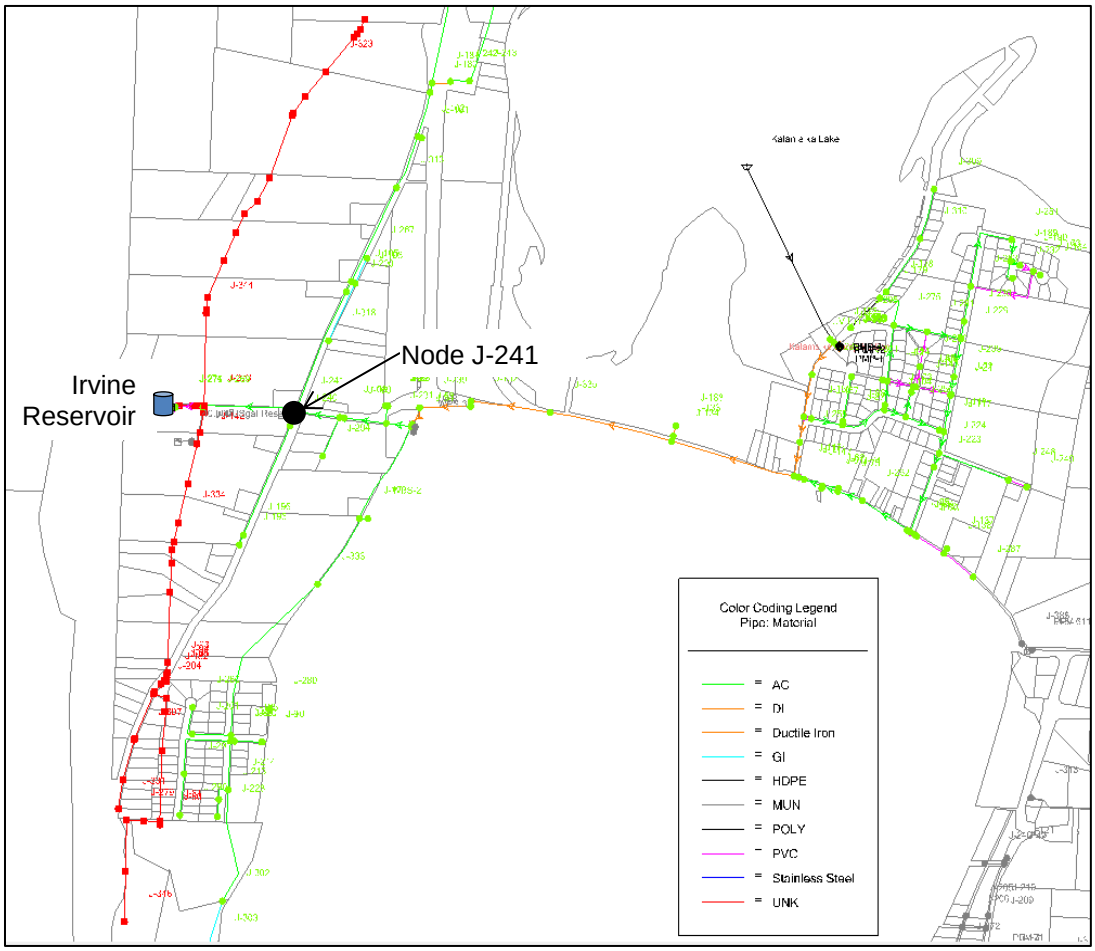
Domestic demands were based upon the information presented in the District of Lake Country (DLC) Engineering Water Conservation Initiative Study 2011 (referred to here after as “DLC Study”).

All parcels with a domestic service connection were considered active (as per direction received from the DLC). The indoor domestic demand and occupancy per domestic service was assumed to be 330 L/p/d and 2.6 people/household respectively as per the DLC Study. Therefore, the indoor (i.e. winter demand) per domestic service was 858 L/day/parcel or 0.010 L/s/parcel.

All domestic service connections were assumed to be unmetered as directed by the DLC. An outdoor irrigation demand per capita of 1,640 L/p/d for non-metered connections was used as per the DLC Study. As with the indoor domestic demand, an occupancy of 2.6 people/household was used. Therefore, the outdoor domestic irrigation demand per domestic service was 4,264 L/day/parcel or 0.049 L/s/parcel.

Agricultural irrigation demands were based upon the maximum allowable irrigation allotment per agricultural service connection of 970mm/year stated in the DLC bylaw. The irrigable area per parcel was determined based upon mapping of the current active irrigable areas provided by the DLC. The duration of the irrigation season was assumed to span 120 days per year. The unit agricultural irrigation demand used in the model was therefore 80.8 m^3/day/ha or 0.94 L/s/ha.

Below is a screen shot showing the upper pressure zone pipe distribution network highlighted in red.



During the initial set up of the model back in November 2011, all the demands for the Kalamalka Water System were allocated to a single junction in the model (J-241) because at the time there was no need to spatially distribute the demands.

The unit demands allocated to J-241 are summarized in the table below. There are a total of 296 domestic parcels with an active service connection and 97.0 ha of active irrigable area.

Unit Demands (Junction: J-241)

	Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (L/s)	Pattern (Demand)
1	296.000	Dom_Indoor		2.939	Fixed
2	296.000	Dom_Outdoor		14.608	Fixed
3	97.000	Ag_Ir_ha		90.713	Fixed
*					

The water demands in the upper pressure zone are summarized below:

Demand Group	Unit	Unit Demand	Demand (L/s)
Indoor domestic	38 parcels	0.010 L/day/parcel	0.38
Outdoor domestic	38 parcels	0.049 L/day/parcel	1.88
Agricultural irrigation	46.36 ha	0.94 L/s/ha	43.6

2.1 Water Demand Allocation Methodology

To simplify the demand allocation process within the WaterCAD model, water demands along the upper pressure zone were grouped together into "Demand Allocation Areas" and assigned to central locations along the distribution system.

Three demand scenarios were created in the model:

1. Maximum Daily Demand (MDD) - agricultural and indoor and outdoor domestic demands
2. Domestic indoor and outdoor demands
3. Winter Daily Demands (WDD) - indoor domestic demand only

3.0 PUMPING REQUIREMENTS

The analysis completed to determine pumping requirements is summarized below:

Demand Scenario	Irvine Reservoir Level (m)	Suction Head at J-390 (psi)	Discharge Head at J-394 (psi)	TDH (m)	Flow (L/s)
MDD	472.85	23.6	82.5	41.5	45.6
MDD + Fire Flow[1]	472.85	19.9	60.9	28.9	105.6
PHD (domestic only)	472.85	24.6	82.8	41.0	3.1

Notes:
1. Fire flow allocated to J-397 (Hydrant 532). Minimum system pressure of 21 psi at J-397.

4.0 CLOSURE

If you have any questions regarding the above, please don't hesitate to contact the undersigned.

Regards,
URBAN SYSTEMS LTD.

Jonathan Lowe, P.Eng
Water & Wastewater Engineer

Jeremy Clowes, P.Eng.
Water Resources Engineer

/jdl
\\usl.urban-systems.com\projects\Projects_KEL\1577\0046\01\D-Drafting-Design-Analysis\Water Model\2012-11-28 MEMO Kalamalka Upper Pressure Zone Demand Allocation.docx

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01

January 2013

LAKE COUNTRY

Life. The Okanagan Way.

Appendix 5-1

Pump Selections

URBAN systems

Pump Data Sheet - AURORA PUMPS

Company: Natpro

Potable Water Pump

Name: Irvine Booster Station

Date: 11/20/2012

PENTAIR

AURORA®

Pump:

Size: 4x5x15

Type: 410 1 STG SPLIT CASE
Synch speed: 1800 rpm

Speed: 1775 rpm
Dia: 316 mm

Curve: 2PC-117373A

Impeller: 444V326

Specific Speeds:

nq: 14
S: 102

Dimensions:

Suction: 125 mm
Discharge: 100 mm

Pump Limits:

Temperature: 135 °C
Pressure: 1724 kPa g
Sphere size: 15.9 mm

Power: ---
Eye area: ---

Search Criteria:

Flow: 46 l/s

Head: 41.5 m

Fluid:

Water
SG: 1
Viscosity: 1.104 cP

Temperature: 15.6 °C
Vapor pressure: 1.773 kPa a
Atm pressure: 101.4 kPa a

NPSHa: ---

Motor:

Standard: NEMA
Enclosure: ODP

Size: 30 kW
Speed: 1800
Frame: 324T

Sizing criteria: Max Power on Design Curve

---- Data Point ----

Flow:	46 l/s
Head:	41.7 m
Eff:	71%
Power:	26.1 kW
NPSHr:	3.71 m

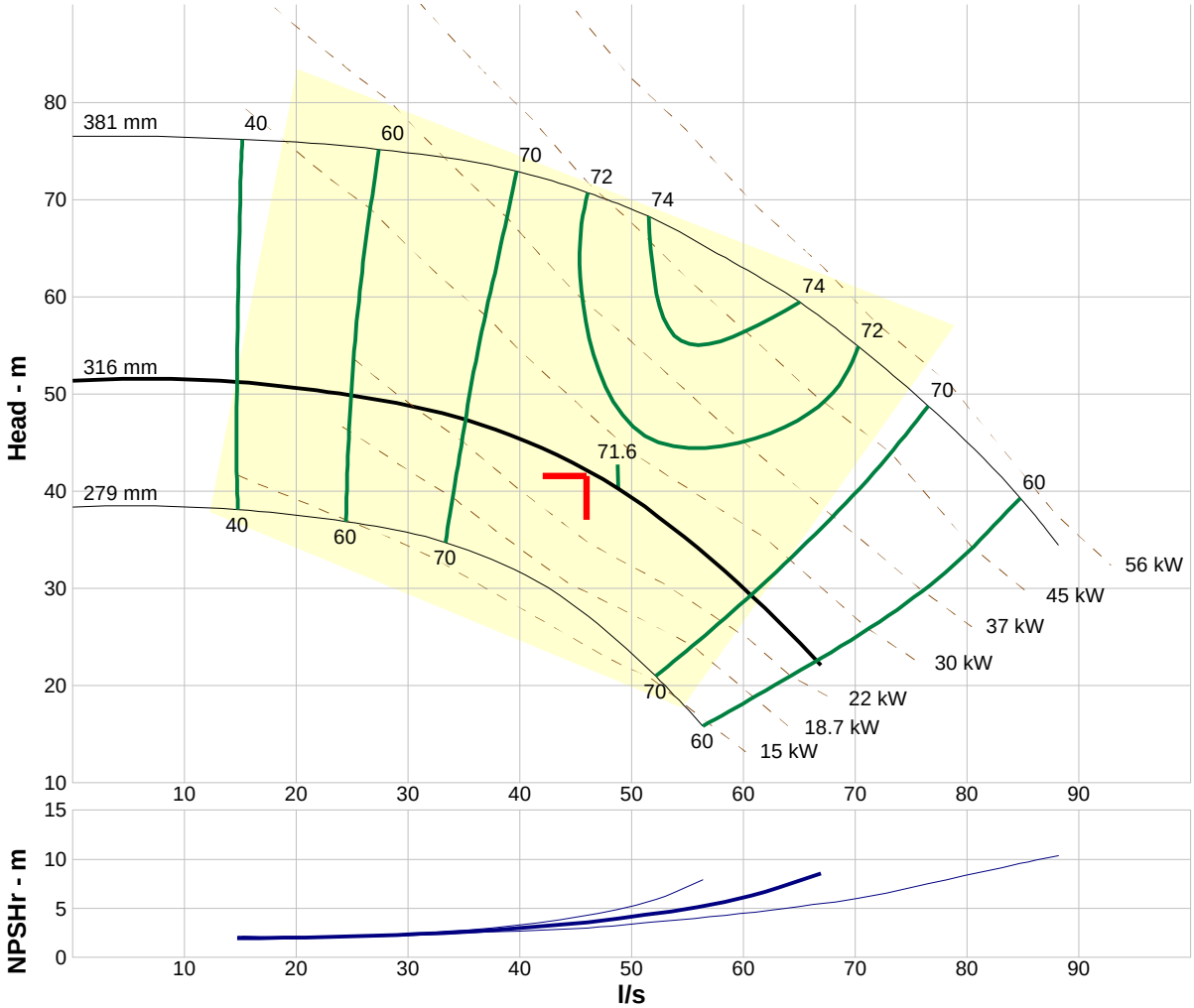
---- Design Curve ----

Shutoff head:	51.4 m
Shutoff dP:	502 kPa
Min flow:	---
BEP:	72% @ 48.8 l/s

NOL power:
26.8 kW @ 48.8 l/s

-- Max Curve --

Max power:
54.4 kW @ 84.7 l/s



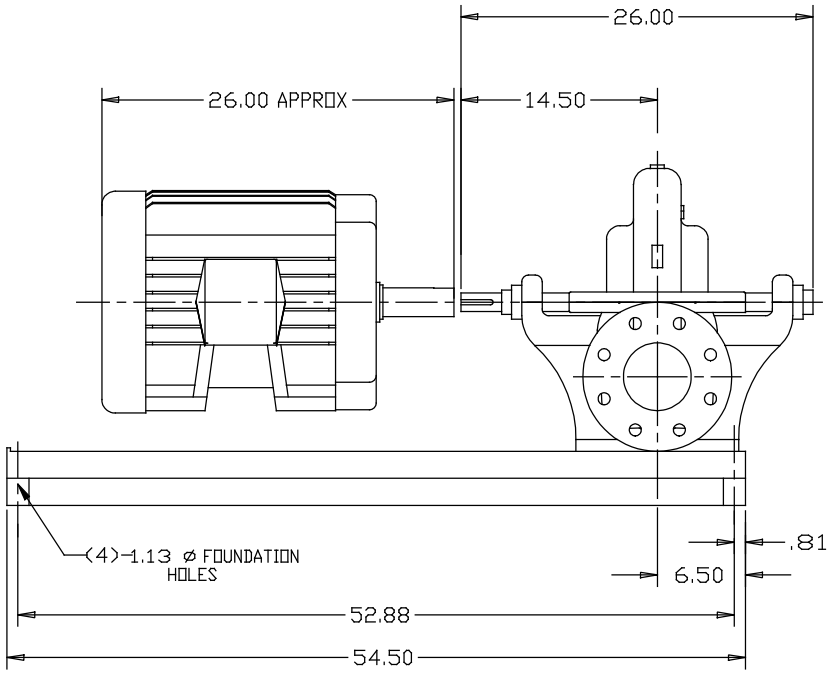
Curve efficiencies are typical. For guaranteed values, contact Aurora Pump or your local distributor. Las eficiencias en curvas son tipicas. Para valores garantizados contacte a Aurora Pump o a su distribuidor local.

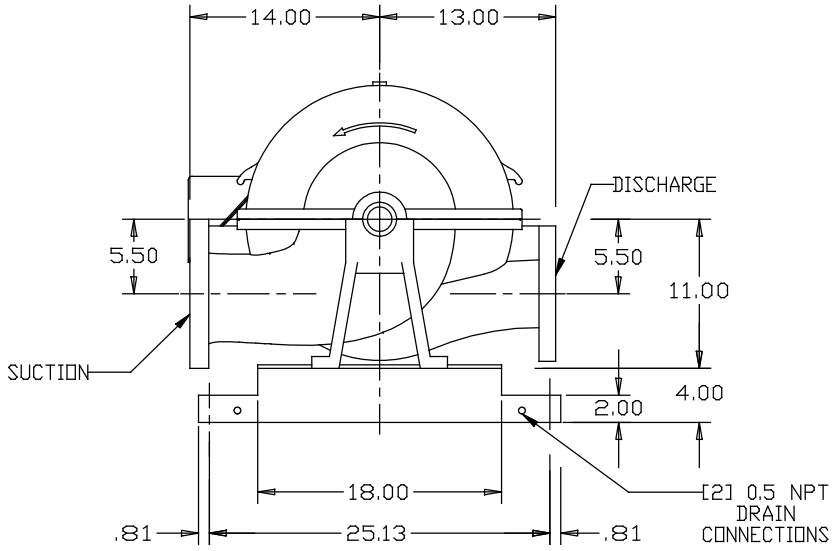
Performance Evaluation:

Flow l/s	Speed rpm	Head m	Efficiency %	Power kW	NPSHr m
55.2	1775	34.3	71	25.8	5.24
46	1775	41.7	71	26.1	3.71
36.8	1775	46.5	70	23.7	2.8
27.6	1775	49.2	63	21	2.29
18.4	1775	50.7	47	19.1	2.04

PART NUMBER
4114X5X15_RH125-125DR324T

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	324T_MOTOR	
2	1	411_4X5X15_RH_125-125	
3	1	DR_BASE_18X54X4	





NOTE :
COUPLING GAP MAY VARY FROM .13 TO 2.06

REV	ZONE	DATE	REVISION DESCRIPTION	BY	CK'D

NOTES:
1. FINISH = 125 RMS.
2. 2 PLACE DECIMALS ± .06
3. 3 PLACE DECIMALS ± .010
4. ANGULAR DIMENSIONS ± 1/2 DEGREE.
5. CHAMFER ALL MACHINED SURFACES .005-.010 X 45° AND REMOVE ALL BURRS.
6. ALL PARTS MUST BE FREE FROM SCALE
7. NO TOLERANCE NEEDED ON REFERENCE DIMENSIONS.
8. ALL BOLT CIRCLE TOLERANCE PER ANSI B16.5
9. CONCENTRICITY TO CENTERLINE .005

STANDARD TOLERANCES UNLESS OTHERWISE SPECIFIED.

MATERIAL:

AURORA
PENTAIR PUMP GROUP

DO NOT SCALE DRAWING

411 ON DRIP RIM BASE

DRAWN BY	DATE	CHECKED BY	APPROVED BY
MAHADEVAN	10/07/03	JLF	CSJ

PLOT SCALE	PATTERN NUMBER	SIZE	PART NUMBER	REV
0.150	-	C	4114X5X15_RH125-125DR324T	—

AGGRESSIVE PUMP & SUPPLY

November 20, 2012

Proposal No: AS12-11-20 01
Item No: ITEM 001
Job:

Series: e-SV Size: 15SV QTY: 1 Stage No: 11

Operating conditions

SERVICE	
LIQUID	
CAPACITY	50.0 gpm
HEAD	134.0 (ft)

Performance at 1750 RPM

PUBLISHED EFFY	71.7% (CDS)
RATED EFFY	71.7%
RATED POWER	2.40 hp (Run out 2.5 hp)
NPSHR	2.6 ft
DISCHARGE PRESSURE	59.9 psi g (79.7 psi g @ Shut off) Based on 0.0 psi g Suc.press
PERF. CURVE	15SV-1800-0
SHUT OFF HEAD	184.2 ft

Quoted Features

CONSTRUCTION	Round-304 (SVB)
MECHANICAL SEAL	Carbon/Silicon Carbide/Viton

Driver : Electric motor Manufacturer : Factory Choice

FURNISHED BY	Pump Mfg	MOUNTED BY	Pump Mfg
RATING	3.0 hp (2.2 KW)	ENCLOSURE	TEFC-PE
PHASE/FREQ/VOLTS	3/60 Hz/575	SPEED	1800 RPM
INSULATION/SF		FRAME	180TC
MOTOR PART NO	V09A34H5BD2S		

Program Version 1.39.0.0

Submittal Data

Multi-Stage Pumps

MODEL : 15SV11FF8E60

Hydraulic Data					Motor Data	e-SV Vertical Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	NPSHR	Voltage/Phase/Enclosure		
63.7 gpm	50.0 gpm	184.2 ft	134.0 ft	2.6 ft	575V 3 PH TEFC-PE	15SV11FF8E60	1

Submittal Prepared for: AGGRESSIVE PUMP & SUPPLY
Job:
Proposal No: AS12-11-20 01
Engineer:
Contractor:
Item No: ITEM 001
Submittal Prepared by: Aggressive Pump Sales
Company:
Date: November 20, 2012
Submittal Date: November 20, 2012
Approved by:

Engineering Data

Pump Code: 15SV11FF8E60
Pump Size: 15SV
Stage No: 11
Pump Horsepower at Rating Point: 2.40 hp
Pump Shut Off Head: 184.2 ft
Efficiency: 71.7 %
Motor Speed: 1800
System Input Power: 3 / 575 V
Motor Rated Horsepower: 3.0 hp
Max.Frequency: 60Hz
Frame Size: 180TC
Motor Part No: V09A34H5BD2S
Discharge Size: 2.00 in
Impeller Construction: Round-304 (SVB)
Impeller Type: Radial Impeller
Shaft Seal: Carbon/Silicon Carbide/Viton

Standard Equipment / Capability:

PUMP

The e-SV pump is a non-self priming vertical multistage pump coupled to a standard motor.The liquid end, located between the upper cover and the pump casing, is held in place bytie rods. The pump casing is available with different configurations and connection types.

- Delivery: up to 700.0 gpm/ Head: up to 1200. ft
- Temperature of pumped liquid: -20.0 deg F to 250.0 deg F standard version
- Direction of rotation: clockwise looking at the pump from the top down (marked with an arrow on the adapter and on the coupling).

MOTOR

- Standard NEMA 180TC Frame motor totally enclosed fan cooled
- 1800 RPM nominal
- Three phase version,4 pole:575 V,60Hz,3.0 hp
- F-AISI Round Flange/304 with 580.0 psi g MAWP
- Reduced axial thrusts enable the use of standard NEMA TC motors that are easily found in the market
- Seal housing chamber designed to prevent the accumulation of air in the critical area next to the mechanical seal
- Mechanical seal according to EN 12756 (ex DIN 24960) and ISO 3069
- Versions with ANSI flanges that can be coupled to ANSI counter-flanges
- Threaded oval counter-flanges made of stainless steel are standard supply for the T versions
- Easy maintenance. No special tools required for assembly or disassembly
- Standard version for temperatures ranging from: 0 deg F to 250 deg F (optional to 300 deg F)

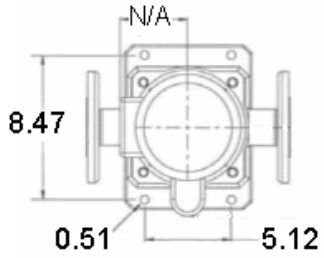
Unit Dimensions

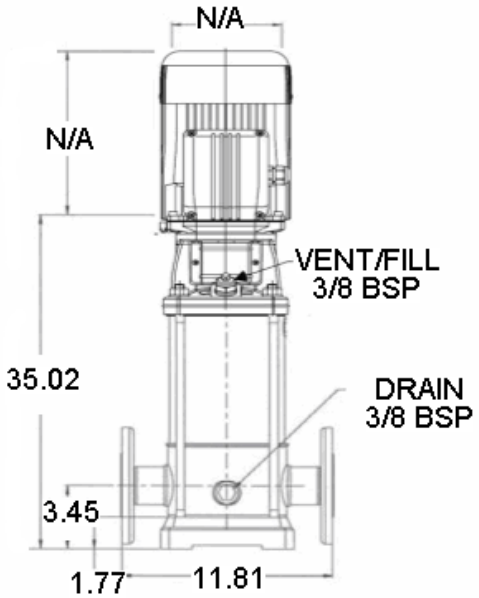
Multi-Stage Pumps

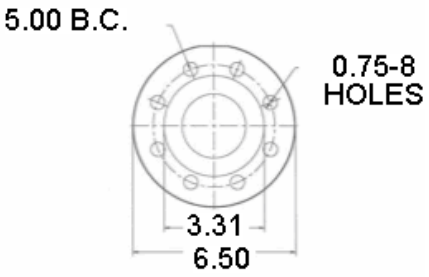
MODEL : 15SV11FF8E60

Hydraulic Data					Motor Data	e-SV Vertical Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	NPSHR	Voltage/Phase/Enclosure		
63.7 gpm	50.0 gpm	184.2 ft	134.0 ft	2.6 ft	575V 3 PH TEFC-PE	15SV11FF8E60	1

Submittal Prepared for: AGGRESSIVE PUMP & SUPPLY
Job:
Proposal No: AS12-11-20 01
Engineer:
Contractor:
Item No: ITEM 001
Submittal Prepared by: Aggressive Pump Sales
Company:
Date: November 20, 2012
Submittal Date: November 20, 2012
Approved by:







• Dimensions are subject to change. Not to be used for construction purposes unless certified

Performance Data

Multi-Stage Pumps

MODEL: 15SV11FF8E60

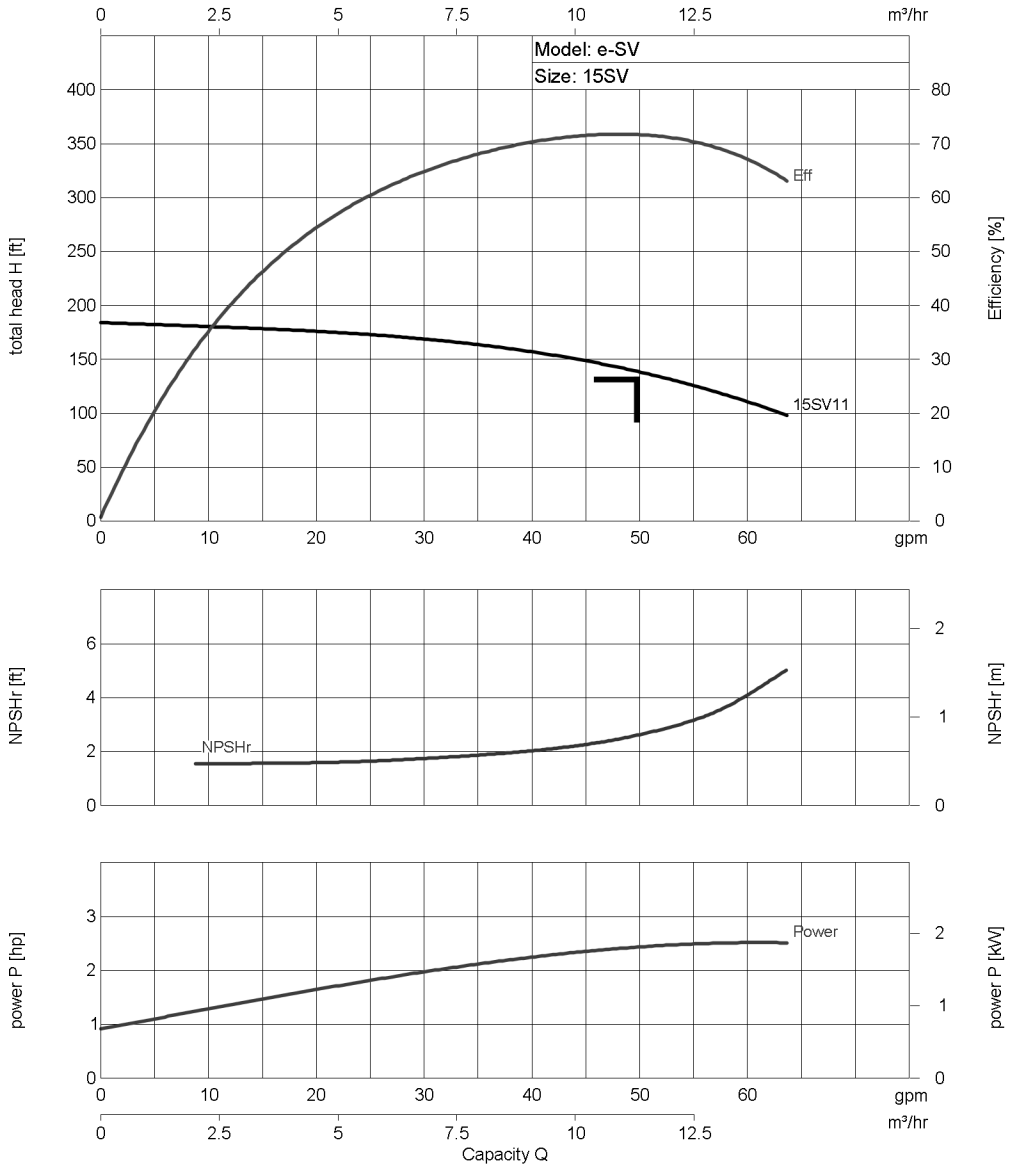
Hydraulic Data					Motor Data	e-SV Vertical Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	NPSHR	Voltage/Phase/Enclosure		
63.7 gpm	50.0 gpm	184.2 ft	134.0 ft	2.6 ft	575V 3 PH TEFC-PE	15SV11FF8E60	1

Submittal Prepared for: AGGRESSIVE PUMP & SUPPLY
Job:
Proposal No: AS12-11-20 01

Engineer:
Contractor:
Item No: ITEM 001

Submittal Prepared by: Aggressive Pump Sales
Company:
Date: November 20, 2012

Submittal Date: November 20, 2012
Approved by:



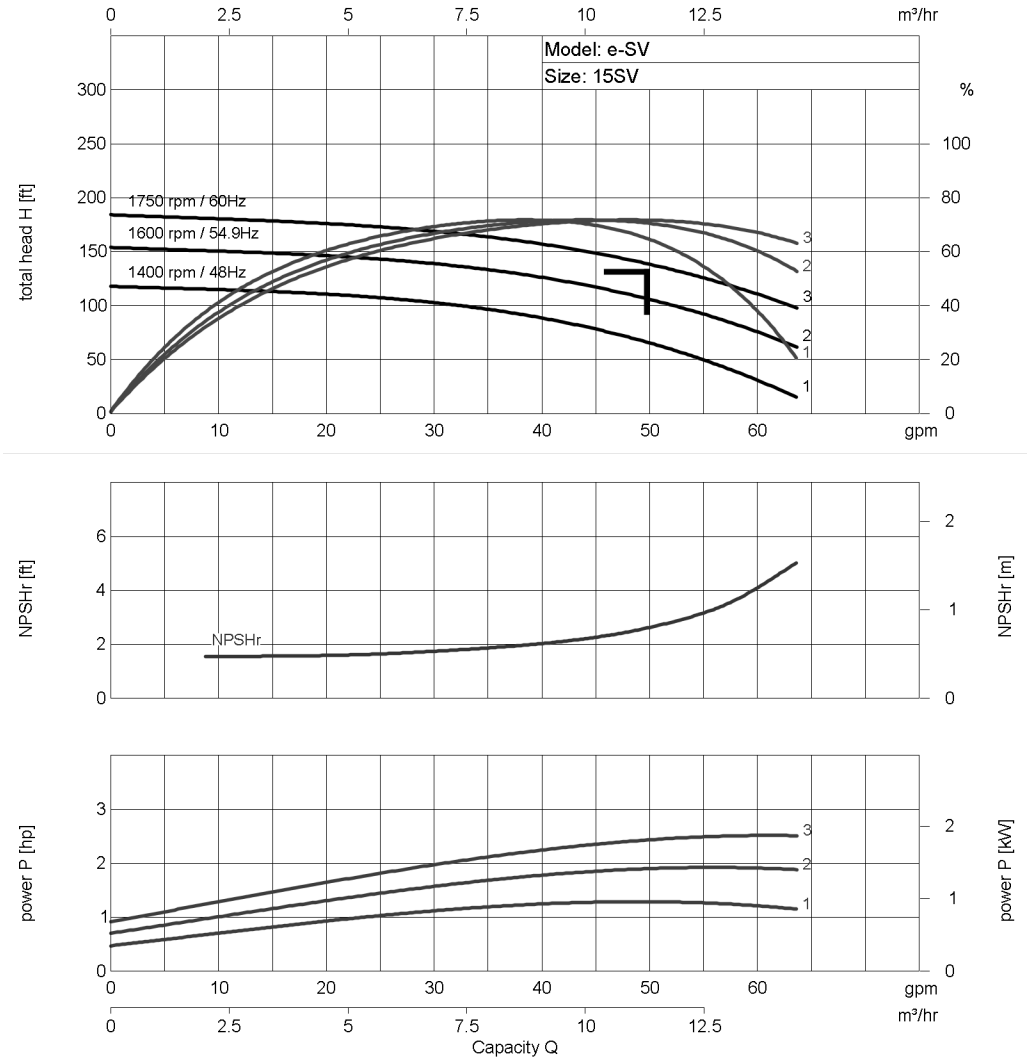
Performance Data

Multi-Stage Pumps

MODEL: 15SV11FF8E60

Hydraulic Data					Motor Data	e-SV Vertical Model	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	NPSHR	Voltage/Phase/Enclosure		
63.7 gpm	50.0 gpm	184.2 ft	134.0 ft	2.6 ft	575V 3 PH TEFC-PE	15SV11FF8E60	1

Submittal Prepared for: AGGRESSIVE PUMP & SUPPLY
Job:
Proposal No: AS12-11-20 01
Engineer:
Contractor:
Item No: ITEM 001
Submittal Prepared by: Aggressive Pump Sales
Company:
Date: November 20, 2012
Submittal Date: November 20, 2012
Approved by:



REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01

January 2013

LAKE COUNTRY

Life. The Okanagan Way.

Appendix 5-2

Record Drawings

URBAN systems

PLAN B5030

LOT B
PLAN 1818

LOT B
PLAN 1818

PLAN A-3074 WATERMAIN RIGHT OF WAY

PROPOSED VALVE CHAMBER

END OF CONTRACT

B2 Pump Station

New Reservoir

WATER MAIN RIGHT OF WAY

6.0m RIGHT-OF-WAY TO BE REGISTERED

LOT 1
PLAN 33173

PLAN B2047

FUTURE ACCESS ROAD

ACCESS ROAD

BARN

SHOP

HOUSE

PLAN B1456

EXISTING SHEDS

PROPOSED RESERVOIR SITE
40m x 30m

UNREGISTERED TEMPORARY ACCESS

DRIVEWAY

DRIVEWAY

EXISTING POWER SUPPLY

BOOSTER STATION

WATER RESERVOIR

PLAN A-3074 WATERMAIN RIGHT OF WAY

B1 Pump Station

Old Reservoir

LOT 1
PLAN 25623

LOT 2
PLAN 25623

PLAN 18489
1

PLAN 23940
A

PLAN 19875
A

PLAN 441
15

OLD MISSION ROAD

PLAN 3130
1

PLAN 1818
K

PLAN 9954
1
2
3

PLAN B611

PLAN 39057
1

IRVINE ROAD

PLAN 1818
J

PLAN 22100
1

PLAN 22704
1
3

PLAN 441
16

PLAN B4544

PLAN 34302
1

HWY # 97

PLAN 8939
1

OYAMA ROAD

HWY # 97 PLAN H723

WOOD LAKE

Mould Engineering
206 – 437 Glenmore Rd.
Kelowna, B.C. V1V 1Y5
Telephone 868-2072

PROFESSIONAL ENGINEER
STUART B. MOULD
BRITISH COLUMBIA

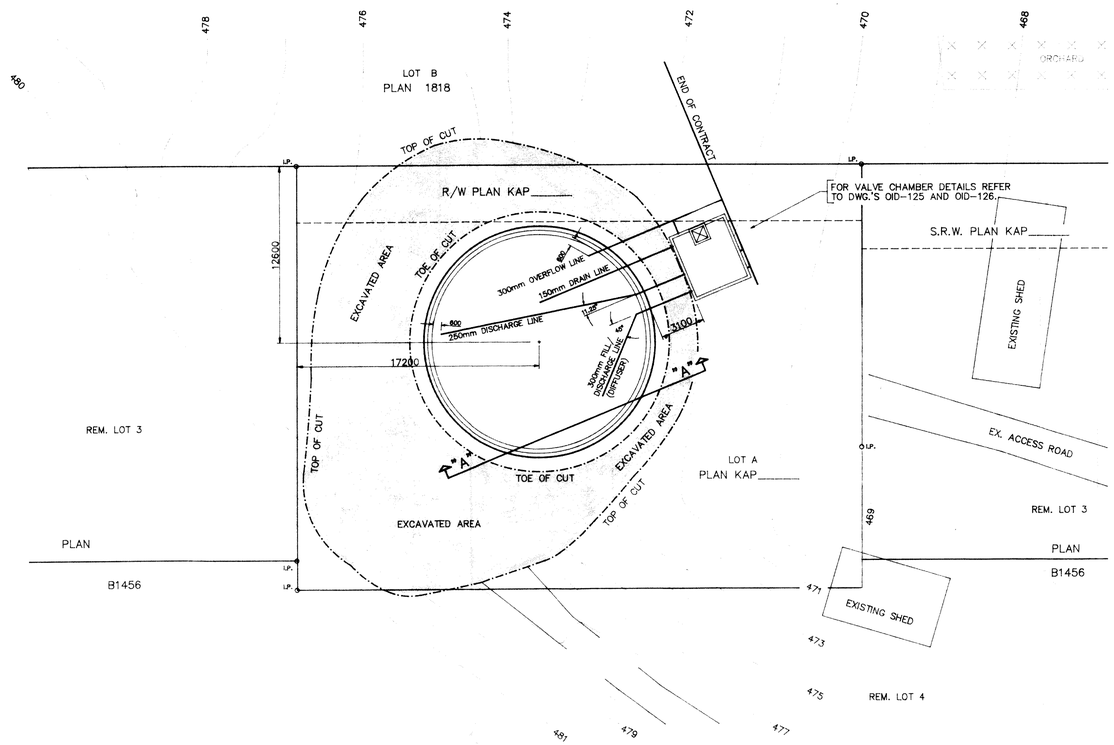
DRAWN	J.G.
DESIGN	
APPROVED	
DATE	MARCH 1996
SCALE	1 : 1250

OYAMA SERVICE AREA

SITE LOCATION PLAN

DRAWING NO. OID-121

REV. NO.



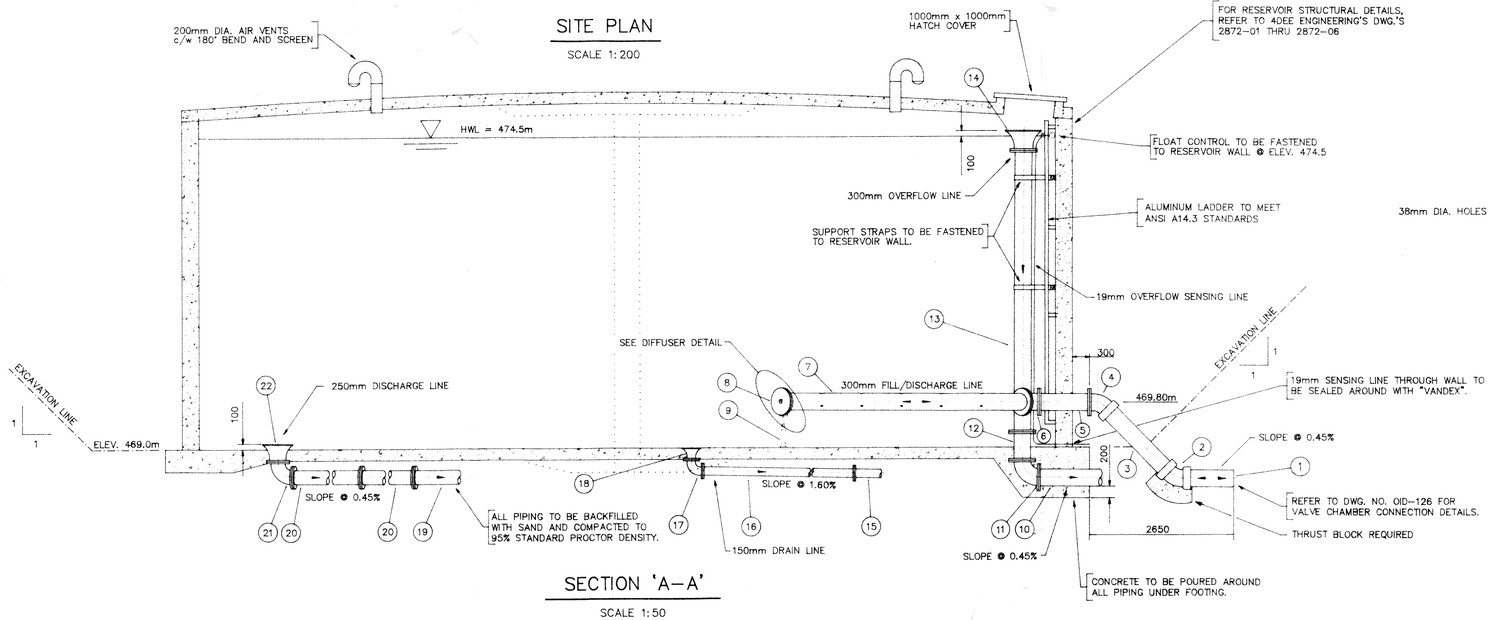
SITE PLAN

SCALE 1:200

SCHEDULE OF FITTINGS		
ITEM NO.	NO. REQ'D	DESCRIPTION
1	1	300mm DIA. PVC SPOOL PIECE, 1000mm LONG, CUT TO SUIT IN FIELD.
2	1	300H x H ✪ 45° BEND
3	1	300mm DIA. PVC SPOOL PIECE, 1600mm LONG, CUT TO SUIT IN FIELD.
4	1	300H x F ✪ 45° BEND
5	1	300F x F SPOOL PIECE, 900mm LONG.
6	1	300F x F ✪ 45° BEND
7	1	300F x F SPOOL PIECE, 6000mm LONG, c/w 38mm DIA. HOLES DRILLED ✪ 120° INTERVALS ON 1000mm CENTERS.
8	1	300mm DIA. BLIND FLANGE, c/w 75mm DIA. HOLE DRILLED THRU CENTER OF FLANGE.
9	1	ADJUSTABLE FLANGE PIPE SUPPORT
10	1	300F x PE SPOOL PIECE, 2300mm LONG.
11	1	300F x F ✪ 90° BEND
12	1	300F x F SPOOL PIECE, 500mm LONG.
13	1	300F x F SPOOL PIECE, 4975mm LONG.
14	1	300mm STRAIGHT STANDARD BELL MOUTH CASTING
15	1	150F x PE SPOOL PIECE, 3500mm LONG.
16	1	150F x F SPOOL PIECE, 6000mm LONG.
17	1	150F x F ✪ 90° BEND
18	1	150mm STRAIGHT STANDARD BELL MOUTH CASTING
19	1	250F x PE SPOOL PIECE, 5040mm LONG, c/w 11.25° WELDED BEND AT 3240mm FROM PE.
20	2	250F x F SPOOL PIECE, 6000mm LONG.
21	1	250F x F ✪ 90° BEND
22	1	250mm STRAIGHT STANDARD BELL MOUTH CASTING

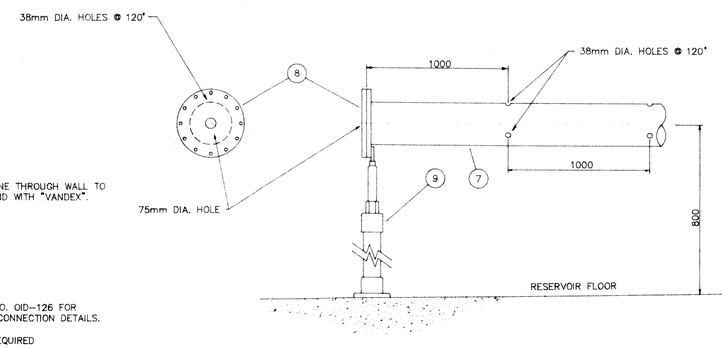
NOTE:

1. ALL PIPING TO BE SCHEDULE 40 STEEL.
2. ALL SURFACES OF PIPING TO BE COATED WITH EPOXY OR MARINE ENAMEL ACCORDING TO AWWA STD-210.
3. ELEVATIONS DERIVED FROM MONUMENT ON SOUTH-EAST CORNER OF D.L. 572, ELEV. 392.560m
4. THE FOLLOWING NOTATIONS HAVE BEEN USED IN THE SCHEDULE OF FITTINGS:
   a) F – CLASS 150 STEEL FLANGE, AWWA STD C-207.
   b) H – PUSH ON RUBBER GASKET BELL JOINT AS DESCRIBED IN AWWA STD. C-111.
   c) PE – PLAIN END.



SECTION 'A–A'

SCALE 1:50



DIFFUSER DETAIL

SCALE 1:20

NO.	DATE	BY	REVISION	CH'KD
A	JAN/96	C.C.	CHANGED LOCATION OF FILL/DISCHARGE LINE	

Mould Engineering
206 – 437 Glenmore Road, Kelowna, B.C. V1V 1Y5
Telephone 868-2072

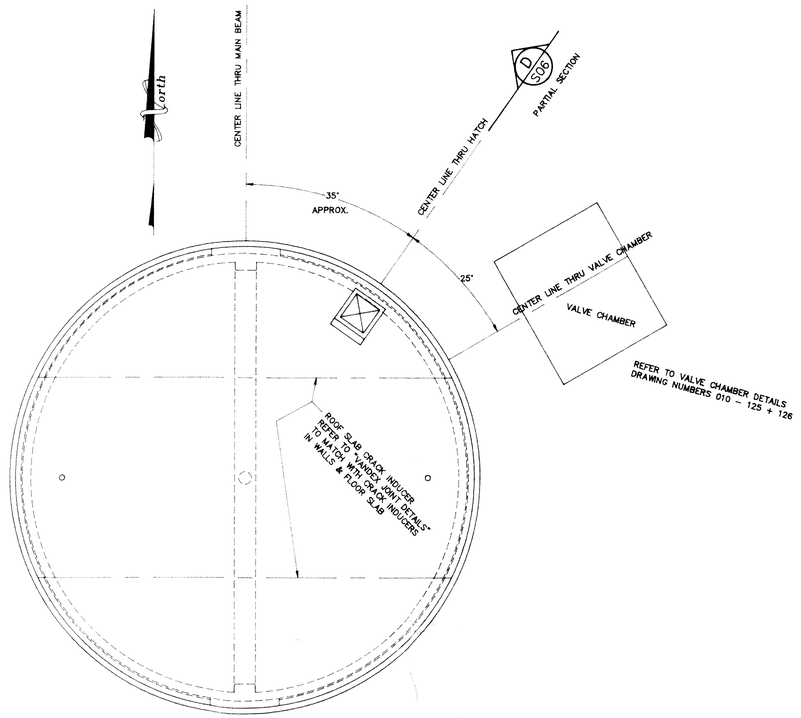
STUART S. MOULD — PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

DRAWN	C.C.
DESIGN	J.G.
APPROVED	S.M.
DATE	MARCH 96
SCALE	AS SHOWN

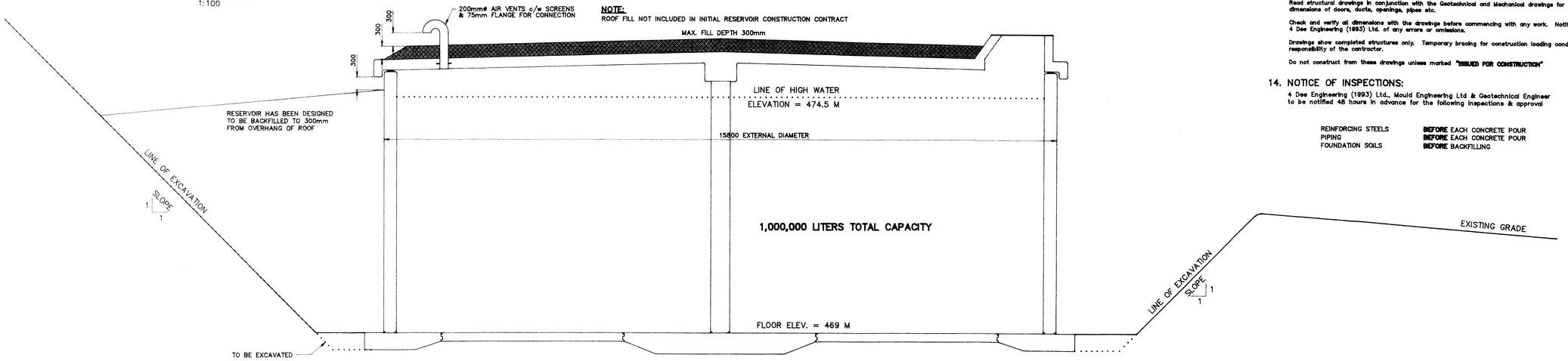
OYAMA SERVICE AREA

OYAMA RESERVOIR SITE PLAN AND MECHANICAL DETAILS

DRAWING NO. OID-120 | REV. NO. A



PLAN VIEW
1:100



ELEVATION
1:50

GENERAL SPECIFICATIONS

The following specifications are a summary of the "Tender Documents", any conflicting statements are to be superseded by the "Tender Documents" specification.

Any deviation from these specifications or drawings without the written consent of the engineer will result in the contractor / owner correcting the deviation.

1. DESIGN LOADS:

ALL LOADS ARE IN KPa (P.S.F.)
ROOF LIVE LOAD: 2.4 KPa (50 P.S.F.)
SUPERIMPOSED ROOF DEAD LOAD: 6 KPa (120.0 P.S.F.)
ROOF OVERBURDEN DENSITY: NOT TO EXCEED 20 KN/CU. METER (125 LBS/CU.FT)

Footings are proportioned for soil bearing capacity of 192.0 KPa (4000 LBS/SQ.FT)
The footings bear on natural inorganic earth. No footings bear higher than on a 1.5 horizontal to 1.0 vertical slope above any adjacent excavation, planned or existing.

2. REFERENCE STANDARDS:

.1 British Columbia Building Code 1992
.2 National Buildin Code of Canada 1990
.3 G30.12–M1977, "Billet Steel Bars for Concrete Reinforcement"
.4 CAN3–A371–M84, "Masonry Construction for Buildings"
.5 CAN3–A165.1–M85, "Concrete Masonry Units"
.6 CAN/CSA–A82.1–M87, "Burned Clay Brick" (Solid masonry units made from clay or shale)
.7 CAN/CSA–A23.2–94, "Methods of Test for Concrete"
.8 CAN/CSA–A23.2–94, "Methods of Test for Concrete"
.9 ACI Standard 301–72, "Specifications for Structural for Buildings"
.10 CAN/CSA–A23.3–M84, "Design of Concrete Structures for Concrete Buildings"
.11 CAN/CSA–A5–M88, "Portland Cement"
.12 S269.1–1975, "Falsa Work for Construction Purposes"
.13 CAN/CSA–O122–M88, "Structural Glue Laminated Timber"
.14 CAN/CSA–G40.21–M91, "Structural Quality Steels"
.15 CSA–W59–M1984, "Welded Steel Construction" (Metal Arc Welding)
.16 CSA W48, "Welding Electrodes"
.17 CAN/CSA–S16.1–94, "Limit States Delsgn for Steel Structures"

3. FIELD REVIEW BY 4 DEE ENGINEERING (1993) LTD:

4 Dee Engineering (1993) Ltd. provides field review only for the work shown on these structural drawings. This review is not a "Full Time" review, but is periodic review at the sole discretion of 4 Dee Engineering (1993) Ltd. in order to ascertain that the work is in general conformance with the plans and supporting documents prepared by 4 Dee Engineering (1993) Ltd. Field review by 4 Dee Engineering (1993) Ltd. is not carried out for the contractor's benefit, nor does it make 4 Dee Engineering (1993) Ltd. guarantors of the contractor's work. It remains the contractor's responsibility to build the work in conformance with the contract documents.

4. EXCAVATION:

Excavate to lines and levels necessary to complete the work. The contractor shall provide shoring during excavation, as required. Comply with governing safety regulations. Protect subgrade footings/slab against changes in moisture and/or freeze–thaw action during construction.

5. FOOTINGS:

Footing are proportioned for a soil bearing capacity of 4,000 P.S.F. Footings shall bear on natural, inorganic earth. No footing shall bear higher than on a 1.5 horizontal to 1.0 vertical slope above any adjacent excavation, planned or existing. Bearing capacity to be confirmed in writting by Geotechnical Engineer.

6. REINFORCING STEEL:

Reinforcing steel to CSA–G30.12–M1977, Grade 400. Welded wire fabric to CSA–G30.5–M1977. Reinforcing work should be in accordance with CAN/CSA–A23.3. Lap horizontal bars 30 x bar diameter; vertical bars 24 x bar diameter. Increase bar laps 20% for a bar spacing less than 8". Minimum 2–15M reinforcing bars around openings; extend reinforcing bars 24" minimum past corners. Provide corner bars for all walls reinforcing.

REINFORCEMENT BAR SPLICE LENGTH TABLE

REBAR SIZE	GRADE (MPa.)	COMPRESSION SPLICE (MIN.)	TENSION SPLICE LENGTH (MIN.) PER CONCRETE STRENGTH			
			20 MPa.	25 MPa.	30 MPa.	35 MPa.
10M	400	330mm (13")	460mm (18")	460mm (18")	460mm (18")	460mm (18")
15M	400	480mm (19")	635mm (25")	635mm (25")	635mm (25")	635mm (25")
20M	400	585mm (23")	890mm (35")	790mm (31")	790mm (31")	790mm (31")
25M	400	740mm (29")	1450mm (57")	1295mm (51")	1170mm (46")	1095mm (43")
30M	400	885mm (34")	2010mm (79")	1805mm (71")	1650mm (65")	1525mm (60")
35M	400	1040mm (41")	3000mm (118")	2590mm (102")	2365mm (93")	2185mm (86")

6. REINFORCING STEEL (cont.):

Notes:
1. Top bar slices to be increase by a factor of 1.3. Top bar splice as any horizontal bar with 12" or more of concrete below.
2. Where splices are dimensioned on the drawings, such dimensions shall apply.

Support slab reinforcing as suitable chairs or supports not further than 48" in either direction. Supply support bars, chairs, and carriers as necessary.

TYPICAL CLEARANCE FOR REINFORCING STEEL:

Surface Poured against Ground..... 75mm (3")
Formed Surfaces Exposed to Ground or Weather..... 50mm (2")
Beams..... 50mm (2") TO MAIN STEEL
Columns..... 50mm (2") TO MAIN STEEL
Salbs, Walls..... 50mm (2")

7. CONCRETE:

Concrete materials and methods of construction to CAN/CSA–A23.1–94. Provide concrete for and cooperate in the preparation of test cylinders. Take 3 cylinders for every 100 cubic yards or less of concrete placed. A minimum of one test of 3 cylinders for each pour.

All concrete normal weight, 150 P.C.F., type 10 cement with Min. 15% replacement type F flyash.

Submit proposed mix design to the engineer for approval.

Do not use admixtures other than air entrainment, standard water reducers, or super plasticizers without prior approval of the engineer. Super plasticizer is required.

Reject all concrete when time between batching and placing exceeds 2 hours.

Water may be added to the concrete on site to adjust the slump to specified range.

Concrete to be pumped with pipe "in wall". "Elephant Trunk" is NOT to be used.
Consolidate all concrete using mechanical vibrators.

Construct formwork in accordance with WCB IH&S 34.28 and CSA–S269.1–1975. Formwork design is the responsibility of the contractor.

Protect concrete from adverse weather conditions in accordance with CSA–A23.1 or as determined by the engineer.

In cold, below freezing temperatures, approved cold weather concreting procedures must be followed. Do not place concrete on frozen ground or frozen reinforcing bars.

TYPE OF CONCRETE	STRENGTH @ 28 DAYS	AIR CONTENT	MAX. SLUMP	MAX. AGG. SIZE	EXPOSURE CLASS	WATER/CEMENT RATIO
ALL RESERVOIR CONCRETE	32MPa (4800 PSI)	5% – 8%	63.5mm (2.50")	20mm (0.75")	C–1	0.40

Non structural cracks are a function of concrete's intrinsic materials, and tend to be unpredictable. A majority of these cracks can be limited or controlled, although circumstances do arise when they cannot be avoided.

8. CONCRETE BOND BREAKERS:

Oil based bond breaker is NOT to be used on construction or control joints.

9. CONCRETE ROOF SLAB & MAIN ROOF BEAM:

All slabs and beams to be cambered .002 X clear span (inches).

10. GROUT

Shall be non–shrink, minimum strength 35 MPa @ 28 days.

11. STRUCTURAL STEEL:

Structural steel shall be in accordance with CSA Standards CAN/CSA–G40.21–M91, grade 300W. All H.S.S. columns shall be grade 350W.

12. PRIMERS:

For all Steel: C.I.S.C./C.P.M.A. Standard 1–73A primer, or other pre–approved. Field touch up all welds with primer after slag has been removed.

13. STRUCTURAL DRAWINGS:

Read structural drawings in conjunction with the Geotechnical and Mechanical drawings for detailed dimensions of doors, ducts, openings, pipes etc.

Check and verify all dimensions with the drawings before commencing with any work. Notify 4 Dee Engineering (1993) Ltd. of any errors or omissions.

Drawings show completed structures only. Temporary bracing for construction loading conditions is the responsibility of the contractor.

Do not construct from these drawings unless marked **"ISSUED FOR CONSTRUCTION"**

14. NOTICE OF INSPECTIONS:

4 Dee Engineering (1993) Ltd., Mould Engineering Ltd & Geotechnical Engineer to be notified 48 hours in advance for the following inspections & approval

REINFORCING STEELS	**BEFORE** EACH CONCRETE POUR
PIPING	**BEFORE** EACH CONCRETE POUR
FOUNDATION SOILS	**BEFORE** BACKFILLING

4Dee
ENGINEERING
(1993) LTD.
200–1974 MOSS COURT
KELOWNA, B.C. V1Y–9L3
PHONE:(604) 762–8488 FAX:(604) 762–8311

SEAL:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
DENIS FRIE

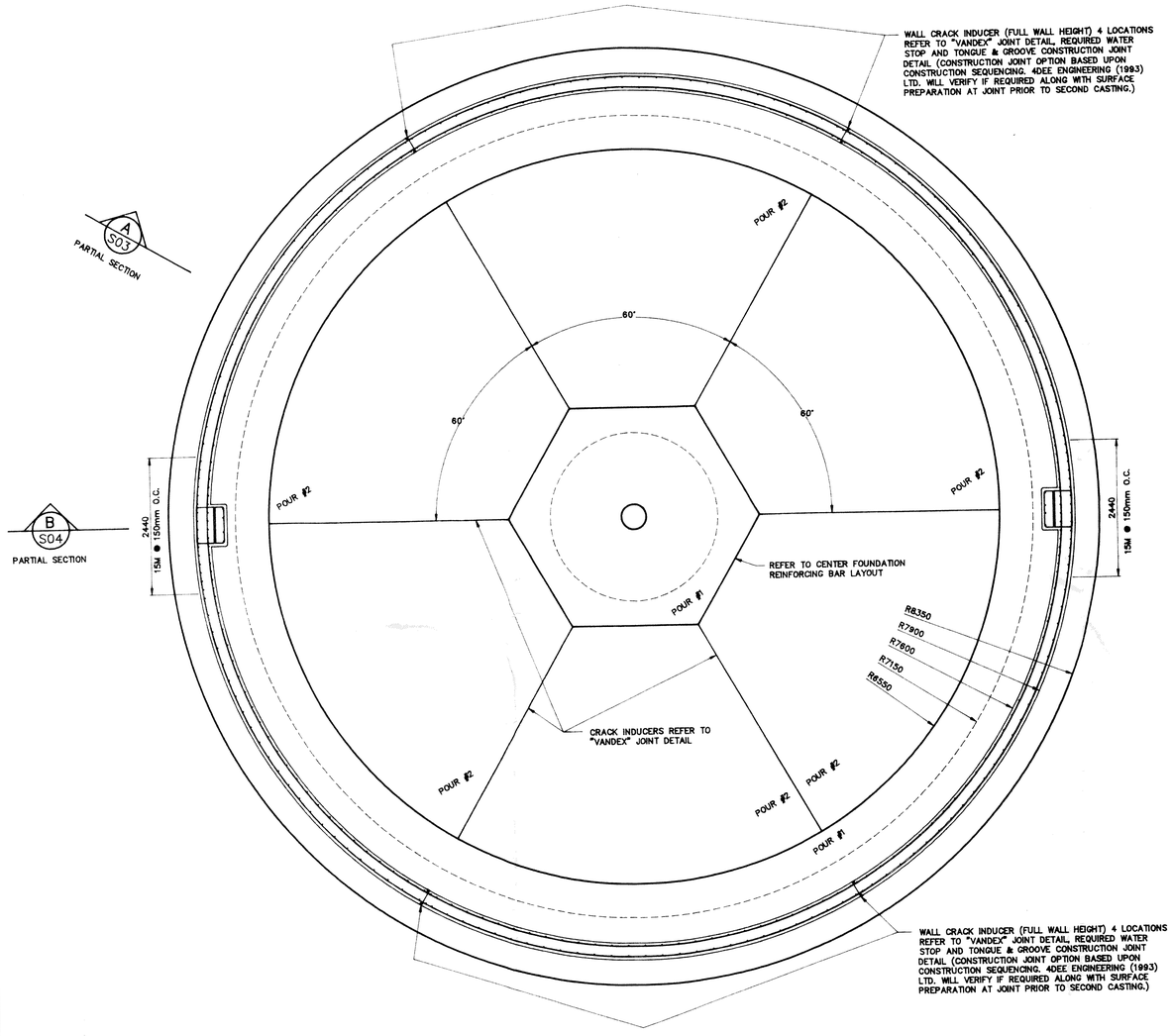
THIS DESIGN IS FOR THE COMPLETED STRUCTURE ONLY

PROJECT TITLE
REGIONAL DISTRICT
OF
CENTRAL OKANAGAN
OYAMA RESERVOIR
OYAMA B.C.

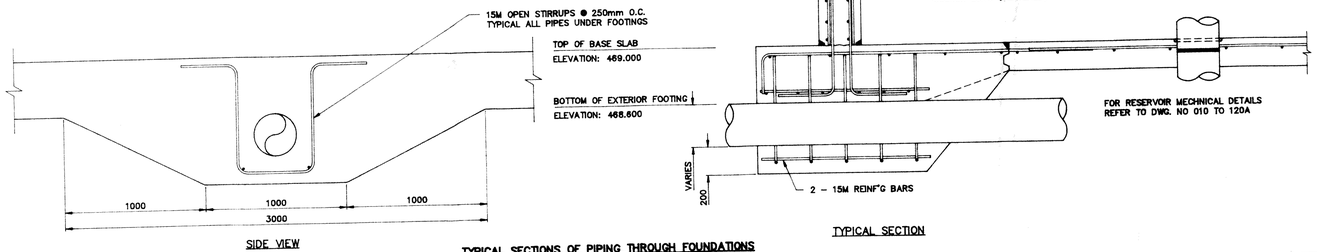
PROJECT CONSULTANT
Mould Engineering
206 – 437 GLENMORE RD.
KELOWNA, BC
V1Y 1Y5

DRAWING TITLE
ROOF PLAN VIEW
CROSS SECTION ELEVATION

DATE 1995–09–08	FILE No. 95–2872
DRAWN BY T.M.K.	DESIGNED BY K.M.E.
SCALE AS SHOWN	ISSUED 1996–03–07
DRAWING NUMBER 2872–01	OF 6 | S01



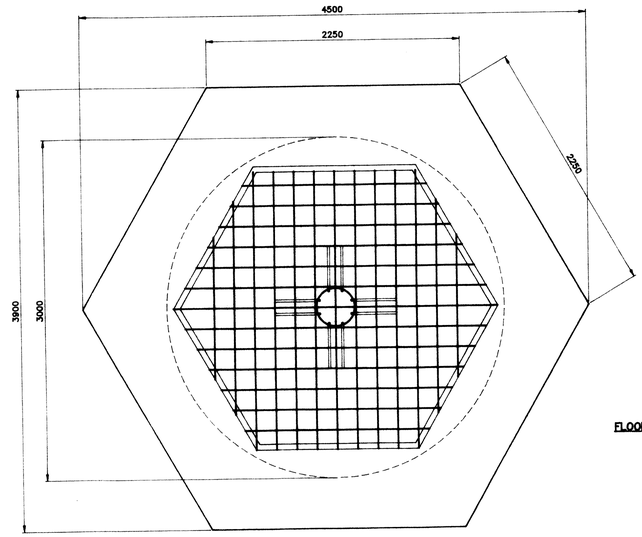
FOUNDATION PLAN
SCALE 1:50



TYPICAL SECTIONS OF PIPING THROUGH FOUNDATIONS
SCALE 1:50

NOTE: ALL PIPE PENETRATIONS THROUGH CONCRETE
ALL PIPES PASSING THROUGH EITHER THE CONCRETE SLAB-ON GRADE OR CONCRETE WALLS TO CONTAIN A "VOLCLAY" SEALING "WATERSTOP-RX" STRIP 19mm x 19mm LOCATED IN THE CENTER OF WALL / FLOOR SLAB WITH 25mm@ FOAM ROD TIED AROUND EXPOSED SURFACES OF THE PIPE. AFTER THE CONCRETE IS CURED THE VOID FROM THE FOAM ROD IS PACKED WITH "VANDEX" (ie. TOP OF FLOOR SLAB, INSIDE & OUTSIDE OF WALLS) INSTALL 2 - 10MM DIAGONALS 1000mm LONG (CENTERED) TO SPECIFIED REINFORCING

FOR RESERVOIR MECHNICAL DETAILS REFER TO DWG. NO 010 TO 120A

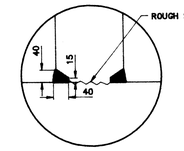


REFER TO DRAWING #S3 FOR REINFORCING BAR SIZE

CENTER FOUNDATION REINFORCING BAR LAYOUT
SCALE 1:25

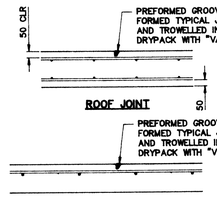
GENERAL CONSTRUCTION NOTES

- FOUNDATIONS TO BE CAST AS PER SEQUENCE INDICATED ON FOUNDATION PLAN
- NO HORIZONTAL COLD JOINTS ALLOWED IN THE EXTERIOR WALL. (CAST FULL HEIGHT)
- THE EXTERIOR WALL MAY BE CAST IN VERTICAL SECTIONS WITH THE COLD JOINTS IN THE INDICATED LOCATIONS ON THE FOUNDATION PLAN. NO ADDITIONAL COLD JOINTS ALLOWED IN WALL WITHOUT WRITTEN APPROVAL BY 4DEE-ENGINEERING
- ROOF SLABS & FLOOR SLABS / FOUNDATIONS TO BE POWER TROWELLED FININSHED WITH A WET CURE TO FOLLOW. WET CURE FOR A MIN. OF 7 DAYS WITHIN A TEMPERATURE RANGE OF +4° TO +20°. BURLAP IS TO BE USED TO MAINTAIN THE MOISTURE WITH A POLY COVER AND / OR INSULATED BLANKET COVER.

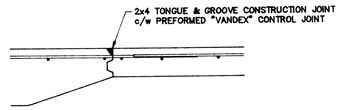


NOTE:
GROOVE FILLED WITH "VANDEX" CONCENTRATE "DRY-PACK" AND PACKED TIGHTLY. (LEFT PROUD)

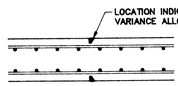
PREFORMED JOINT DETAIL



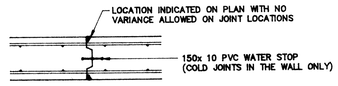
FLOOR SLAB ON GRADE (PERPENDICULAR TO FOOTINGS)



FLOOR JOINT (TYPICAL EXTERIOR & INTERIOR FOOTINGS)



WALL JOINT WITHOUT TONGUE & GROOVE CONSTRUCTION JOINT



WALL JOINT WITH TONGUE & GROOVE CONSTRUCTION JOINT

NOTE:
THE TONGUE & GROOVE CONSTRUCTION JOINTS FOR THE WALLS TO BE FORMED WITH A 2x6 AND THE FLOOR SLAB WITH A 2x4 WITH THE CORNERS BACK CUT @ 22.5°. THE ROOF SLAB IS TO CAST MONOLITHICALLY WITH THE PREFORMED JOINT DETAIL CAST IT INTO THE POUR.

TONGUE & GROOVE CONSTRUCTION JOINTS
SCALE 1:20

CAST-IN-PLACE CONCRETE SURFACE TREATMENT
A slurry of "VANDEX" or approved equivalent shall be applied at a rate of 1 kg/ sq. meter in two consecutive coats to the entire structure (inside & outside) based of the following requirements. "DRY-PACK" all routed voids

Horizontal Surfaces:
1. Rout out all visible cracks exceeding .254mm (.01") in width to a depth of 19mm (3/4")
2. Remove all laitance (cement scum), dirt, dust and then rinse with water to all concrete surfaces.
3. All free laying water must be removed the day prior to the slurry application.

Vertical Surfaces:
1. Remove all form scale, oil, form release agents and any other foreign materials likely to affect the bond, penetration, and performance of the "VANDEX" waterproofing.
2. Form ties holes shall be left approx. 25mm back of surface and patched prior to slurry application.
3. Honeycomb pockets and faulty construction joints shall be routed out to sound concrete.
4. Construction joints and visible cracks in concrete surfaces exceeding hair-line size .254 (.01") shall be routed out to 19mm deep.
5. Rinse all surfaces to be waterproofed throughly with water the day prior to the "VANDEX" application. Moisture must be present in the concrete strata to achieve maximum initial penetration of the active "VANDEX" Chemicals. Surfaces shall be moist only (not wet), when the coatings are to be applied.

4Dee
ENGINEERING
(1993) LTD.
200-1974 MOSS COURT
KELOWNA, B.C. V1Y-9L3
PHONE:(604) 762-6488 FAX:(604) 762-8311

SEAL:
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
DENIS FRIE

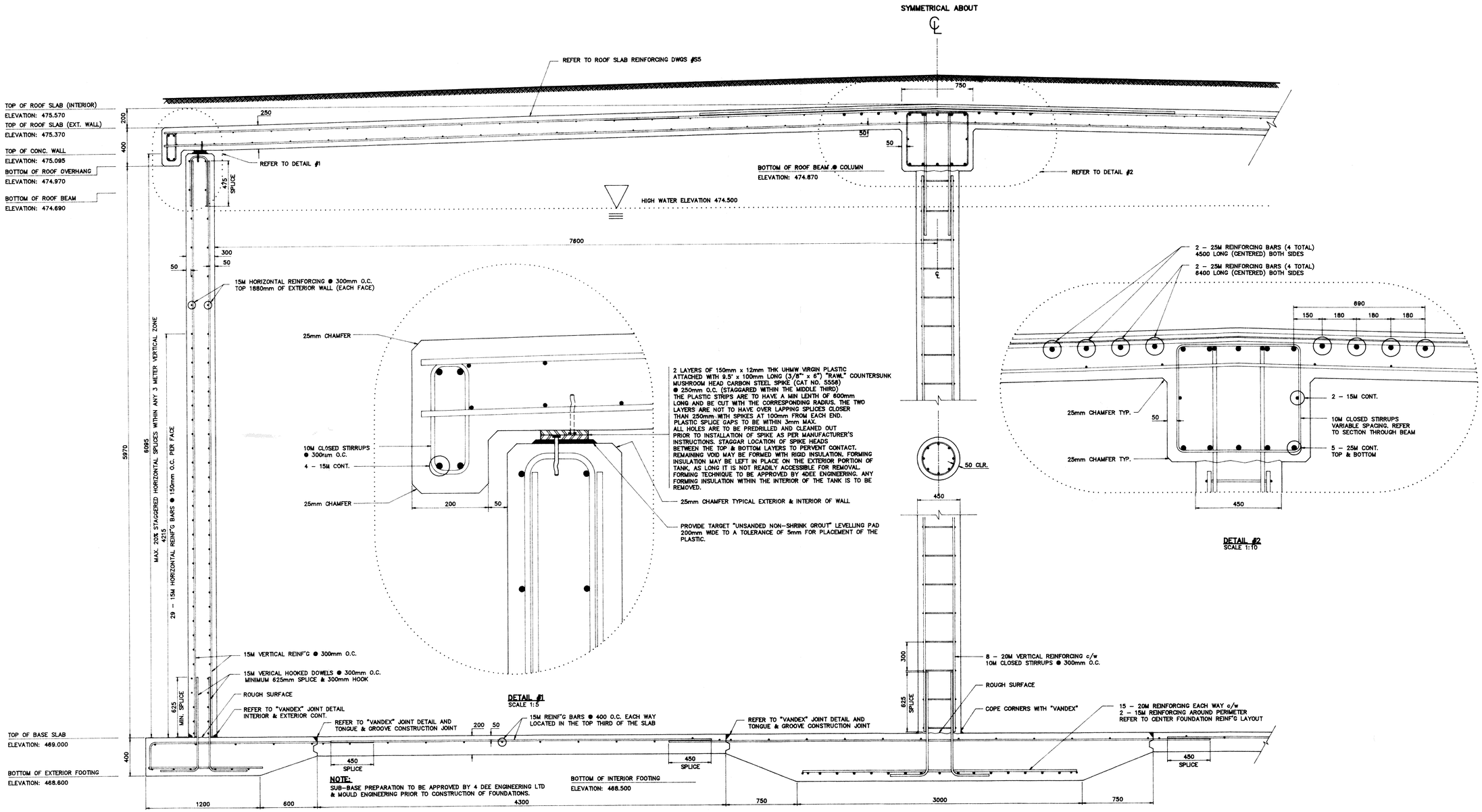
THIS DESIGN IS FOR THE COMPLETED STRUCTURE ONLY

PROJECT TITLE
REGIONAL DISTRICT
OF
CENTRAL OKANAGAN
OYAMA RESERVOIR
OYAMA B.C.

PROJECT CONSULTANT
Mould Engineering
206 - 437 GLENMORE RD.
KELOWNA, BC
V1Y 1Y5

DRAWING TITLE
FOUNDATION PLAN
SECTIONS & DETAILS

DATE 1995-09-08	FILE No. 95-2872
DRAWN BY T.M.K.	DESIGNED BY K.M.E.
SCALE AS SHOWN	ISSUED 1996-03-07
DRAWING NUMBER 2872-02	OF 6 | S02



4Dee
ENGINEERING
(1993) LTD.
200–1974 MOSS COURT
KELOWNA, B.C. V1Y–9L3
PHONE:(604) 762–8488 FAX:(604) 762–8311

SEAL:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA DENIS FRIE

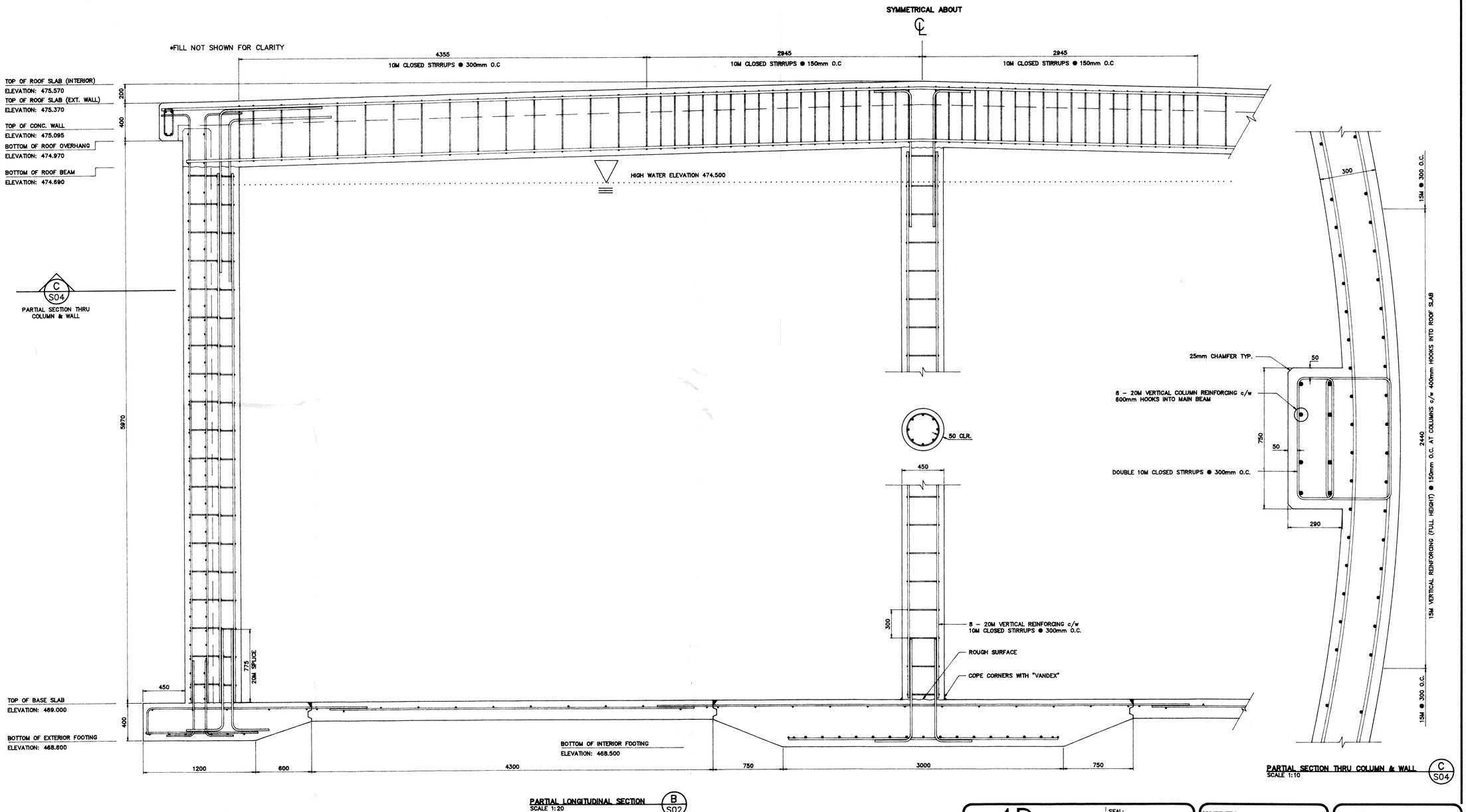
THIS DESIGN IS FOR THE COMPLETED STRUCTURE ONLY

PROJECT TITLE
REGIONAL DISTRICT
OF
CENTRAL OKANAGAN
OYAMA RESERVOIR
OYAMA B.C.

PROJECT CONSULTANT
Mould Engineering
206 – 437 GLENMORE RD.
KELOWNA, BC
V1Y 1Y5

DRAWING TITLE
SECTIONS & DETAILS

DATE 1995–09–08	FILE No. 95–2872
DRAWN BY T.M.K.	DESIGNED BY K.M.E.
SCALE AS SHOWN	ISSUED 1996–03–07
DRAWING NUMBER 2872–03	OF 6 | S03



4Dee
ENGINEERING
(1993) LTD.
200–1974 MOSS COURT
KELOWNA, B.C. V1Y–9L3
PHONE:(604) 762–6488 FAX:(604) 762–8311

THE GENERAL CONTRACTOR SHALL CHECK THE DRAWING FOR ERRORS & OMMISIONS PRIOR TO CONSTRUCTION. REPORT ALL DISCREPANCIES TO THE ENGINEER IMMEDIATELY.

SEAL:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
DENIS FRIE

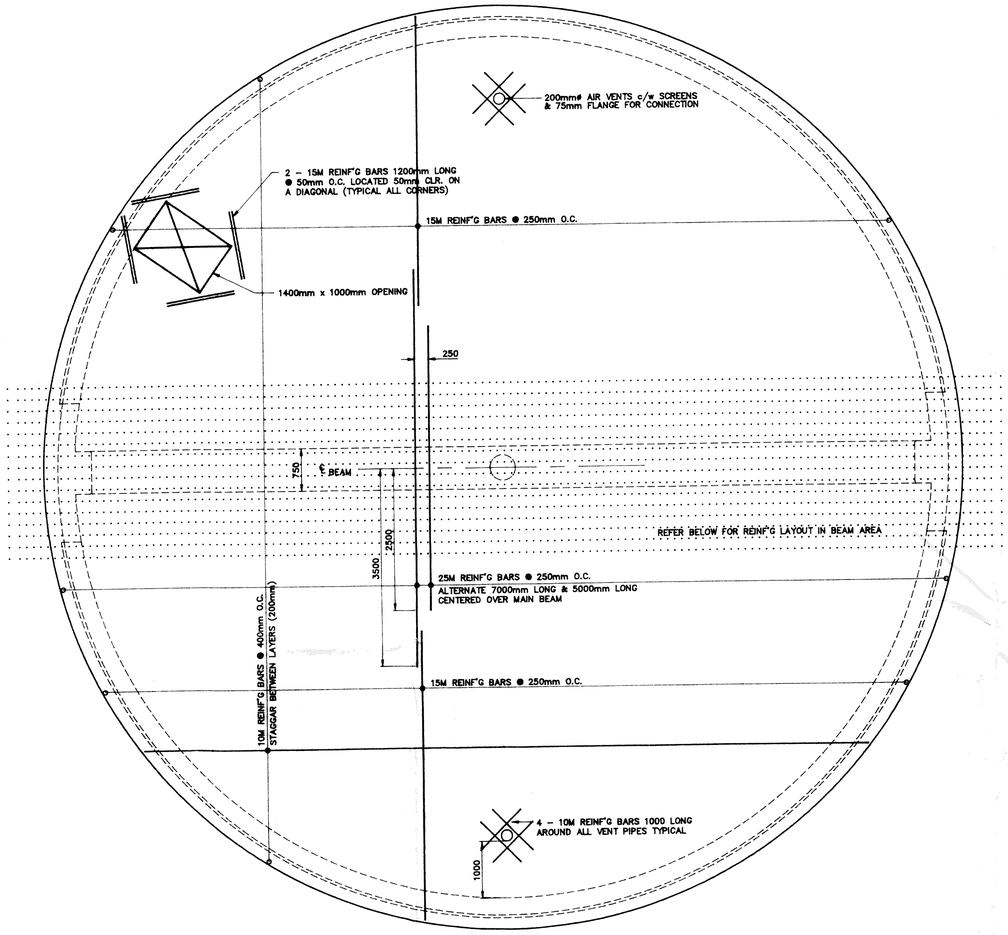
THIS DESIGN IS FOR THE COMPLETED STRUCTURE ONLY

PROJECT TITLE
REGIONAL DISTRICT
OF
CENTRAL OKANAGAN
OYAMA RESERVOIR
OYAMA B.C.

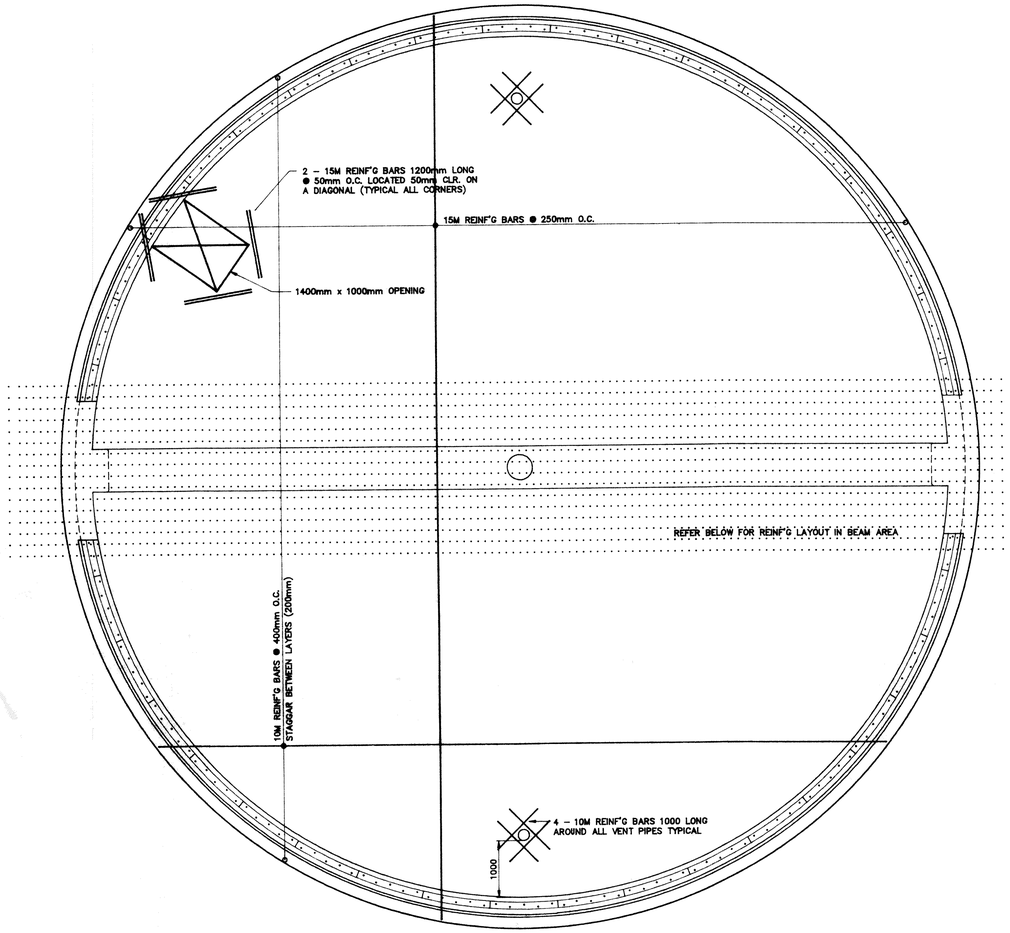
PROJECT CONSULTANT
Mould Engineering
206 – 437 GLENMORE RD.
KELOWNA, BC
V1Y 1Y5

DRAWING TITLE
SECTIONS & DETAILS

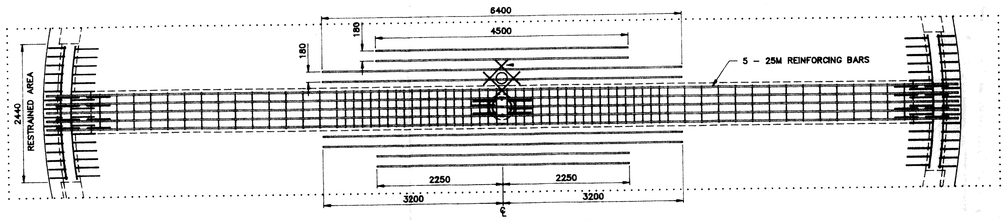
DATE 1995–09–08	FILE No. 95–2872
DRAWN BY T.M.K.	CHECKED BY K.M.E.
SCALE AS SHOWN	ISSUED 1996–03–07
DRAWING NUMBER 2872–04	OF 6 | S04



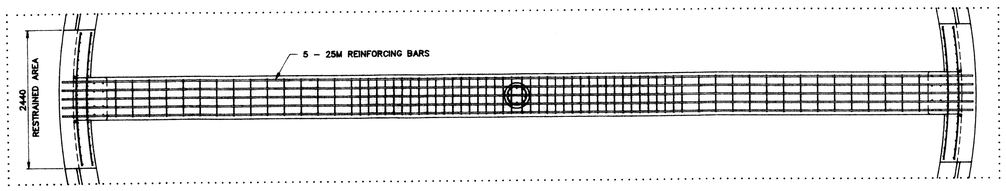
ROOF SLAB TOP REINFORCING LAYOUT
SCALE 1:50



ROOF SLAB BOTTOM REINFORCING LAYOUT
SCALE 1:50



ROOF BEAM TOP REINFORCING LAYOUT
SCALE 1:50



ROOF BEAM BOTTOM REINFORCING LAYOUT
SCALE 1:50

4Dee
ENGINEERING
(1993) LTD.
200–1974 MOSS COURT
KELOWNA, B.C. V1Y–9L3
PHONE:(604) 762–6488 FAX:(604) 762–8311

SEAL:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA DENIS FRIE

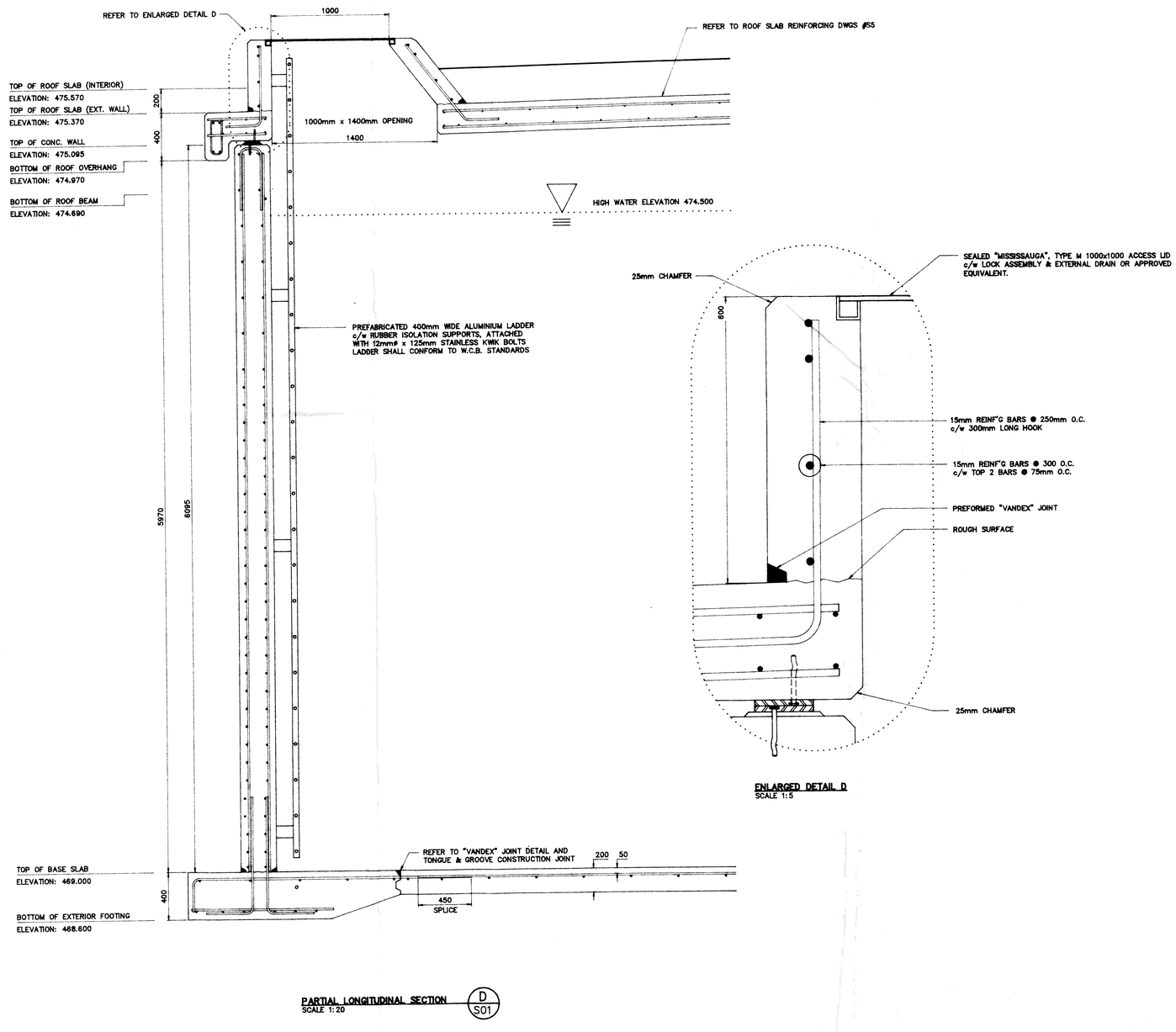
THIS DESIGN IS FOR THE COMPLETED STRUCTURE ONLY

PROJECT TITLE
REGIONAL DISTRICT
OF
CENTRAL OKANAGAN
OYAMA RESERVOIR
OYAMA B.C.

PROJECT CONSULTANT
Mould Engineering
206 – 437 GLENMORE RD.
KELOWNA, BC
V1Y 1Y5

DRAWING TITLE
ROOF PLAN VIEW
CROSS SECTION ELEVATION

DATE 1995–09–08	FILE No. 95–2872
DRAWN BY T.M.K.	DESIGNED BY K.M.E.
SCALE AS SHOWN	ISSUED 1998–03–07
DRAWING NUMBER 2872–05	OF 6 | S05



PARTIAL LONGITUDINAL SECTION (D / S01)
SCALE 1:20

ENLARGED DETAIL D
SCALE 1:5

4Dee ENGINEERING (1993) LTD.
200–1974 MOSS COURT
KELOWNA, B.C. V1Y–9L3
PHONE:(604) 762–6488 FAX:(604) 762–8311

SEAL:
PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — DENIS FRIE

THIS DESIGN IS FOR THE COMPLETED STRUCTURE ONLY

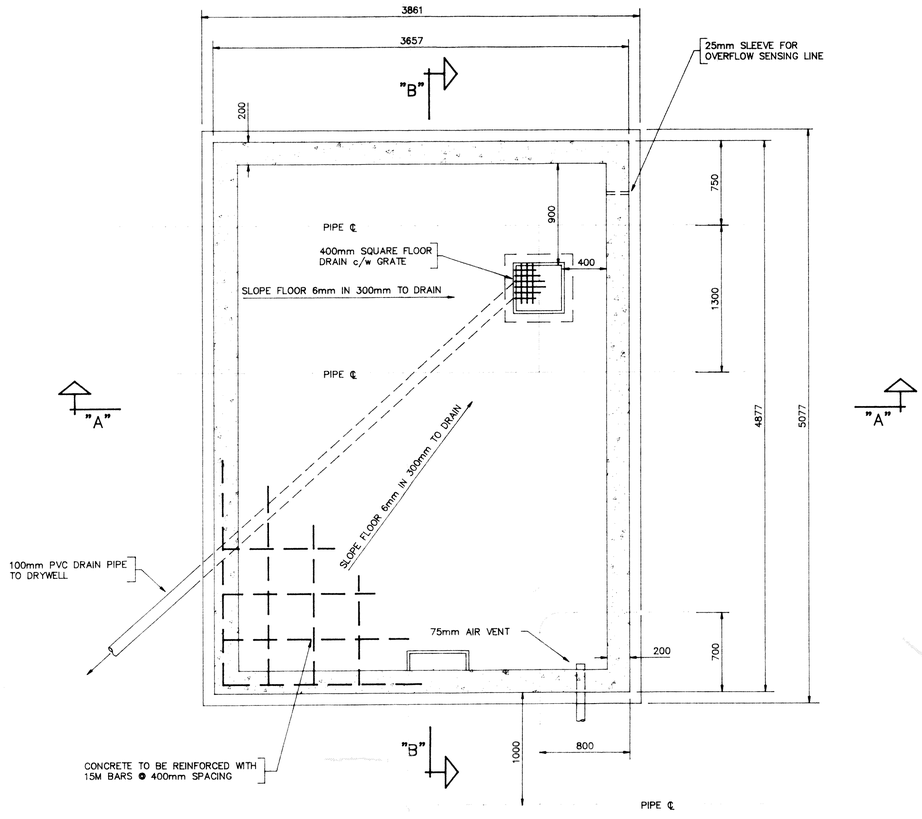
PROJECT TITLE
REGIONAL DISTRICT OF CENTRAL OKANAGAN
OYAMA RESERVOIR
OYAMA B.C.

PROJECT CONSULTANT
Mould Engineering
206 – 437 GLENMORE RD.
KELOWNA, BC
V1Y 1Y5

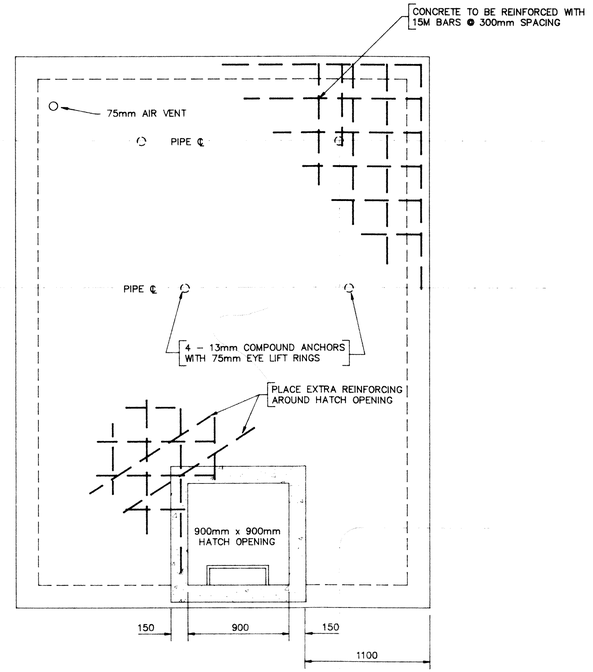
DRAWING TITLE
ACCESS HATCH
SECTIONS & DETAILS

DATE 1995–09–08	FILE No. 95–2872
DRAWN BY T.M.K.	DESIGNED BY K.M.E.
SCALE AS SHOWN	ISSUED 1996–03–07

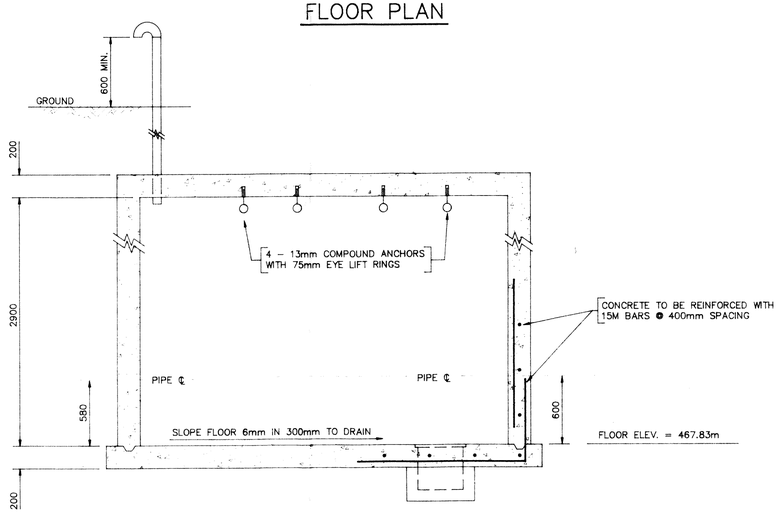
DRAWING NUMBER 2872–06 OF 6 | S06



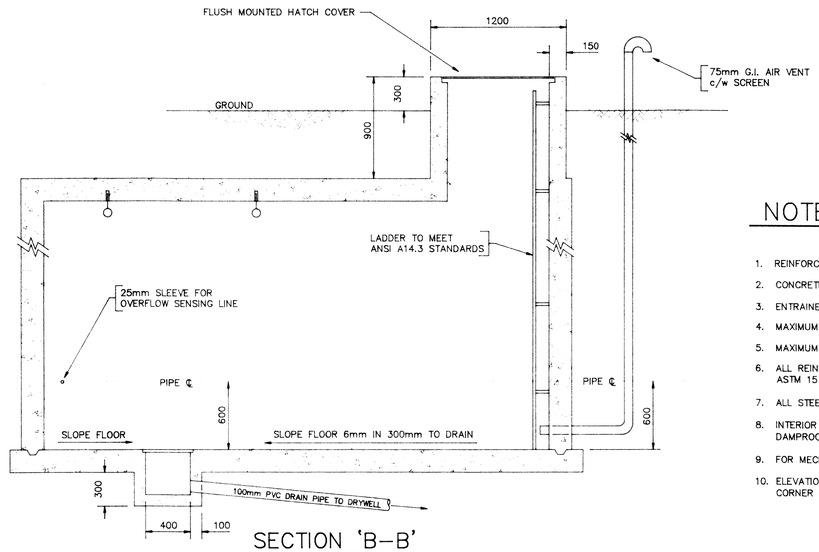
FLOOR PLAN



ROOF PLAN



SECTION 'A-A'



SECTION 'B-B'

NOTES

1. REINFORCING STEEL TO HAVE MINIMUM 40mm COVER.
2. CONCRETE TO BE 25Mpa @ 30 DAY STRENGTH.
3. ENTRAINED AIR SHALL BE MAINTAINED AT 5%.
4. MAXIMUM CONCRETE SLUMP SHALL BE 75mm.
5. MAXIMUM AGGREGATE SIZE SHALL BE 19mm.
6. ALL REINFORCING STEEL TO BE INTERMEDIATE GRADE, ASTM 15 DEFORMED.
7. ALL STEEL TO BE BENT AROUND OPENING.
8. INTERIOR WALLS TO BE PAINTED AND EXTERIOR WALLS TO BE DAMPROOFED WITH ASPHALT PRIMER AND FOUNDATION COATING.
9. FOR MECHANICAL DETAILS SEE DRAWING NO. OID-126.
10. ELEVATIONS DERIVED FROM MONUMENT ON SOUTH-EAST CORNER OF D.L. 572, ELEV. 392.560m.

NO.	DATE	BY	REVISION	CH'KD

Mould Engineering
208 - 437 Glenmore Road, Kelowna, B.C. V1V 1Y5
Telephone 868-2072

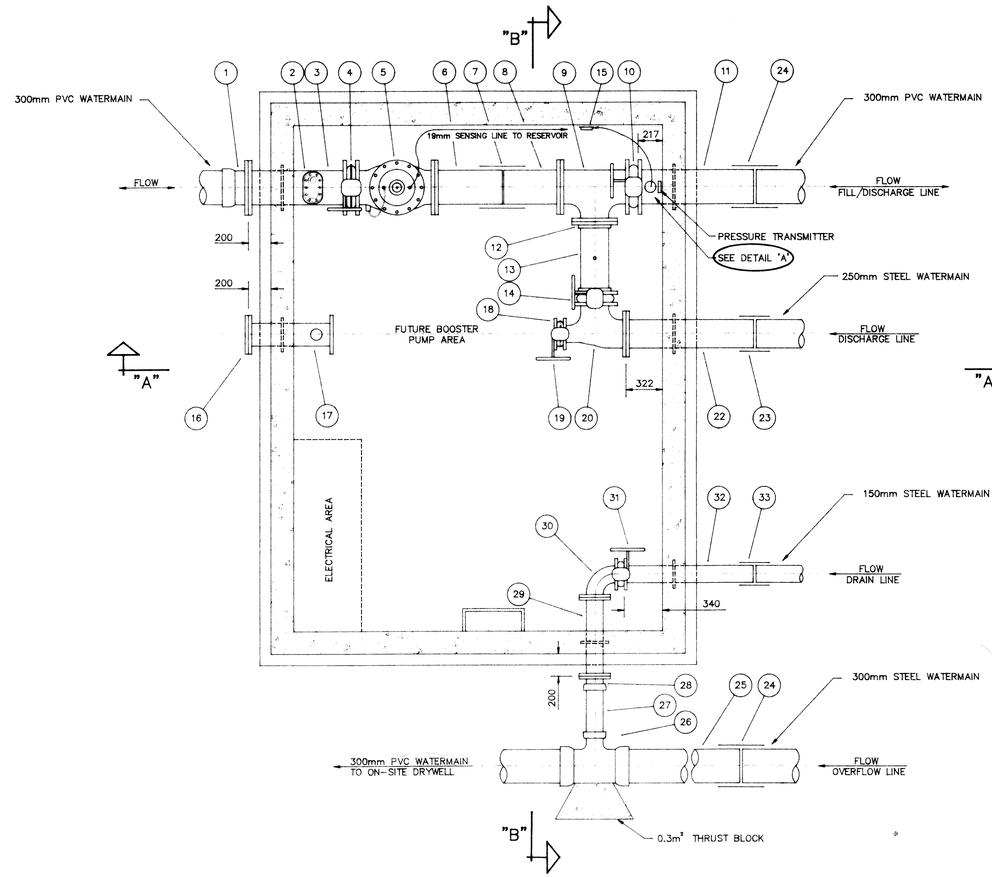
DRAWN	C.C.
DESIGN	J.G.
APPROVED	S.M.
DATE	FEB/1996
SCALE	1:25

OYAMA SERVICE AREA

OYAMA RESERVOIR VALVE CHAMBER STRUCTURAL DETAILS

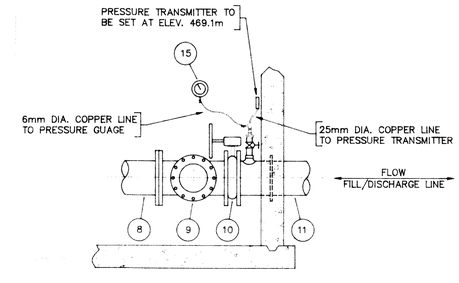
DRAWING NO. OID-125

REV. NO.



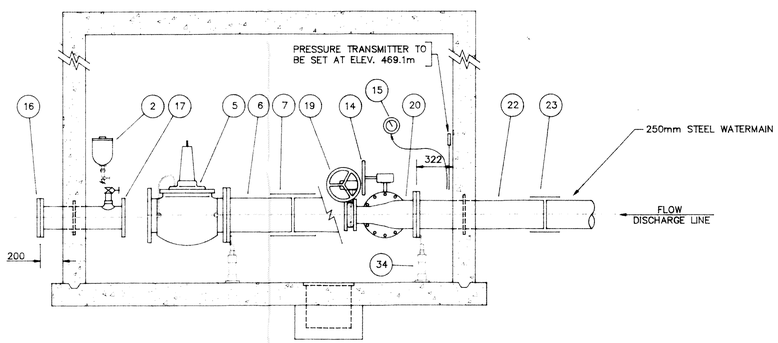
PLAN

FOR RESERVOIR MECHANICAL
DETAILS SEE DWG. NO. OID-120A

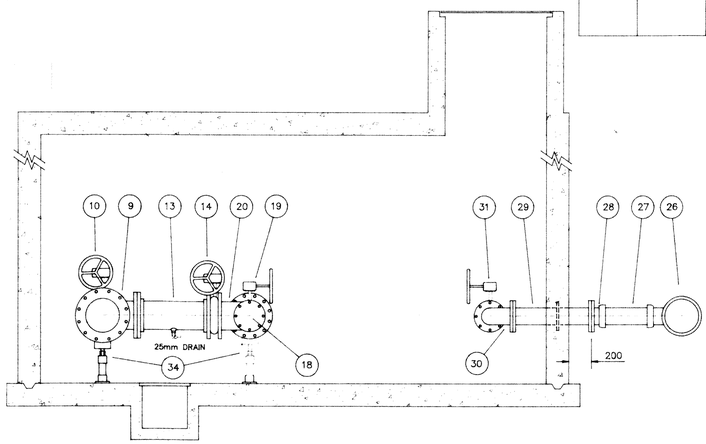


DETAIL 'A'

SCHEDULE OF FITTINGS		
ITEM NO.	NO. REQ'D	DESCRIPTION
1	1	300H x F ADAPTER
2	1	25mm COMBINATION AIR AND VACUUM VALVE (APCO 143C OR EQUIVALENT)
3	1	300F x F SPOOL PIECE, 870mm LONG, c/w 350mm DIA. x 13mm THICK WALL RING LOCATED 570mm FROM INSIDE FLANGE, AND A 25mm IPT OUTLET LOCATED 300mm FROM INSIDE FLANGE.
4	1	300mm LUG STYLE BUTTERFLY VALVE, c/w HAND WHEEL ACTUATOR
5	1	300F x F MODULATING FLOAT VALVE (SINGER MODEL 106F, TYPE IV OR EQUIVALENT)
6	1	300F x PE SPOOL PIECE, 600mm LONG, CUT TO SUIT IN FIELD
7	1	300mm STEEL PIPE COUPLING
8	1	300F x PE SPOOL PIECE, 500mm LONG
9	1	300F x 300F x 250F TEE
10	1	300mm WAFER STYLE BUTTERFLY VALVE , c/w HAND WHEEL ACTUATOR
11	1	300F x PE SPOOL PIECE, 1020mm LONG, c/w 350mm DIA. x 13mm THICK WALL RING LOCATED 320mm FROM FLANGE, AND A 50mm IPT OUTLET LOCATED 100mm FROM FLANGE
12	2	250mm UNI-FLANGE ADAPTER, c/w SET SCREWS
13	1	250PE x PE SPOOL PIECE, 670mm LONG, c/w 25mm IPT OUTLET, CUT TO SUIT IN FIELD.
14	1	250mm WAFER STYLE BUTTERFLY VALVE, c/w HAND WHEEL ACTUATOR
15	1	PRESSURE GUAGE, 115mm FACE, 0-30 PSI GRADUATION, 1% ACCURACY
16	1	200mm BLIND FLANGE
17	1	200F x F SPOOL PIECE, 750mm LONG c/w 250mm DIA. x 13mm THICK WALL RING LOCATED 450mm FROM INSIDE FLANGE, AND A 50mm IPT OUTLET LOCATED 150mm FROM INSIDE FLANGE.
18	1	150mm BLIND FLANGE
19	1	150mm LUG STYLE BUTTERFLY VALVE, c/w HAND WHEEL ACTUATOR
20	1	250F x 150F x 250F TEE
22	1	250F x PE SPOOL PIECE, 1120mm LONG c/w 300mm DIA. x 13mm THICK WALL RING LOCATED 420mm FROM FLANGE, CUT TO SUIT IN FIELD.
23	1	250mm STEEL PIPE COUPLING
24	2	300mm ADAPTER COUPLING (END CODE: 300mm D4 TO 300mm B7)
25	1	300mm PVC SPOOL PIECE, 3900mm LONG, CUT TO SUIT IN FIELD.
26	1	300H x 300H x 150H TEE
27	1	150mm PVC SPOOL PIECE, 600mm LONG, CUT TO SUIT IN FIELD.
28	1	150H x F ADAPTER
29	1	150F x F SPOOL PIECE, 695mm LONG, c/w 200mm DIA. x 13mm THICK WALL RING LOCATED 400mm FROM INSIDE FLANGE
30	1	150F x F @ 90° BEND
31	1	150mm WAFER STYLE BUTTERFLY VALVE, c/w HAND WHEEL ACTUATOR
32	1	150F x PE SPOOL PIECE, 1140mm LONG, c/w 200mm DIA. x 13mm THICK WALL RING LOCATED 440mm FROM FLANGE, CUT TO SUIT IN FIELD.
33	1	150mm STEEL PIPE COUPLING
34	2	ADJUSTABLE FLANGE PIPE SUPPORT



SECTION 'A-A'



SECTION 'B-B'

NOTES:

1. THE FOLLOWING NOTATIONS HAVE BEEN USED IN THE SCHEDULE OF FITTINGS:
   a) F – CLASS D FLANGE, AWWA STD C-207.
   b) PE – PLAIN END.
   c) DI – DUCTILE IRON.
   d) H – PUSH ON RUBBER GASKET BELL JOINT AS DESCRIBED IN AWWA STD. C-111.
2. ALL STEEL TO BE COATED INSIDE AND OUT WITH EPOXY OR MARINE ENAMEL ACCORDING TO AWWA STD. C-210.

NO.	DATE	BY	REVISION	CH'KD

Mould Engineering
206 – 437 Glenmore Road,
Kelowna, B.C. V1V 1Y5
Telephone 868-2072

DRAWN	C.C.
DESIGN	J.G.
APPROVED	S.M.
DATE	FEB/1996
SCALE	1:25

OYAMA SERVICE AREA

OYAMA RESERVOIR VALVE CHAMBER MECHANICAL DETAILS

DRAWING NO. OID-126

REV. NO.

REPORT

Kalamalka Lake Water Distribution System – Upper Pressure Zone Review

1577.0046.01

January 2013

LAKE COUNTRY

Life. The Okanagan Way.

Appendix 6-1

Cost Estimates

URBAN systems

Irvine Booster Station
Cost Estimate

Job No. 1577.0046.01
Date 13/01/2013

Prepared by: J.Clowes
Checked by: D.Nash

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
1	General				
1.1	Mobilization and Demobilization	1	ls	20,000	$20,000
2	Removals				
2.1	150 m3 reservoir	1	ls	30,000	$30,000
2.2	Exisiting B1 pump station	1	ls	20,000	$20,000
2.3	Decomission B2 pump station and discharge line	1	ls	20,000	$20,000
3	Site Works				
3.1	Access road	1	ls	20,000	$20,000
3.2	Retaining Wall	85	v.sq m	300	$25,500
3.2	Tie to existing watermain	2	ls	6,000	$12,000
3.3	300mm Pipe - Suction	20	lm	215	$4,300
3.4	250mm Pipe - Discharge	15	lm	200	$3,000
3.5	250mm buried gate valve	1	ea.	4,000	$4,000
3.6	300mm buried gate valve	1	ea.	6,000	$6,000
3.9	Chain Link fence	100	lm	50	$5,000
3.10	Misc site works and landscaping	1	ls	10,000	$10,000
4	Pump Station				
4.1	Building	106	sq.m	1,800	$190,800
4.2	40HP Booster Pump	2	ls	30,000	$60,000
4.3	3HP Jockey Pump	2	ls	4,500	$9,000
4.4	150mm pressure relief valve	1	ea.	6,750	$6,750
4.5	75mm butterfly valve - 150#	2	ea.	500	$1,000
4.6	150mm butterfly valve - 150#	2	ea.	1,300	$2,600
4.7	200mm butterfly valve - 150#	2	ea.	1,700	$3,400
4.8	300mm butterfly valve - 150#	2	ea.	2,500	$5,000
4.9	200mm check valve - 150#	2	ea.	2,500	$5,000
4.10	150mm check valve - 150#	1	ea.	2,000	$2,000
4.11	300mm strainer	2	ea.	4,500	$9,000
4.12	75mm strainer	1	ea.	500	$500
4.13	50mm check valve	2	ea.	500	$1,000
4.14	50mm ball valve	2	ea.	500	$1,000
4.15	25mm combination air release and air/vac	5	ea.	800	$4,000
4.16	50mm schedule 10 SS	5	lm	90	$450
4.17	75mm schedule 10 SS	10	lm	100	$1,000
4.18	150mm Schedule 10 SS	10	lm	900	$9,000
4.19	200mm Schedule 10 SS	5	lm	1,200	$6,000
4.20	250mm Schedule 10 SS	10	lm	1,300	$13,000
4.21	300mm Schedule 10 SS	20	lm	1,500	$30,000
4.22	Pressure gauge	6	ea.	500	$3,000
4.23	Electrical and Instrumentation	1	ls	135,000	$135,000
4.24	Electrical service	1	ls	30,000	$30,000
5	Distribution System Upgrades				
5.1	200mm PVC C900 watermain	943	lm	180	$169,740
5.2	Asphalt road restoration	900	sq.m	50	$45,000
5.3	Residential service connections	23	ea.	1,500	$34,500
5.4	Irrigation service connections	8	ea.	2,000	$16,000
5.5	Hydrant connections	3	ea.	1,500	$4,500
5.6	Tie to existing watermain	1	ea.	6,000	$6,000
5.7	Replace air/vacuum valve	6	ea.	1,000	$6,000
5.8	Add air/vacuum valve	4	ea.	6,000	$24,000
5.9	Misc (restoration, driveway crossings)	1	ls	50,000	$50,000
				Subtotal	$1,064,040
				Contingency and Engineering (35%)	$372,414
				Total (rounded)	$1,435,000

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
6	Optional				
6.1	Private Hydrant	2	ea.	4,000	$8,000
6.2	200 mm buried gate valve	4	ea.	3,500	$14,000
6.3	Blow-off	2	ea.	3,000	$6,000
				Subtotal	$28,000
				Contingency (20%)	$5,600
				Total (rounded)	$35,000

Appendix D

Seaton Road Watermain Extension

(Urban Systems)

MEMORANDUM

Date:	September 12, 2014
To:	Janice Pederson, Michael Mercer, District of Lake Country
cc:	Mike Mitchell, District of Lake Country
From:	Jason Barta
File:	1577.0022.01-C
Subject:	Seaton Road – Watermain Extension Analysis for #10011 Seaton Road

Background

The District of Lake Country (District) requested that Urban Systems Ltd. (Urban) investigate water servicing alternatives to provide irrigation water to #10011 Seaton Road. There are no water mains along either roadway frontage for the property, although a domestic service for the property exists along the southern frontage.

The site could be supplied with irrigation water via Seaton Road from either the south or the north. A loop connecting the existing north and south watermains would require a brand new pressure reducing station (PRV), since the watermain to the north is supplied by the Camp & Bond PRV and the watermain to the south is supplied by the Seaton PRV. The existing watermains to the north and south of the site are both currently supplied by the Beaver Lake water source.

Design Criteria

The District has confirmed that the subject parcel is classified (or will be classified) as Class “A” land, is approximately 10 acres in size and will be restricted to a peak irrigation flow of 6 gallons per minute per acre, for a total water demand of 60 gpm, or 228 Litres per minute.

The following design criteria were taken from the District’s Subdivision and Development Servicing Bylaw, No. 97-139 (bylaw):

- Minimum watermain diameter shall be 200mm;
- Maximum static pressure of 145 psi (1,000 kPa);
- Minimum static pressure of 40 psi (275 kPa);
- Minimum residual pressure at peak hour of 36 psi (250 kPa); and
- All fire flow analyses will be performed while adhering to the following constraints:
    - System demands will reflect MDD plus fire flow rate;
    - Minimum residual pressure during fire flow shall be 20 psi (140kPa); and
    - Watermain velocities shall not exceed 4 meters per second under fire flow conditions

Assumptions

The subject parcels and surrounding lands are all zoned A-1, agricultural. For the purposes of this analysis, it is assumed that the minimum required fire flow for the area will be 3,600 L/min.

Cost estimates do not include any land purchases, nor legal fees associated with such.

Analysis

North System Analysis

The existing water system north of the site is fed via the Camp and Bond PRV station. The largest PRV in the station is 200mm in diameter and can pass a maximum flow of 3,100 USgpm (11,700 L/min) based on literature from the manufacturer.

The watermains along Seaton Road are predominantly 200mm in diameter, however, there are some sections of 150mm and 100mm mains. A review of the existing conditions water model shows that these smaller mains restrict the available fire flow to approximately 1,800 L/min. This is not sufficient to meet the bylaw minimum of 3,600 L/min, so any mains along Seaton Road to the north of the subject property must be upgraded to a minimum diameter of 200mm.

The hydraulic water model was modified to upsize the Seaton Road watermains to 200mm in diameter, and a new demand of 228 L/min was added to the proposed watermain extension to the subject property. With these new upgrades in place, the model estimates that the pressure under PHD conditions will be 130 psi at an elevation of 487m and the available fire flow will increase to 7,000 L/min. **Figure 1** illustrates the required upgrades along Seaton Road associated with the north watermain extension.

South system analysis

The existing water system south of the site is fed via the Seaton PRV station. The largest PRV in the station is 100mm in diameter and can pass a maximum flow of 800 USgpm (3,000 L/min) based on literature from the manufacturer.

There is a long section of 100mm diameter watermain to the south of the site, along Seaton Road. This watermain, as well as portions of the 200mm further south, are located on private property. The model estimates that there is 4,200 L/min of available fire flow at the intersection of Seaton and Wilson Roads due to the loop along Wilson Road. However,

There is also a 150mm watermain along Wilson Road that provides a loop to the intersection near the subject property. The available fire flow in the existing system at the intersection of Seaton and Wilson Road is estimated at 4,200 L/min by the model, due to the loop with Wilson Road.

However, if a 3,600 L/min fire event were to happen near the subject site, the majority of the flow would be pulled via Wilson Road watermain, which would reduce pressures in the area from nearly 70 psi to below 30 psi. Thus, an upgrade to the Seaton PRV and the undersized watermains will be required, and is illustrated on **Figure 2**.

With these new upgrades in place, the model estimates that the pressure under PHD conditions will be 67 psi at an elevation of 487m and the available fire flow will increase to 7,300 L/min.

Cost Estimate

The estimates provided in **Table 1** this section are classified as a Class ‘C’ cost estimates. This estimate, which is prepared with limited site information, is based on probable conditions affecting the project. It

LAKE COUNTRY
Life. The Okanagan Way.

10011 Seaton Road Upgrades
North Watermain Extension

N

Legend
- Existing PRV Stations
- Existing Watermains
- North Watermain Extension
- North Watermain Upgrades
- Subject Property

700mm WP-01995c
150mm WP-01993
150mm WP-01994
150mm WP-02001
700mm WP-06497
0mm WP-01991
700mm WP-01990
Chase
100mm WP-02004
600mm WP-02554
Camp and Bond PRV
100mm WP-01996
400mm WP-01986a
Camp
Sonata
200mm WP-02614
150mm WP-02611
700mm WP-01995b
38mm WP-01998
700mm WP-01995a
Abandon existing 100mm watermain. 85 meters new parallel 200mm water
Tie-in to existing watermain
Abandon existing 150mm watermain. 190 meters new parallel 200mm water
400mm WP-06498
Seaton
200mm WP-02520
100mm WP-01984
150mm WP-01983
200mm WP-01982
200mm WP-06499a
250mm WP-01981
200 meters 200mm diameter watermain c/w hydrant assemby at terminus
Tie-in to existing watermain
150mm WP-02271
Tie-in to existing watermain
Tie-in to existing watermain New 200x200x150 tee and 200mm gate valve
250mm WP-01980
#10011
200mm WP-01899
100mm WP-01976
Wilson
150mm WP-01977
150mm WP-01974
150mm WP-01973
0 0.045 0.09 0.18 km

Path: U:\Projects_KEL\1577\0022\01\X-Single-File\2014-09-10 Seaton Road Watermain Extensions\2014-09-11 Figure 1.mxd Last updated by jbarta on September-11-14 at 11:49:04 AM

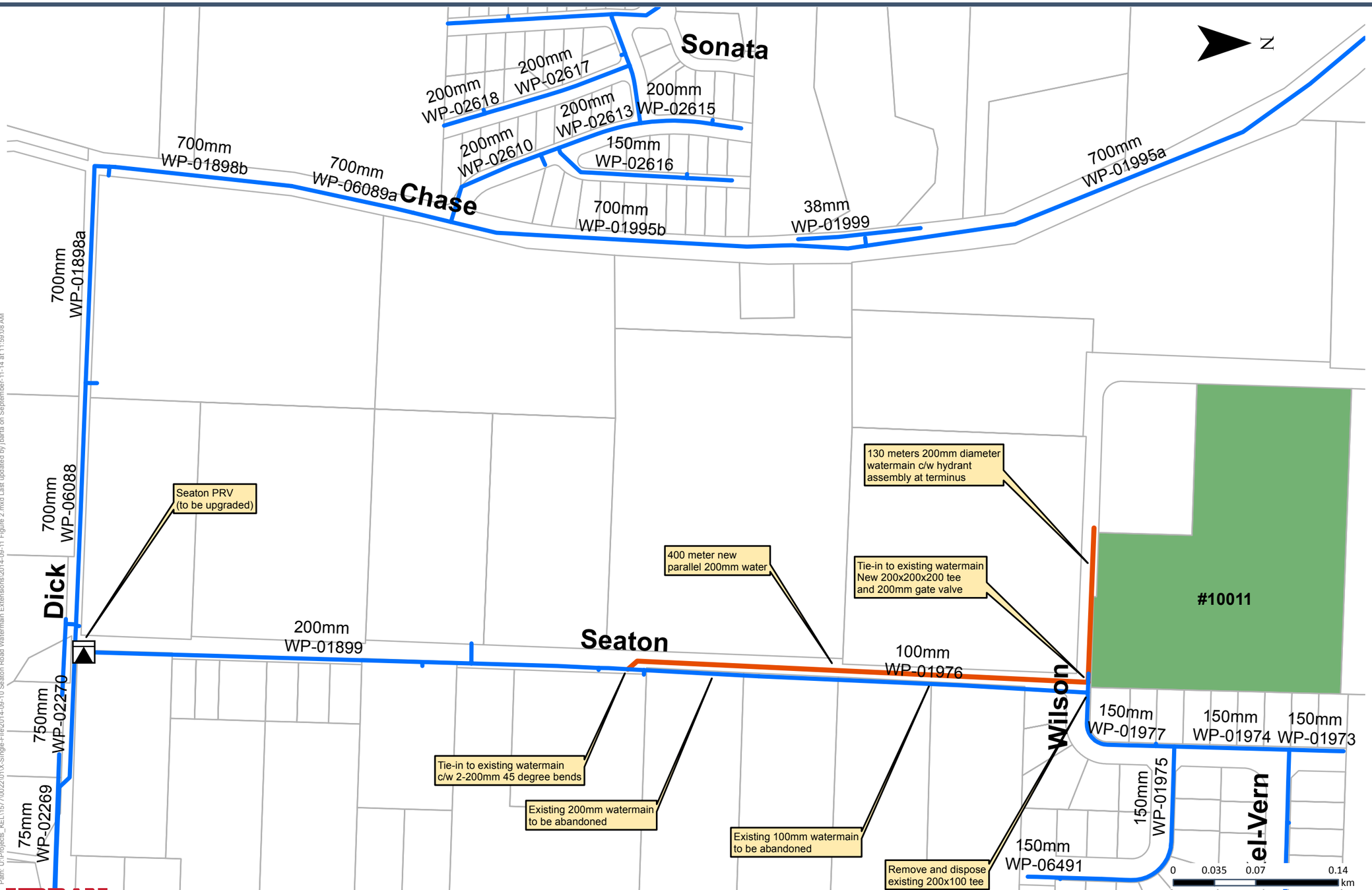
URBAN systems

Figure 1

10011 Seaton Road, Lake Country
1577.0022.01 | September 2014

LAKE COUNTRY
Life. The Okanagan Way.

10011 Seaton Road Upgrades
South Watermain Extension



Path: U:\Projects_KEL\1577\0022\01\X-Single-File\2014-09-10 Seaton Road Watermain Extensions\2014-09-11 Figure 2.mxd Last updated by barta on September-11-14 at 11:59:08 AM

URBAN systems

Figure 2

10011 Seaton Road, Lake Country
1577.0022.01 | September 2014

represents the summation of all identifiable project component costs. A contingency allowance of 25% plus engineering and other allowances is appropriate for this class of estimate. A detailed breakdown is attached to this memorandum.

Table 1 – Cost Estimate

	North Watermain Extension	South Watermain Extension
Removals	$19,000	$22,000
Watermain upgrades	$153,000	$351,000
Roadway Restoration (*)	$69,000	$77,000
Subtotal	$241,000	$427,000
Contingency Allowance (40%)	$97,000	$171,000
Total	**$338,000**	**$598,000**

(*) assumes half road width restoration

Summary

Servicing the property at 10011 Seaton Road by extending and upgrading the existing watermain north of the site is the most cost-effective strategy. Both cost estimates are close in value with the exception of the PRV facility required in the south extension option. If the District has additional discretionary funds available, choosing the south watermain extension project will improve operations by providing an above-ground PRV building as well as addressing the existing watermain trespass issue on private property.

Thank you for the opportunity to assist the District with this water system analysis. Should you have any questions, please contact the undersigned.

URBAN SYSTEMS LTD.

Jason Barta, B.Sc.
Municipal Infrastructure Analyst
/jb

Reviewed by:

Randy Runzer, AScT
Principal, Senior Technologist

U:\Projects_KEL\1577\0022\01\X-Single-File\2014-09-10 Seaton Road Watermain Extensions\2014-09-11 Seaton Road - Watermain Extension Analysis.docx

10011 Seaton Road - Watermain Extensions

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
North Watermain Extension					
1.0	Remove & dispose existing asphalt	sq.m	1900	$6.00	$ 11,400.00
2.0	Sawcut existing asphalt	m	950	$8.00	$ 7,600.00
3.0	200mm DR18 PVC watermain	m	475	$260.00	$ 123,500.00
4.0	200x200x150mm tee	each	1	$1,300.00	$ 1,300.00
5.0	200mm gate valve	each	1	$1,700.00	$ 1,700.00
6.0	Hydrant assembly	each	1	$5,200.00	$ 5,200.00
7.0	Tie-in to existing watermain	each	4	$1,800.00	$ 7,200.00
8.0	Controlled density fill	m	275	$50.00	$ 13,750.00
9.0	Roadway restoration - 300mm depth sub base gravel course	sq. m	1900	$15.00	$ 28,500.00
10.0	Roadway restoration - 100mm depth base gravel course	sq. m	1900	$6.00	$ 11,400.00
11.0	Roadway restoration - 50mm depth asphaltic concrete pavement	sq. m	1900	$15.00	$ 28,500.00
				Subtotal (North watermain extension)	**$ 241,000.00**
				Engineering and contingency (15%+25%)	**$ 97,000.00**
				Total (North watermain extension)	**$ 338,000.00**
South Watermain Extension					
1.0	Remove & dispose existing asphalt	sq.m	2120	$6.00	$ 12,720.00
2.0	Sawcut existing asphalt	m	1060	$8.00	$ 8,480.00
3.0	200mm DR18 PVC watermain	m	530	$260.00	$ 137,800.00
4.0	200x200x200mm tee	each	1	$1,300.00	$ 1,300.00
5.0	200mm gate valve	each	1	$1,700.00	$ 1,700.00
6.0	200mm 45 degree bend	each	2	$400.00	$ 800.00
7.0	Hydrant assembly	each	1	$5,200.00	$ 5,200.00
8.0	Above ground PRV building (building, power, heat, lights, 150mm and 50mm pressure valves, SCADA with radio, parking, fencing)	LS	1	$180,000.00	$ 180,000.00
9.0	Tie-in to existing watermain	each	2	$1,800.00	$ 3,600.00
10.0	Controlled density fill	m	400	$50.00	$ 20,000.00
11.0	Roadway restoration - 300mm depth sub base gravel course	sq. m	2120	$15.00	$ 31,800.00
12.0	Roadway restoration - 100mm depth base gravel course	sq. m	2120	$6.00	$ 12,720.00
13.0	Roadway restoration - 50mm depth asphaltic concrete pavement	sq. m	2120	$15.00	$ 31,800.00
				Subtotal (South watermain extension)	**$ 427,000.00**
				Engineering and contingency (15%+25%)	**$ 171,000.00**
				Total (South watermain extension)	**$ 598,000.00**

Appendix E

Moberly Road Watermain Extension

(Urban Systems)

MEMORANDUM

URBAN systems

Date:	October 23, 2015
To:	Sid Smith, Michael Mercer; District of Lake Country
cc:	
From:	Jason Barta
File:	1577.0063.01
Subject:	Moberly Road Watermain Extension

Background

Urban Systems met with the District of Lake Country and Mr. Rob Richardson on October 9th, 2015 at the District offices to discuss extending the District's water system to service up to twenty (20) homes that are currently receiving water from a private water utility. The parcels to be serviced are located between Moberly Road and Carrs Landing Road.

This memo investigates the available pressure and fire flow in the District's water system and the upgrades required to provide adequate pressure and fire flow to the twenty properties.

Urban Systems is currently working on the District project "Small Diameter Watermain Analysis" in which upstream upgrades have already been identified to provide sufficient fire flow to the Carrs Landing and Pixie Beach areas.

Methodology

We will add the anticipated water use for the twenty properties to the existing conditions water model under both peak hour and maximum day demand conditions to determine the effect on system pressures and available fire flow.

The following design criteria were taken from the District's Subdivision and Development Servicing Bylaw, No. 97-139 (bylaw):

- Residential maximum day demand (MDD) is 3,000 L/capita/day;
- Minimum pressure under peak hour demands (PHD) shall not be less than 36 psi (250 kPa);
- All fire flow analyses will be performed while adhering to the following constraints:
    - System demands will reflect MDD plus fire flow rate;
    - Minimum residual pressure during fire flow shall be 20 psi (140kPa); and
    - Watermain velocities shall not exceed 4 meters per second under fire flow conditions

Based on twenty parcels and a density of two persons per household, the anticipated MDD is 1.39 L/s. The demands were added to the north end of a proposed watermain along Moberly Road (currently a private driveway) that parallels Carrs Landing Road. At the request of the District, the system was examined under a scenario where the proposed main was 150mm in diameter and a second scenario where the proposed main was 200mm in diameter.

URBAN systems

Results

The proposed watermain water main was modeled as both a 150mm and 200mm diameter watermain extension in the model, with demands assigned to a node at the north end of the main, at an approximate elevation of 400 meters.

A new 250mm diameter watermain must be installed from the intersection of Moberly and Carrs Landing Roads, along Moberly Road, to the private easement.

The proposed watermain servicing the twenty properties through the private driveway easement, as well as the upstream upgrades identified in the Small Diameter Watermain Analysis project are shown in Figure 1.

Table 1 below lists the available fire flow based on the anticipated diameter of the new main serving the twenty properties.

Table 1 – Available Fire Flow

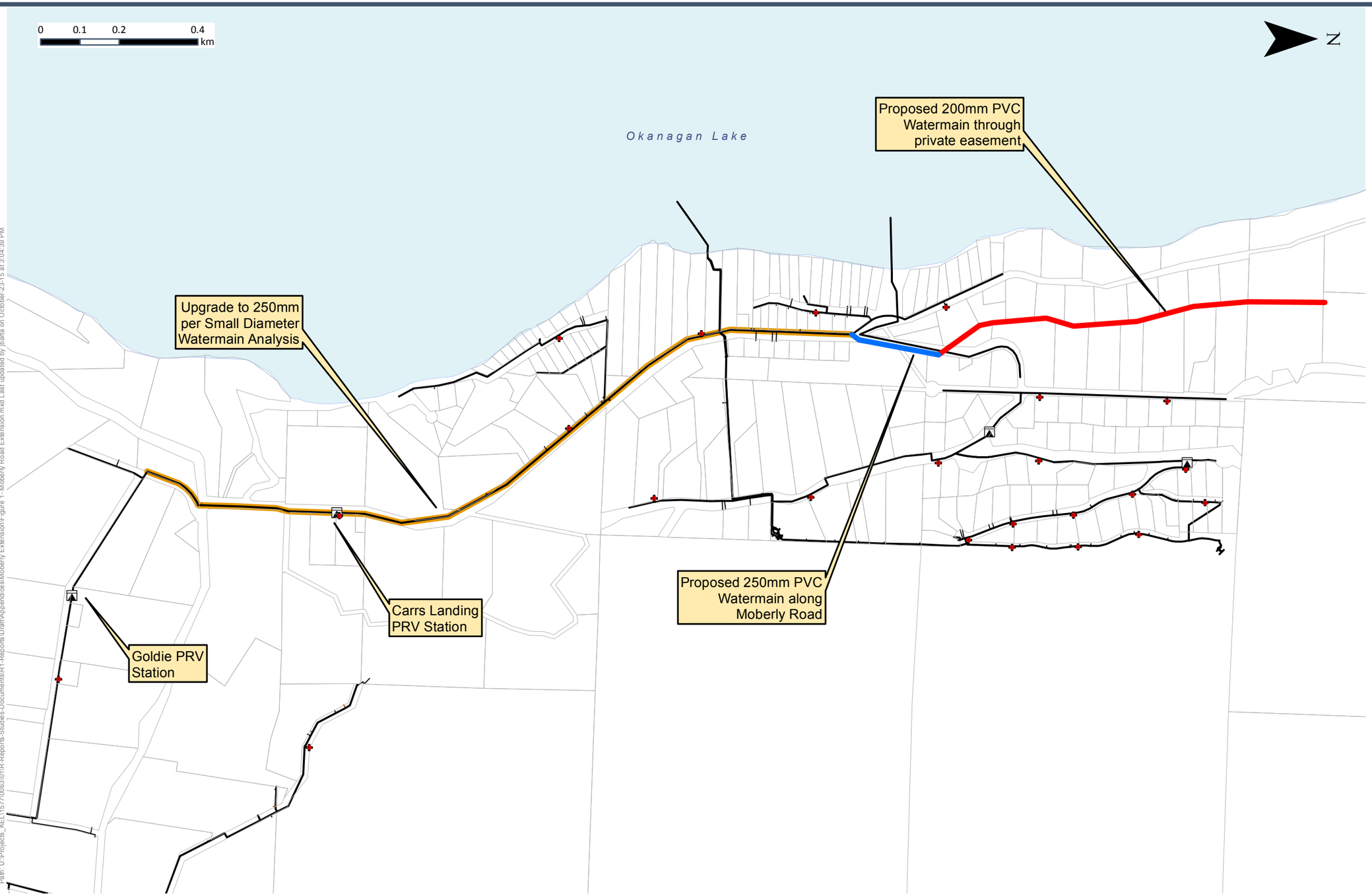
Diameter of Proposed Main	150mm	200mm
Available Fire Flow	32 L/s	58 L/s

As shown in Table 1, the available fire flow does not meet the District minimum of 60 L/s. The proposed watermain through the private easement (approximate length 1,040 meters) could be upsized to 250mm in diameter (Option #1) to provide 73 L/s of fire flow, but may cause water quality issues due to the low demands drawing from a large main.

Option #2 would be to oversize some of the upstream upgrades that are identified in the Small Diameter Watermain analysis. Specifically, the proposed 250mm diameter watermain from the Goldie PRV station to the tee servicing the Pixton Road area could be oversized to 300mm in diameter. The estimated length of this oversizing is 1,660 meters. This option is shown in Figure 2. Even with the oversizing to 300mm diameter, the proposed watermain through the private easement still needs to be 200mm in diameter to provide 63 L/s of fire flow.

LAKE COUNTRY
Life. The Okanagan Way.

Moberly Road Watermain Extension



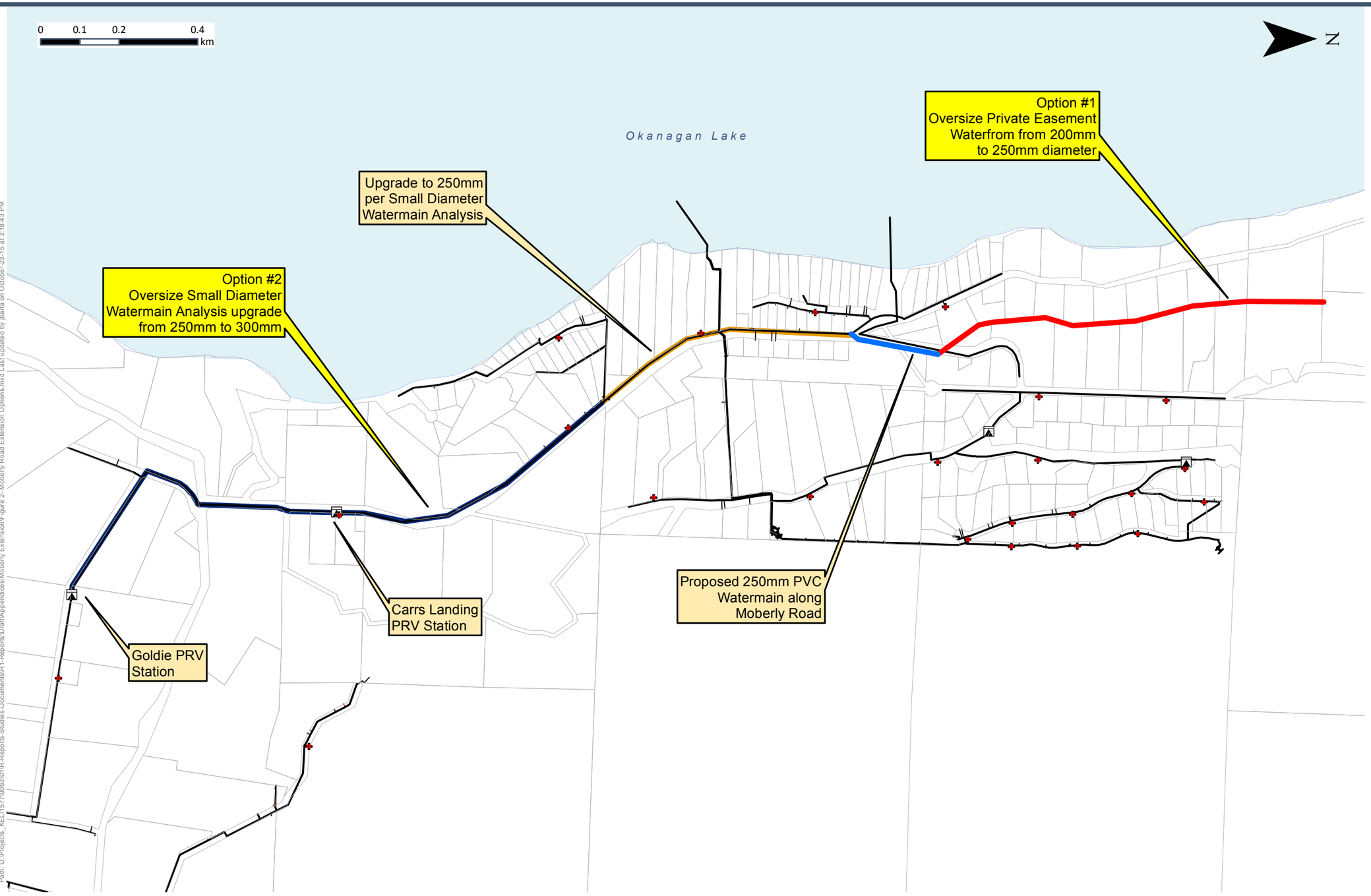
URBANSYSTEMS.

Figure 1

Small Diameter Watermain Analysis
1577.0063.01 | October 2015

LAKE COUNTRY
Life. The Okanagan Way.

Moberly Road Watermain Extension Options



Path: U:\Projects_KEL\1577\0063\01\R-Reports-Studies-Documents\R1-Reports\Draft\Appendices\Moberly Extension\Figure 2- Moberly Road Extension Options.mxd Last updated by jbarta on October-23-15 at 3:18:43 PM

URBAN SYSTEMS

Figure 2

Small Diameter Watermain Analysis
1577.0063.01 | October 2015

Recommendation

Given the relatively small price difference in pipe costs for over-sizing, and to avoid water quality issues, it is suggested that Option 2 be selected. The oversizing from the Goldie PRV to the Pixton Road watermain tee fitting provides additional fire flow capacity to the entire Carrs Landing area.

The design for the watermain extension along Moberly Road and through the private easement should be reviewed by the District to confirm compliance with BCBC 2012, with respect to hydrant spacing. The District should also request and review details fire flow calculations for each property to ensure the required fire flow does not exceed 63 L/s.

Closure

Should you have any questions or comments, please contact the undersigned.

URBAN SYSTEMS LTD.

Jason Barta, B.Sc.
Municipal Infrastructure Analyst
/jb

U:\Projects_KEL\1577\0063\01\R-Reports-Studies-Documents\R1-Reports\Draft\Appendices\Moberly Extension\2015-10-23 Moberly Road Watermain Extension.docx

Appendix F

Pre-Design Cost Estimates

URBAN systems

Pre-Design Cost Estimate
Okanagan Centre - PRV Replacement - 6th Street

Project Description		Project #	1.1
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 6", 2"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	486	Checked by:	J. Clowes
Existing HGL setting on downstream side of PRV (m)	427	See Figure	1-1
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	130		
Estimated existing maximum day demand (L/min)	841		
Estimated existing peak hour demand (L/min)	1,244		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Watermain Upgrades - Option #1

Project Description

Upgrade Camp Road watermain to 300mm
Upgrade Hare Road watermain to 300mm/200mm
Upgrade Withers Road watermain to 300mm
Upgrade Stokepoges Road watermain to 200mm
Upgrade Maddock Avenue watermain to 200mm
Add new 250mm watermain along Okanagan Centre Road West
Abandon existing watermain from 5th street to Camp Road
Reconnect existing water services to new mains
Replace existing hydrant assembly and lead (9)
Add new hydrants to ensure maximum spacing of 180m
New mainline valves per Figure 1-1
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	1.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	1-1

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$95,000	$95,000
	Insurance and Bonding	1	LS	$30,000	$30,000
	75mm asphalt restoration	14940	sq.m	$20	$298,800
	100mm base course gravel restoration	14940	sq.m	$6	$89,640
	350mm subbase course gravel restoration	14940	sq.m	$15	$224,100
	Rock removal allowance	1500	m	$150	$225,000
	Utility conflict allowance	1	ls	$30,000	$30,000
	Reconnect existing service to new watermain	70	ea	$1,500	$105,000
	Replace existing hydrant assembly and lead	9	ea	$6,500	$58,500
	New 150mm hydrant assembly	15	ea	$5,500	$82,500
	Tie-in to existing 100mm watermain	4	ea	$5,000	$20,000
	Tie-in to existing 150mm watermain	4	ea	$5,000	$20,000
	Tie-in to existing 200mm watermain	2	ea.	$5,000	$10,000
	Tie-in to existing 250mm watermain	2	ea	$5,000	$10,000
	200mm PVC watermain	1220	m	$250	$305,000
	200mm Gate valve	8	ea	$2,000	$16,000
	250mm PVC watermain	1360	m	$275	$374,000
	250mm Gate valve	10	ea	$3,000	$30,000
	300mm PVC watermain	2400	ea	$325	$780,000
	300mm Gate valve	7	ea	$4,000	$28,000
	Remove and dispose existing 150mm watermain	230	lm	$50	$11,500
				subtotal	$2,843,040
				Contingency and Engineering (40%)	$1,137,216
				total	$3,980,256
				rounded total	$3,980,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Watermain Upgrades - Option #2

Project Description

New PRV station and watermain between Camp and Hare Roads (greenfield)
Upgrade Hare Road watermain to 250mm
Upgrade Withers Road watermain to 300mm
Upgrade Stokepoges Road watermain to 200mm
Upgrade Maddock Avenue watermain to 200mm
Add new 250mm watermain along Okanagan Centre Road West
Abandon existing watermain from 5th street to Camp Road
Reconnect existing water services to new mains
Replace existing hydrant assembly and lead (9)
Add new hydrants to ensure maximum spacing of 180m
New mainline valves per Figure 1-2
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	1.3
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	1-2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$95,000	$95,000
	Insurance and Bonding	1	LS	$30,000	$30,000
	75mm asphalt restoration	12990	sq.m	$20	$259,800
	100mm base course gravel restoration	12990	sq.m	$6	$77,940
	350mm subbase course gravel restoration	12990	sq.m	$15	$194,850
	Rock removal allowance	1300	m	$150	$195,000
	Utility conflict allowance	1	ls	$30,000	$30,000
	Reconnect existing service to new watermain	65	ea	$1,500	$97,500
	Replace existing hydrant assembly and lead	9	ea	$6,500	$58,500
	New 150mm hydrant assembly	7	ea	$5,500	$38,500
	Tie-in to existing 100mm watermain	4	ea	$5,000	$20,000
	Tie-in to existing 150mm watermain	4	ea	$5,000	$20,000
	Tie-in to existing 200mm watermain	2	ea.	$5,000	$10,000
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	200mm PVC watermain	860	m	$250	$215,000
	200mm Gate valve	6	ea	$2,000	$12,000
	250mm PVC watermain	3130	m	$275	$860,750
	250mm Gate valve	16	ea	$3,000	$48,000
	300mm PVC watermain	340	m	$325	$110,500
	300mm Gate valve	1	ea	$4,000	$4,000
	New PRV station	1	LS	$260,000	$260,000
				subtotal	$2,642,340
				Contingency and Engineering (40%)	$1,056,936
				total	$3,699,276
				rounded total	$3,700,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Optional AC Watermain Replacement - Camp Road I

Project Description		Project #	1.4
Abandon existing 250mm AC watermain along Camp Road		USL Job No.	1577.0063.01
from Cheeseman Road to Davidson PRV and replace with PVC		Date	06/27/2016
Reconnect existing water services to new mains		Prepared by:	J.Barta
New mainline valves at 250m spacing		Checked by:	J. Clowes
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration		See Figure	1-2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$25,000	$25,000
	Insurance and Bonding	1	LS	$7,000	$7,000
	75mm asphalt restoration	1800	sq.m	$20	$36,000
	100mm base course gravel restoration	1800	sq.m	$6	$10,800
	350mm subbase course gravel restoration	1800	sq.m	$15	$27,000
	Rock removal allowance	400	m	$150	$60,000
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	23	ea	$1,500	$34,500
	Tie-in to existing 250mm watermain	2	ea	$5,000	$10,000
	250mm PVC watermain	900	m	$275	$247,500
	250mm Gate valve	4	ea	$3,000	$12,000
				subtotal	$479,800
				Contingency and Engineering (40%)	$191,920
				total	$671,720
				rounded total	$670,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Optional AC Watermain Replacement - Camp Road II

Project Description		Project #	1.5
Abandon existing 200/250mm AC watermain along Camp Road		USL Job No.	1577.0063.01
from Davidson PRV to Tyndall Road and replace with PVC		Date	06/27/2016
Reconnect existing water services to new mains		Prepared by:	J.Barta
New 250mm mainline valve at existing hydrant location		Checked by:	J. Clowes
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration		See Figure	1-2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$18,000	$18,000
	Insurance and Bonding	1	LS	$6,000	$6,000
	75mm asphalt restoration	1530	sq.m	$20	$30,600
	100mm base course gravel restoration	1530	sq.m	$6	$9,180
	350mm subbase course gravel restoration	1530	sq.m	$15	$22,950
	Rock removal allowance	300	m	$150	$45,000
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	13	ea	$1,500	$19,500
	Tie-in to existing 250mm watermain	2	ea	$5,000	$10,000
	250mm PVC watermain	765	m	$275	$210,375
	250mm Gate valve	3	ea	$3,000	$9,000
				subtotal	$390,605
				Contingency and Engineering (40%)	$156,242
				total	$546,847
				rounded total	$550,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Optional PRV Replacement - Davidson PRV

Project Description		Project #	1.6
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 6", 3"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	605	Checked by:	J. Clowes
Existing HGL setting on downstream side of PRV (m)	533	See Figure	1-2
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	262		
Estimated existing maximum day demand (L/min)	2,181		
Estimated existing peak hour demand (L/min)	2,990		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Optional PRV Replacement - Camp PRV

Project Description		Project #	1.7
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 6", 3"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	529	Checked by:	J. Clowes
Existing HGL setting on downstream side of PRV (m)	488	See Figure	1-2
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	224		
Estimated existing maximum day demand (L/min)	1,721		
Estimated existing peak hour demand (L/min)	2,416		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Okanagan Centre - Optional PRV Replacement - Hare PRV

Project Description		Project #	1.8
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 4", 2"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	487	Checked by:	J. Clowes
Existing HGL setting on downstream side of PRV (m)	437	See Figure	1-2
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	9		
Estimated existing maximum day demand (L/min)	89		
Estimated existing peak hour demand (L/min)	118		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Oyama Isthmus Watermain Upgrades

Project Description

Upgrade Greenhow Road watermain to 200mm (1/2 road restoration)
Upgrade Trask Road watermain to 200mm (1/2 road restoration)
Upgrade Roberts Road watermain to 200mm and loop to Trask Road
Upgrade Ackerman Road watermain to 200mm and loop to Trask Road
Connect hydrant lead at Young/Greenhow Intersection to Greenhow 200mm main
Replace 50mm GI main on Harris Lane with PVC main
Reconnect existing water services to new mains
Replace existing hydrant assembly and lead (3)
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	2.1
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$30,000	$30,000
	Insurance and Bonding	1	LS	$9,000	$9,000
	75mm asphalt restoration	2475	sq.m	$20	$49,500
	100mm base course gravel restoration	2475	sq.m	$6	$14,850
	350mm subbase course gravel restoration	2475	sq.m	$15	$37,125
	Rock removal allowance	400	m	$150	$60,000
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	43	ea	$1,500	$64,500
	Replace existing hydrant assembly and lead	4	ea	$6,500	$26,000
	New 150mm hydrant assembly	0	ea	$5,500	$0
	Tie-in to existing 100mm watermain	2	ea	$5,000	$10,000
	Tie-in to existing 150mm watermain	3	ea	$5,000	$15,000
	Tie-in to existing 200mm watermain	4	ea.	$5,000	$20,000
	Tie-in to existing 250mm watermain	0	ea	$5,000	$0
	Tie-in to existing 300mm watermain	0	ea	$5,000	$0
	Tie-in to existing 350mm watermain	0	ea	$5,500	$0
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	50mm PVC watermain	50	m	$150	$7,500
	150mm Gate valve	0	ea	$1,500	$0
	200mm PVC watermain	985	m	$250	$246,250
	200mm Gate valve	7	ea	$2,000	$14,000
	250mm PVC watermain	0	m	$275	$0
	250mm Gate valve	0	ea	$3,000	$0
	300mm PVC watermain	0	ea.	$325	$0
	300mm Gate valve	0	ea.	$4,000	$0
				subtotal	$619,725
				Contingency and Engineering (40%)	$247,890
				total	$867,615
				rounded total	$870,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Road Watermain Upgrades - Trask Road to Greenhow Road

Project Description

Upgrade Oyama Road watermain to 300mm

Reconnect existing water services to new mains

New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	2.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$35,000	$35,000
	Insurance and Bonding	1	LS	$10,000	$10,000
	75mm asphalt restoration	1020	sq.m	$20	$20,400
	100mm base course gravel restoration	1020	sq.m	$6	$6,120
	350mm subbase course gravel restoration	1020	sq.m	$15	$15,300
	Rock removal allowance	150	m	$150	$22,500
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	8	ea	$1,500	$12,000
	Replace existing hydrant assembly and lead	0	ea	$6,500	$0
	New 150mm hydrant assembly	0	ea	$5,500	$0
	Tie-in to existing 100mm watermain	0	ea	$5,000	$0
	Tie-in to existing 150mm watermain	0	ea	$5,000	$0
	Tie-in to existing 200mm watermain	0	ea.	$5,000	$0
	Tie-in to existing 250mm watermain	0	ea	$5,000	$0
	Tie-in to existing 300mm watermain	2	ea	$5,000	$10,000
	Tie-in to existing 350mm watermain	0	ea	$5,500	$0
	Tie-in to existing 400mm watermain	0	ea	$6,000	$0
	150mm PVC watermain	0	m	$200	$0
	150mm Gate valve	0	ea	$1,500	$0
	200mm PVC watermain	0	m	$250	$0
	200mm Gate valve	0	ea	$2,000	$0
	250mm PVC watermain	0	m	$275	$0
	250mm Gate valve	0	ea	$3,000	$0
	300mm PVC watermain	340	ea.	$325	$110,500
	300mm Gate valve	2	ea.	$4,000	$8,000
				subtotal	$259,820
				Contingency and Engineering (40%)	$103,928
				total	$363,748
				rounded total	$360,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Irvine Boosted Zone - Removals and New Booster Station

Project Description		Project #	3.1
Per Upper Pressure Zone Review Report (Appendix C)		USL Job No.	1577.0063.01
Remove reservoir from existing site 1		Date	06/27/2016
Remove pump station from existing site 1		Prepared by:	J.Barta
Decommission pump station at site 2.		Checked by:	J. Clowes
Proposed site works and pump station at site 1		See Figure	3

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization and Demobilization	1	LS	$20,000	$20,000
	Insurance and Bonding	1	LS	$12,000	$12,000
	Remove existing 150m3 reservoir from site 1	1	LS	$30,000	$30,000
	Remove existing site pump station	1	LS	$20,000	$20,000
	Decommision site 2 pump station and discharge line	1	LS	$20,000	$20,000
	Site works - Refer to Upper Pressure Zone Review in Appendix C	1	LS	$89,800	$89,800
	Pump Station - Refer to Upper Pressure Zone Review in Appendix C	1	LS	$600,000	$600,000
				subtotal	$791,800
				Contingency and Engineering (35%)	$277,130
				total	$1,068,930
				rounded total	$1,070,000

Note: Estimates do not include land acquisition costs.

Pre-Design Cost Estimate
Irvine Boosted Zone - Watermain Upgrades

Project Description

Upgrade existing watermain to 200mm from Irvine Booster Station to south end of Old Mission Road.
Remove and replace existing AC watermain between Old Mission Road and Highland Road. Create loop back up to Old Mission Road
Install two private hydrants between Old Mission Road and Irvine PS
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration
Replace/add air vacuum valves per Upper Supply Zone Report
Upgrade piping from Irvine Reservoir to Old Mission Road for lower pressure zone.

Project #	3.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	3

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$35,000	$35,000
	Insurance and Bonding	1	LS	$10,000	$10,000
	75mm asphalt restoration	1260	sq.m	$20	$25,200
	100mm base course gravel restoration	1260	sq.m	$6	$7,560
	350mm subbase course gravel restoration	1260	sq.m	$15	$18,900
	Rock removal allowance	400	m	$150	$60,000
	Utility conflict allowance	1	ls	$20,000	$20,000
	Remove and dispose existing 100mm watermain	340	m	$50	$17,000
	Reconnect existing service to new watermain	40	ea	$1,500	$60,000
	Replace existing hydrant assembly and lead	3	ea	$6,500	$19,500
	New 150mm hydrant assembly	2	ea	$5,500	$11,000
	Tie-in to existing 200mm watermain	1	ea.	$5,000	$5,000
	Tie-in to existing 300mm watermain	2	ea	$5,000	$10,000
	Replace air/vacuum valve	6	ea	$1,000	$6,000
	Add air/vacuum valve	4	ea	$6,000	$24,000
	200mm PVC watermain	1445	m	$250	$361,250
	200mm Gate valve	6	ea	$2,000	$12,000
	300mm PVC watermain	330	ea.	$325	$107,250
	300mm Gate valve	2	ea.	$4,000	$8,000
				subtotal	$817,660
				Contingency and Engineering (40%)	$327,064
				total	$1,144,724
				rounded total	$1,140,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Cornwall Road - Waterman Upgrades - Option 1

Project Description

Upgrade existing 200mm main to 250mm along Pelmewash Parkway
Upgrade existing 150mm main to 200mm from Pelmewash to Cornwall Road
Upgrade existing 100mm main to 200mm along Old Mission Road
Upgrade Sheldon, Cornwall and Highland Road watermains to 200mm
Abandon northern Cornwall watermain between Sheldon and Highland Roads
Create new 200mm loop linking Sheldon and Highland Roads at south end
Add new hydrant along Pelemwash Parkway and north end of Sheldon Road
Replace existing hydrant assembly and lead (7)
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	4.1
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	4-2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$45,000	$45,000
	Insurance and Bonding	1	LS	$15,000	$15,000
	75mm asphalt restoration	2280	sq.m	$20	$45,600
	100mm base course gravel restoration	2280	sq.m	$6	$13,680
	350mm subbase course gravel restoration	2280	sq.m	$15	$34,200
	Rock removal allowance	800	m	$150	$120,000
	Utility conflict allowance	1	ls	$30,000	$30,000
	Cap/abandon main to old pump station at Pelmewash Parkway	1	LS	$50,000	$50,000
	Reconnect existing service to new watermain	29	ea	$1,500	$43,500
	Replace existing hydrant assembly and lead	7	ea	$6,500	$45,500
	New 150mm hydrant assembly	2	ea	$5,500	$11,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 300mm watermain	2	ea	$5,000	$10,000
	200mm PVC watermain	1620	m	$250	$405,000
	200mm Gate valve	6	ea	$2,000	$12,000
	250mm PVC watermain	460	m	$275	$126,500
	250mm Gate valve	2	ea	$3,000	$6,000
				subtotal	$1,017,980
				Contingency and Engineering (40%)	$407,192
				total	$1,425,172
				rounded total	$1,430,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Cornwall Road - Waterman Upgrades - Option 2

Project Description

Proposed 200mm loop from Old Mission Road to Pelmewash Parkway
Upgrade existing 150mm main to 200mm from Pelmewash to Cornwall Road
Upgrade existing 100mm main to 200mm along Old Mission Road
Upgrade Sheldon, Cornwall and Highland Road watermains to 200mm
Abandon northern Cornwall watermain between Sheldon and Highland Roads
Create new 200mm loop linking Sheldon and Highland Roads at south end
Add new hydrant along Pelemwash Parkway and north end of Sheldon Road
Replace existing hydrant assembly and lead (7)
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	4.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	4-3

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$45,000	$45,000
	Insurance and Bonding	1	LS	$15,000	$15,000
	75mm asphalt restoration	2280	sq.m	$20	$45,600
	100mm base course gravel restoration	2280	sq.m	$6	$13,680
	350mm subbase course gravel restoration	2280	sq.m	$15	$34,200
	Rock removal allowance	750	m	$150	$112,500
	Utility conflict allowance	1	ls	$30,000	$30,000
	Cap/abandon main to old pump station at Pelmewash Parkway	1	LS	$3,000	$3,000
	Reconnect existing service to new watermain	29	ea	$1,500	$43,500
	Replace existing hydrant assembly and lead	7	ea	$6,500	$45,500
	New 150mm hydrant assembly	2	ea	$5,500	$11,000
	Tie-in to existing 150mm watermain	4	ea	$5,000	$20,000
	200mm PVC watermain	1945	m	$250	$486,250
	200mm Gate valve	8	ea	$2,000	$16,000
				subtotal	$921,230
				Contingency and Engineering (40%)	$368,492
				total	$1,289,722
				rounded total	$1,290,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Carrs Landing - Carrs Landing PRV Replacement

Project Description		Project #	5.1
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 4", 2"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	487	Checked by:	J. Clowes
Existing HGL setting on downstream side of PRV (m)	437	See Figure	5-1 and 5-2
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	177		
Estimated existing maximum day demand (L/min)	918		
Ultimate MDD including Ravenridge and Moberly developments (L/min)	3,753		
Estimated existing peak hour demand (L/min)	1,297		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Carrs Landing - Watermain Upgrades Option #1

Project Description

Upgrade Carrs Landing watermain to 250mm
Upgrade Carrs Landing watermain to 200mm north of Moberly Road
Upgrade McCreight Road watermain to 200mm
Upgrade Pixton Road watermain to 200mm
Add new hydrants (7) along Carrs Landing Road
Add new hydrant along Pixton Road
Replace existing Pixton Road hydrant assembly and lead
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	5.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	5-1

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$75,000	$75,000
	Insurance and Bonding	1	LS	$20,000	$20,000
	75mm asphalt restoration	9225	sq.m	$20	$184,500
	100mm base course gravel restoration	9225	sq.m	$6	$55,350
	350mm subbase course gravel restoration	9225	sq.m	$15	$138,375
	Rock removal allowance	750	m	$150	$112,500
	Utility conflict allowance	1	ls	$30,000	$30,000
	Reconnect existing service to new watermain	23	ea	$1,500	$34,500
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	New 150mm hydrant assembly	8	ea	$5,500	$44,000
	Tie-in to existing 100mm watermain	2	ea	$5,000	$10,000
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	200mm PVC watermain	1290	m	$250	$322,500
	200mm Gate valve	6	ea	$2,000	$12,000
	250mm PVC watermain	1995	m	$275	$548,625
	250mm Gate valve	4	ea	$3,000	$12,000
				subtotal	$1,610,850
				Contingency and Engineering (40%)	$644,340
				total	$2,255,190
				rounded total	$2,260,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Carrs Landing - Watermain Upgrades Option #2 (Pixton Road loop)

Project Description

Upgrade Carrs Landing watermain to 250mm
Upgrade Carrs Landing watermain to 200mm north of Moberly Road
Upgrade McCreight Road watermain to 200mm
Upgrade Pixton Road watermain to 200mm
Add new hydrants (7) along Carrs Landing Road
Add new hydrant along Pixton Road
Replace existing Pixton Road hydrant assembly and lead
New 200mm loop from Carrs Landing PRV to south end Pixton Road
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	5.3
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	5-2

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$75,000	$75,000
	Insurance and Bonding	1	LS	$20,000	$20,000
	75mm asphalt restoration	8745	sq.m	$20	$174,900
	100mm base course gravel restoration	8745	sq.m	$6	$52,470
	350mm subbase course gravel restoration	8745	sq.m	$15	$131,175
	Rock removal allowance	750	m	$150	$112,500
	Utility conflict allowance	1	ls	$30,000	$30,000
	Reconnect existing service to new watermain	23	ea	$1,500	$34,500
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	New 150mm hydrant assembly	8	ea	$5,500	$44,000
	Tie-in to existing 100mm watermain	2	ea	$5,000	$10,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	200mm PVC watermain	1200	m	$250	$300,000
	200mm Gate valve	5	ea	$2,000	$10,000
	250mm PVC watermain	1995	m	$275	$548,625
	250mm Gate valve	4	ea	$3,000	$12,000
				subtotal	$1,571,670
				Contingency and Engineering (40%)	$628,668
				total	$2,200,338
				rounded total	$2,200,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Carrs Landing - Carrs Landing Road Oversizing for Moberly/RavenRidge

Project Description

Oversize Carrs Landing watermain from 250mm to 300mm to accommodate future Moberly Road and/or RavenRidge customers

Oversizing cost calculated by including negative value of 250mm diameter watermain and positive value of 300mm diameter watermain

Project #	5.4
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	5-3

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	250mm PVC watermain	-1270	m	$275	-$349,250
	250mm Gate valve	-5	ea	$3,000	-$15,000
	300mm PVC watermain	1640	ea.	$325	$533,000
	300mm Gate valve	6	ea.	$4,000	$24,000
				subtotal	$192,750
				Contingency and Engineering (40%)	$77,100
				total	$269,850
				rounded total	$270,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Carrs Landing - Optional PRV Replacement - Goldie PRV

Project Description			
Decommission existing PRV station.		Project #	5.5
Replace with new above-ground facility		USL Job No.	1577.0063.01
Existing valve sizes: 6", 2"		Date	06/27/2016
Existing HGL measurement on upstream side of PRV (m)	575	Prepared by:	J.Barta
Existing HGL setting on downstream side of PRV (m)	491	Checked by:	J. Clowes
Required fire flow through station (L/min)	5000	See Figure	5-1 and 5-2
Estimate existing winter day demand (L/min)	190		
Estimated existing maximum day demand (L/min)	1,292		
Ultimate MDD including Ravenridge and Moberly developments (L/min)	4,127		
Estimated existing peak hour demand (L/min)	1,711		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Ponderosa Drive - Watermain Upgrades

Project Description

Upgrade Old Mission Road watermain to 200mm
Upgrade Ponderosa Drive watermain to 200mm
Replace exist standpipes with hydrants. Maintained existing 260m spacing
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	6.1
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J. Clowes
See Figure	6-1

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$25,000	$25,000
	Insurance and Bonding	1	LS	$6,000	$6,000
	75mm asphalt restoration	1560	sq.m	$20	$31,200
	100mm base course gravel restoration	2670	sq.m	$6	$16,020
	350mm subbase course gravel restoration	2670	sq.m	$15	$40,050
	Rock removal allowance	400	m	$150	$60,000
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	21	ea	$1,500	$31,500
	New 150mm hydrant assembly	3	ea	$5,500	$16,500
	Tie-in to existing 200mm watermain	3	ea.	$5,000	$15,000
	200mm PVC watermain	890	m	$250	$222,500
	200mm Gate valve	4	ea	$2,000	$8,000
				subtotal	$481,770
				Contingency and Engineering (40%)	$192,708
				total	$674,478
				rounded total	$670,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Coral Beach - Watermain Upgrades

Project Description		Project #	7.1
Upgrade distribution mains to 200mm up to hydrant extents		USL Job No.	1577.0063.01
Construct 700 cubic meter reservoir addition		Date	06/27/2016
Replace existing hydrant assembly and lead (3)		Prepared by:	J. Barta
Reconnect existing water services to new mains		Checked by:	J. Clowes
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration		See Figure	7

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$40,000	$40,000
	Insurance and Bonding	1	LS	$12,000	$12,000
	75mm asphalt restoration	2940	sq.m	$20	$58,800
	100mm base course gravel restoration	2940	sq.m	$6	$17,640
	350mm subbase course gravel restoration	2940	sq.m	$15	$44,100
	Rock removal allowance	400	m	$150	$60,000
	Utility conflict allowance	1	ls	$20,000	$20,000
	Reconnect existing service to new watermain	41	ea	$1,500	$61,500
	Replace existing hydrant assembly and lead	3	ea	$6,500	$19,500
	New 150mm hydrant assembly	3	ea	$5,500	$16,500
	Cast-in-place concrete (reservoir)	700	cu.m	$300	$210,000
	Reservoir inlet/outlet piping	1	LS	$100,000	$100,000
	Tie-in to existing 100mm watermain	2	ea	$5,000	$10,000
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	200mm PVC watermain	1180	m	$250	$295,000
	200mm Gate valve	6	ea	$2,000	$12,000
				subtotal	$982,040
				Contingency and Engineering (40%)	$392,816
				total	$1,374,856
				rounded total	$1,370,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Owls Nest - Watermain Upgrades - North of Evans Road (Common for Option 1 & 2)

Project Description

Upgrade all mains to 200mm diameter
Replace hydrant assembly and lead (2)
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.1.1
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-1

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$10,000	$10,000
	Insurance and Bonding	1	LS	$3,000	$3,000
	75mm asphalt restoration	1080	sq.m	$20	$21,600
	100mm base course gravel restoration	1080	sq.m	$6	$6,480
	350mm subbase course gravel restoration	1080	sq.m	$15	$16,200
	Rock removal allowance	150	m	$150	$22,500
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	8	ea	$1,500	$12,000
	Replace existing hydrant assembly and lead	2	ea	$6,500	$13,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	200mm PVC watermain	360	m	$250	$90,000
	200mm Gate valve	2	ea	$2,000	$4,000
				subtotal	$218,780
				Contingency and Engineering (40%)	$87,512
				total	$306,292
				rounded total	$310,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Owls Nest - Watermain Upgrades - South of Evans Road - Option 1

Project Description

Upgrade existing supply main from Irvine Road to Evans Road to 250mm
Replace series 160 piping at north end of Old Mission Road with PVC
Reconnect existing water services & hydrants to new mains
Cost estimate does not include any restoration costs within orchard
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.1.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-1

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$45,000	$45,000
	Insurance and Bonding	1	LS	$12,000	$12,000
	75mm asphalt restoration	3900	sq.m	$20	$78,000
	100mm base course gravel restoration	3900	sq.m	$6	$23,400
	350mm subbase course gravel restoration	3900	sq.m	$15	$58,500
	Rock removal allowance	750	m	$150	$112,500
	Utility conflict allowance	1	ls	$30,000	$30,000
	Reconnect existing service to new watermain	28	ea	$1,500	$42,000
	Reconnect existing hydrant to new watermain	5	ea	$2,000	$10,000
	Tie-in to existing 300mm watermain	1	ea	$5,000	$5,000
	200mm PVC watermain	240	m	$250	$60,000
	250mm PVC watermain	1550	m	$275	$426,250
	250mm Gate valve	5	ea	$3,000	$15,000
				subtotal	$917,650
				Contingency and Engineering (40%)	$367,060
				total	$1,284,710
				rounded total	$1,280,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Owls Nest - Watermain Upgrades - South of Evans Road - Option 2

Project Description

Upgrade Old Mission Road watermain to 250mm diameter
Proposed Pelmewash Parkway 250mm loop to Owls Nest Road
Existing watermain from Buttersworth to Owls Nest Road to remain in service
Reconnect existing water services & hydrants to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.1.3
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-1

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$50,000	$50,000
	Insurance and Bonding	1	LS	$15,000	$15,000
	75mm asphalt restoration	5580	sq.m	$20	$111,600
	100mm base course gravel restoration	5580	sq.m	$6	$33,480
	350mm subbase course gravel restoration	5580	sq.m	$15	$83,700
	Rock removal allowance	750	m	$150	$112,500
	Utility conflict allowance	1	ls	$30,000	$30,000
	Reconnect existing service to new watermain	28	ea	$1,500	$42,000
	Reconnect existing hydrant to new watermain	5	ea	$2,000	$10,000
	Tie-in to existing 300mm watermain	1	ea	$5,000	$5,000
	250mm PVC watermain	1860	m	$275	$511,500
	250mm Gate valve	4	ea	$3,000	$12,000
				subtotal	$1,016,780
				Contingency and Engineering (40%)	$406,712
				total	$1,423,492
				rounded total	$1,420,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Seaton Road - Watermain Upgrades

Project Description

Upgrade existing undersized watermains to 200mm diameter
Abandon undersized watermains
Tie in to Seaton Road culdesac with 200mm tee and new gate valves
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.2
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-3

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$13,000	$13,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	75mm asphalt restoration	1410	sq.m	$20	$28,200
	100mm base course gravel restoration	1410	sq.m	$6	$8,460
	350mm subbase course gravel restoration	1410	sq.m	$15	$21,150
	Rock removal allowance	200	m	$150	$30,000
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	9	ea	$1,500	$13,500
	New 150mm hydrant assembly	2	ea	$5,500	$11,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 200mm watermain	3	ea.	$5,000	$15,000
	200mm PVC watermain	470	m	$250	$117,500
	200mm Gate valve	3	ea	$2,000	$6,000
				subtotal	$282,810
				Contingency and Engineering (40%)	$113,124
				total	$395,934
				rounded total	$400,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Woodsdale-Oceola Road - Watermain Looping

Project Description

280m of 250mm watermain along Oceola per DCC project W-10
Highway crossing (casing pipe) per DCC project W-10
700m of 250mm along Woodsdale to form new loop
New hydrant at Woodsdale Ct
Replace hydrant assembly and lead
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.3
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-4

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$40,000	$40,000
	Insurance and Bonding	1	LS	$10,000	$10,000
	75mm asphalt restoration	2850	sq.m	$20	$57,000
	100mm base course gravel restoration	2850	sq.m	$6	$17,100
	350mm subbase course gravel restoration	2850	sq.m	$15	$42,750
	Rock removal allowance	500	m	$150	$75,000
	Utility conflict allowance	1	ls	$30,000	$30,000
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	New 150mm hydrant assembly	1	ea	$5,500	$5,500
	Tie-in to existing 250mm watermain	2	ea	$5,000	$10,000
	600mm casing pipe under highway 97 by trenchless methods	80	m	$3,000	$240,000
	250mm PVC watermain	1030	m	$275	$283,250
	250mm Gate valve	6	ea	$3,000	$18,000
				subtotal	$835,100
				Contingency and Engineering (40%)	$334,040
				total	$1,169,140
				rounded total	$1,170,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Broadwater & Oyama Roads - Watermain Looping

Project Description

Construct 200mm loop on Broadwater Road
Construct 200mm loop on Oyama Road
Upgrade existing mains to 200mm along Broadwater, west of Oyama Road
Replace hydrant assembly and lead (4)
Reconnect existing water services to new mains
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.4
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$30,000	$30,000
	Insurance and Bonding	1	LS	$10,000	$10,000
	75mm asphalt restoration	3780	sq.m	$20	$75,600
	100mm base course gravel restoration	3780	sq.m	$6	$22,680
	350mm subbase course gravel restoration	3780	sq.m	$15	$56,700
	Rock removal allowance	500	m	$150	$75,000
	Utility conflict allowance	1	ls	$10,000	$10,000
	Reconnect existing service to new watermain	15	ea	$1,500	$22,500
	Replace existing hydrant assembly and lead	4	ea	$6,500	$26,000
	Tie-in to existing 100mm watermain	5	ea	$5,000	$25,000
	200mm PVC watermain	1260	m	$250	$315,000
	200mm Gate valve	4	ea	$2,000	$8,000
				subtotal	$676,480
				Contingency and Engineering (40%)	$270,592
				total	$947,072
				rounded total	$950,000

Note: Estimates do not include land acquisition costs.

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - Todd Road (East Hill)

Project Description		Project #	8.5
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 4", 1.5"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	606	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	542	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	20		
Estimated existing maximum day demand (L/min)	1,680		
Estimated existing peak hour demand (L/min)	2,520		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - Oyama Road (Cemetery)

Project Description		Project #	8.6
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 1.5", 3/4"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	532	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	480	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	5		
Estimated existing maximum day demand (L/min)	100		
Estimated existing peak hour demand (L/min)	150		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - MiddleBench (Harmen)

Project Description		Project #	8.7
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 2.5", 1"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	596	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	543	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	5		
Estimated existing maximum day demand (L/min)	620		
Estimated existing peak hour demand (L/min)	930		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - MiddleBench (Alison)

Project Description		Project #	8.8
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 4", 1"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	596	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	535	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	25		
Estimated existing maximum day demand (L/min)	1,900		
Estimated existing peak hour demand (L/min)	2,850		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - Oyama Road (Broadwater)

Project Description		Project #	8.9
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 4", 1.5"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	535	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	494	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	15		
Estimated existing maximum day demand (L/min)	1,680		
Estimated existing peak hour demand (L/min)	2,520		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - Towgood Road

Project Description		Project #	8.10
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 4", 2"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	586	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	550	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	5		
Estimated existing maximum day demand (L/min)	2,300		
Estimated existing peak hour demand (L/min)	3,450		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Oyama Water System - Optional PRV Replacement - Trewhitt Road

Project Description		Project #	8.11
Decommission existing PRV station.		USL Job No.	1577.0063.01
Replace with new above-ground facility		Date	06/27/2016
Existing valve sizes: 3", 2"		Prepared by:	J.Barta
Existing HGL measurement on upstream side of PRV (m)	617	Checked by:	J.Clowes
Existing HGL setting on downstream side of PRV (m)	552	See Figure	8-6
Required fire flow through station (L/min)	5000		
Estimated existing winter day demand (L/min)	25		
Estimated existing maximum day demand (L/min)	610		
Estimated existing peak hour demand (L/min)	915		

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$4,000	$4,000
	Remove existing PRV station	1	ea.	$15,000	$15,000
	Pre-cast Concrete Building	1	ea.	$50,000	$50,000
	Foundation Prep for Building	1	ea.	$10,000	$10,000
	Connect to Existing	2	ea.	$5,000	$10,000
	200 mm PRV	1	ea	$15,000	$15,000
	38 mm PRV c/w isolation valves and piping	1	ls	$5,000	$5,000
	Butterfly valve - 200 mm	2	ea	$2,500	$5,000
	200mm Pipe (schedule 10SS)	15	m	$1,200	$18,000
	200mm strainer	1	ea	$4,000	$4,000
	200mm Mag meter	1	ea	$6,000	$6,000
	200 mm expansion joints	2	ea	$5,000	$10,000
	Pressure transducer	2	ea.	$1,500	$3,000
	pressure gauge	2	ea	$500	$1,000
	sampling tap	1	ea	$500	$500
	air release	1	ea	$1,000	$1,000
	Electrical Equipment	1	ea.	$30,000	$30,000
	Electrical Service	1	ea.	$15,000	$15,000
	Access Road and Gravel parking pad	1	ea.	$15,000	$15,000
	Site landscaping and restoration	1	ea.	$10,000	$10,000
				subtotal	$239,500
				Contingency and Engineering (35%)	$83,825
				total	$323,325
				rounded total	$320,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Oyama Road, 250m south of Crawford Road

Project Description

Replace hydrant assembly and lead
Install new valves on mainline and lead
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.12
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of Oyama and Eyles Roads

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.13
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Abandon GI watermain and reconnect services - Oyama Road at Eyles Road

Project Description

Abandon existing 50,, GI main

Reconnect existing services(5) to existing 150 main along Oyama Road

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.14
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-8

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	70	sq.m	$20	$1,400
	100mm base course gravel restoration	70	sq.m	$6	$420
	350mm subbase course gravel restoration	70	sq.m	$15	$1,050
	Reconnect existing service to new watermain	5	ea	$1,500	$7,500
				subtotal	$10,370
				Contingency and Engineering (40%)	$4,148
				total	$14,518
				rounded total	$15,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of Oyama and Trewhitt Roads

Project Description

Replace hydrant assembly and lead
Install new valves on mainline and lead
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.15
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace GI watermain - Trewhitt Road, south of PRV station

Project Description

Abandon existing 50mm GI watermain
New 50mm PVC water main
Reconnect existing services to new 50mm PVC main
Main is is gravel driveway, no asphalt or subbase restoration

Project #	8.16
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	100mm base course gravel restoration	70	sq.m	$6	$420
	Reconnect existing service to new watermain	1	ea	$1,500	$1,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	50mm PVC watermain	35	m	$75	$2,625
				subtotal	$9,545
				Contingency and Engineering (40%)	$3,818
				total	$13,363
				rounded total	$13,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Trewhitt Road at PRV station

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.17
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Abandon GI watermain and reconnect services - Trewhitt Road, north of PRV station

Project Description

Abandon existing 50mm GI watermain

Reconnect existing services(4) to existing 150 main along Oyama Road

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.18
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	56	sq.m	$20	$1,120
	100mm base course gravel restoration	56	sq.m	$6	$336
	350mm subbase course gravel restoration	56	sq.m	$15	$840
	Reconnect existing service to new watermain	4	ea	$1,500	$6,000
				subtotal	$8,296
				Contingency and Engineering (40%)	$3,318
				total	$11,614
				rounded total	$12,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Trewhitt Road, 270m east of Oyama Road

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.19
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	1	ea	$1,500	$1,500
	200mm Gate valve	1	ea	$2,000	$2,000
				subtotal	$15,574
				Contingency and Engineering (40%)	$6,230
				total	$21,804
				rounded total	$22,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Oyama Road, 280m south of Towgood Road

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.20
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Middle Bench Road, 270m south of Towgood Road

Project Description

Replace hydrant assembly and lead

Install new valves on 250mm mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.21
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	1	ea	$1,500	$1,500
	250mm Gate valve	1	ea	$3,000	$3,000
				subtotal	$16,574
				Contingency and Engineering (40%)	$6,630
				total	$23,204
				rounded total	$23,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of Middle Bench and Towgood Roads

Project Description

Replace hydrant assembly and lead
Hot tap on 350mm watermain c/w 150mm valve
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.22
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 350mm watermain	1	ea	$5,500	$5,500
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$14,074
				Contingency and Engineering (40%)	$5,630
				total	$19,704
				rounded total	$20,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of Middle Bench and Allison Roads

Project Description

Replace hydrant assembly and lead
Hot tap on 400mm watermain c/w 150mm valve
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.23
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$14,574
				Contingency and Engineering (40%)	$5,830
				total	$20,404
				rounded total	$20,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Middle Bench Road, 150m north of Allison Road

Project Description

Replace hydrant assembly and lead
Hot tap on 400mm watermain c/w 150mm valve
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.24
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$14,574
				Contingency and Engineering (40%)	$5,830
				total	$20,404
				rounded total	$20,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Abandoned GI watermain and reconnect services - Middle Bench Road near Harmen Road

Project Description

Abandon existing 50mm and 100mm GI mains

Reconnect Middle Bench Road services (3) to existing 500mm main in roadway
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.25
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	42	sq.m	$20	$840
	100mm base course gravel restoration	42	sq.m	$6	$252
	350mm subbase course gravel restoration	42	sq.m	$15	$630
	Reconnect existing service to new watermain	3	ea	$1,500	$4,500
	Tie-in to existing 400mm watermain	3	ea	$6,000	$18,000
				subtotal	$24,222
				Contingency and Engineering (40%)	$9,689
				total	$33,911
				rounded total	$34,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of Middle Bench and East Hill Roads

Project Description

Replace hydrant assembly and lead
Hot tap on 500mm watermain c/w 150mm valve
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.26
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$14,574
				Contingency and Engineering (40%)	$5,830
				total	$20,404
				rounded total	$20,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace AC watermains and reconnect services - Middle Bench Road, North of East Hill Road

Project Description

Remove existing 100mm AC watermain
Reconnect services to new 100mm PVC watermain
Hot-tap existing 500mm main c/w 100mm valve
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.27
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$5,000	$5,000
	Insurance and Bonding	1	LS	$1,500	$1,500
	75mm asphalt restoration	570	sq.m	$20	$11,400
	100mm base course gravel restoration	570	sq.m	$6	$3,420
	350mm subbase course gravel restoration	570	sq.m	$15	$8,550
	Rock removal allowance	100	m	$150	$15,000
	Remove and dispose existing 100mm watermain	190	m	$50	$9,500
	Reconnect existing service to new watermain	7	ea	$1,500	$10,500
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	100mm PVC watermain	190	m	$150	$28,500
	100mm Gate valve	1	ea	$1,250	$1,250
				subtotal	$100,620
				Contingency and Engineering (40%)	$40,248
				total	$140,868
				rounded total	$141,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - East Hill Road, 250m south of Todd Road

Project Description

Replace hydrant assembly and lead
Hot tap on 500mm watermain c/w 150mm valve
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.28
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$14,574
				Contingency and Engineering (40%)	$5,830
				total	$20,404
				rounded total	$20,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - East Hill Road, 530m south of Todd Road

Project Description

Replace hydrant assembly and lead
Hot tap on 500mm watermain c/w 150mm valve
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.29
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$14,574
				Contingency and Engineering (40%)	$5,830
				total	$20,404
				rounded total	$20,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Abandon AC watermains and reconnect services - Middle Bench Road, 500m south of Todd Road

Project Description

Abandon AC watermain (2) on east and west side of 500mm trunk
Reconnect existing services (9) to 500mm trunk watermain
Assumed 2m wide trench within roadway for restoration quantity

Project #	8.30
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	108	sq.m	$20	$2,160
	100mm base course gravel restoration	108	sq.m	$6	$648
	350mm subbase course gravel restoration	108	sq.m	$15	$1,620
	Reconnect existing service to new watermain	9	ea	$1,500	$13,500
				subtotal	$17,928
				Contingency and Engineering (40%)	$7,171
				total	$25,099
				rounded total	$25,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace watermains - Middle Bench Road, 500m south of Todd Road

Project Description

Abandon existing 38 and 50mm service mains
Install new 50mm PVC watermain
Reconnect existing services (2) to new 50mm watermain
New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.31
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$2,500	$2,500
	Insurance and Bonding	1	LS	$750	$750
	75mm asphalt restoration	390	sq.m	$20	$7,800
	100mm base course gravel restoration	390	sq.m	$6	$2,340
	350mm subbase course gravel restoration	390	sq.m	$15	$5,850
	Rock removal allowance	70	m	$150	$10,500
	Reconnect existing service to new watermain	2	ea	$1,500	$3,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	50mm PVC watermain	130	m	$70	$9,100
				subtotal	$52,840
				Contingency and Engineering (40%)	$21,136
				total	$73,976
				rounded total	$74,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Middle Bench Road, 400m south of Todd Road

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.32
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of East Hill and Todd Roads

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.33
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-5

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 350mm watermain	1	ea	$5,500	$5,500
	150mm Gate valve	1	ea	$1,500	$1,500
	300mm Gate valve	1	ea.	$4,000	$4,000
				subtotal	$18,074
				Contingency and Engineering (40%)	$7,230
				total	$25,304
				rounded total	$25,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace 100mm AC watermain with 150mm PVC water - Lacresta Road

Project Description			
Abandon existing 100mm AC watermain.	Project #	8.34
Tie in to existing 150mm watermain on south side of Lacresta	USL Job No.	1577.0063.01
Reconnect existing services (5) to new 150mm PVC watermain	Date	06/27/2016
Reconnect existing hydrant to new 150mm watermain	Prepared by:	J.Barta
Assumed half road restoration per watermain length	Checked by:	J.Clowes
	See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$3,000	$3,000
	Insurance and Bonding	1	LS	$1,000	$1,000
	75mm asphalt restoration	315	sq.m	$20	$6,300
	100mm base course gravel restoration	315	sq.m	$6	$1,890
	350mm subbase course gravel restoration	315	sq.m	$15	$4,725
	Rock removal allowance	50	m	$150	$7,500
	Reconnect existing service to new watermain	5	ea	$1,500	$7,500
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 100mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm PVC watermain	90	m	$200	$18,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$67,915
				Contingency and Engineering (40%)	$27,166
				total	$95,081
				rounded total	$95,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Replace 50mm GI watermain with 50mm PVC - Floral Road

Project Description

Abandon existing 50mm GI watermain
Replace with 50mm PVC watermain
Reconnect existing services (3) to new 150mm PVC watermain
Assumed half road restoration per watermain length

Project #	8.35
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	245	sq.m	$20	$4,900
	100mm base course gravel restoration	245	sq.m	$6	$1,470
	350mm subbase course gravel restoration	245	sq.m	$15	$3,675
	Rock removal allowance	30	m	$150	$4,500
	Reconnect existing service to new watermain	3	ea	$1,500	$4,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	50mm PVC watermain	70	m	$70	$4,900
				subtotal	$28,945
				Contingency and Engineering (40%)	$11,578
				total	$40,523
				rounded total	$41,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Daniel Drive, north of Edan Place

Project Description

Replace hydrant assembly and lead

Install new valves on mainline and lead

Assumed 2m wide trench across roadway for restoration quantity

Project #	8.36
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$15,074
				Contingency and Engineering (40%)	$6,030
				total	$21,104
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Replace hydrant assembly and lead - Artella Road

Project Description

Replace hydrant assembly and lead
Install new valve on lead
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.37
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$13,574
				Contingency and Engineering (40%)	$5,430
				total	$19,004
				rounded total	$19,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant supply main - Bond Road, 160m north of Williams Road

Project Description

Replace hydrant assembly and lead
Replace existing 100/150 main with new 200mm PVC main
Majority of main replacement in roadway shoulder
Assumed 3m wide road restoration needed for new main at road edge

Project #	8.38
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$12,000	$12,000
	Insurance and Bonding	1	LS	$3,000	$3,000
	75mm asphalt restoration	1395	sq.m	$20	$27,900
	100mm base course gravel restoration	1395	sq.m	$6	$8,370
	350mm subbase course gravel restoration	1395	sq.m	$15	$20,925
	Rock removal allowance	200	m	$150	$30,000
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	2	ea	$5,000	$10,000
	200mm PVC watermain	465	m	$250	$116,250
	200mm Gate valve	3	ea	$2,000	$6,000
				subtotal	$240,945
				Contingency and Engineering (40%)	$96,378
				total	$337,323
				rounded total	$337,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace existing main, hydrant assembly and lead - OK Centre Road, 300m south of Robinson Road

Project Description

Replace hydrant assembly and lead

Replace 100mm watermain between hydrant and upstream section of 150mm main

Install new valves on mainline and lead

New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.39
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-6

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$3,500	$3,500
	Insurance and Bonding	1	LS	$1,000	$1,000
	75mm asphalt restoration	375	sq.m	$20	$7,500
	100mm base course gravel restoration	375	sq.m	$6	$2,250
	350mm subbase course gravel restoration	375	sq.m	$15	$5,625
	Rock removal allowance	60	m	$150	$9,000
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Remove and dispose existing 100mm watermain	125	ea	$50	$6,250
	Tie-in to existing 100mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm PVC watermain	125	m	$200	$25,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$79,625
				Contingency and Engineering (40%)	$31,850
				total	$111,475
				rounded total	$111,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Abandon GI watermain and reconnect services - Intersection of Camp and Tyndall Roads

Project Description

Abandon existing 50mm GI watermain.

Reconnect existing services (3) to existing main on west side of road
Assumed 2m wide trench across roadway for restoration quantity

Project #	8.40
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-7

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	60	sq.m	$20	$1,200
	100mm base course gravel restoration	60	sq.m	$6	$360
	350mm subbase course gravel restoration	60	sq.m	$15	$900
	Reconnect existing service to new watermain	3	ea	$1,500	$4,500
				subtotal	$6,960
				Contingency and Engineering (40%)	$2,784
				total	$9,744
				rounded total	$10,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Intersection of Seaton and Camp Roads

Project Description

Replace hydrant assembly and lead

Replace 100mm watermain between hydrant and upstream section of 150mm main
Install new valves on mainline and lead
Watermain appears to be in shoulder - no road restoration included

Project #	8.41
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-8

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	1	ea	$1,500	$1,500
	200mm Gate valve	1	ea	$2,000	$2,000
				subtotal	$15,000
				Contingency and Engineering (40%)	$6,000
				total	$21,000
				rounded total	$21,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate
Replace existing 100mm watermain - Newene Road

Project Description

Abandon existing 100mm watermain. Install new 200mm PVC main
Reconnect existing services (2) to new main
Install new gate valve at north end of replacement.
Assume half road restoration

Project #	8.42
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-8

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$6,000	$6,000
	Insurance and Bonding	1	LS	$2,000	$2,000
	75mm asphalt restoration	765	sq.m	$20	$15,300
	100mm base course gravel restoration	765	sq.m	$6	$4,590
	350mm subbase course gravel restoration	765	sq.m	$15	$11,475
	Rock removal allowance	100	m	$150	$15,000
	Reconnect existing service to new watermain	2	ea	$1,500	$3,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 200mm watermain	1	ea.	$5,000	$5,000
	200mm PVC watermain	255	m	$250	$63,750
	200mm Gate valve	1	ea	$2,000	$2,000
				subtotal	$133,115
				Contingency and Engineering (40%)	$53,246
				total	$186,361
				rounded total	$186,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace existing main, hydrant assembly and lead - Intersection of OK Centre and Read Roads

Project Description

Remove existing 100mm main between intersection and hydrant tee
Replace hydrant assembly and lead
Install new valves on mainline and lead
Assumed half road restoration

Project #	8.43
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-8

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	75	sq.m	$20	$1,500
	100mm base course gravel restoration	75	sq.m	$6	$450
	350mm subbase course gravel restoration	75	sq.m	$15	$1,125
	Rock removal allowance	10	m	$150	$1,500
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Remove and dispose existing 100mm watermain	25	ea	$50	$1,250
	Tie-in to existing 100mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm PVC watermain	25	m	$200	$5,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$30,325
				Contingency and Engineering (40%)	$12,130
				total	$42,455
				rounded total	$42,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace existing main, hydrnat assembly and lead - Pollard Road

Project Description

Remove existing 100mm main between intersection and hydrant tee
Replace hydrant assembly and lead
Install new valve on lead
Assumed half road restoration

Project #	8.44
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-8

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	30	sq.m	$20	$600
	100mm base course gravel restoration	30	sq.m	$6	$180
	350mm subbase course gravel restoration	30	sq.m	$15	$450
	Rock removal allowance	5	m	$150	$750
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Remove and dispose existing 100mm watermain	10	ea	$50	$500
	Tie-in to existing 100mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 150mm watermain	1	ea	$5,000	$5,000
	150mm PVC watermain	10	m	$200	$2,000
	150mm Gate valve	1	ea	$1,500	$1,500
				subtotal	$22,480
				Contingency and Engineering (40%)	$8,992
				total	$31,472
				rounded total	$31,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace existing 100mm and 150mm watermains - Shanks Road

Project Description

Abandon existing 100mm and 150mm mains.
Construct 200mm main extension to southern-most existing hydrant
Increases fire flow at last hydrant to 4,200 L/min
Reconnect existing services (7) to new 200mm PVC watermain
Assumed half road restoration

Project #	8.45
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-9

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$10,000	$10,000
	Insurance and Bonding	1	LS	$3,000	$3,000
	75mm asphalt restoration	1200	sq.m	$20	$24,000
	100mm base course gravel restoration	1200	sq.m	$6	$7,200
	350mm subbase course gravel restoration	1200	sq.m	$15	$18,000
	Rock removal allowance	200	m	$150	$30,000
	Reconnect existing service to new watermain	7	ea	$1,500	$10,500
	Tie-in to existing 100mm watermain	1	ea	$5,000	$5,000
	Tie-in to existing 200mm watermain	1	ea.	$5,000	$5,000
	200mm PVC watermain	400	m	$250	$100,000
	200mm Gate valve	1	ea	$2,000	$2,000
				subtotal	$214,700
				Contingency and Engineering (40%)	$85,880
				total	$300,580
				rounded total	$301,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace existing 75mm GI watermain - Seaton Road, West of Read Road

Project Description

remove existing 75 GI watermain. Replace with 75mm PVC

Reconnect existing services (3) to new 200mm PVC watermain

New mains in shoulders where possible. Still assumed 3m wide asphalt restoration

Project #	8.46
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-9

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$4,000	$4,000
	Insurance and Bonding	1	LS	$1,000	$1,000
	75mm asphalt restoration	480	sq.m	$20	$9,600
	100mm base course gravel restoration	480	sq.m	$6	$2,880
	350mm subbase course gravel restoration	480	sq.m	$15	$7,200
	Rock removal allowance	80	m	$150	$12,000
	Reconnect existing service to new watermain	3	ea	$1,500	$4,500
	Remove and dispose existing 750mm watermain	160	ea	$50	$8,000
	Tie-in to existing 400mm watermain	1	ea	$6,000	$6,000
	75mm PVC watermain	160	m	$150	$24,000
				subtotal	$79,180
				Contingency and Engineering (40%)	$31,672
				total	$110,852
				rounded total	$111,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace existing main, hydrant assembly and lead - Mountainview Road, north of Janet Road

Project Description

Remove existing 100mm main, replace with 150mm PVC
Replace hydrant assembly and lead
Install new valves on main and lead
Reconnect existing services (3) to new 150mm PVC watermain
Assumed half road restoration

Project #	8.47
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-9

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Mobilization & Demobilization	1	LS	$3,000	$3,000
	Insurance and Bonding	1	LS	$1,000	$1,000
	75mm asphalt restoration	315	sq.m	$20	$6,300
	100mm base course gravel restoration	315	sq.m	$6	$1,890
	350mm subbase course gravel restoration	315	sq.m	$15	$4,725
	Rock removal allowance	0	m	$150	$0
	Reconnect existing service to new watermain	3	ea	$1,500	$4,500
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Remove and dispose existing 100mm watermain	90	ea	$50	$4,500
	Tie-in to existing 150mm watermain	2	ea	$5,000	$10,000
	150mm PVC watermain	90	m	$200	$18,000
	150mm Gate valve	2	ea	$1,500	$3,000
				subtotal	$63,415
				Contingency and Engineering (40%)	$25,366
				total	$88,781
				rounded total	$89,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Abandon 75mm Steel main and reconnect services - Glenmore Road, south of Janet Road

Project Description

Abandon existing 75mm watermain

Reconnect existing services (5) to existing 300mm main

Watermains appear to be in the shoulder and not require road restoration

Project #	8.48
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-9

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	Reconnect existing service to new watermain	5	ea	$1,500	$7,500
				subtotal	$7,500
				Contingency and Engineering (40%)	$3,000
				total	$10,500
				rounded total	$11,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Pre-Design Cost Estimate

Replace hydrant assembly and lead - Shanks Road, 140m south of Glenmore Road

Project Description

Replace hydrant assembly and lead

Install new valves on main and lead

Assumed 2m wide road restoration for new lead across Shanks Road

Project #	8.49
USL Job No.	1577.0063.01
Date	06/27/2016
Prepared by:	J.Barta
Checked by:	J.Clowes
See Figure	8-9

ITEM	DESCRIPTION	QTY	UNIT	$/UNIT	EXTENDED
	75mm asphalt restoration	14	sq.m	$20	$280
	100mm base course gravel restoration	14	sq.m	$6	$84
	350mm subbase course gravel restoration	14	sq.m	$15	$210
	Replace existing hydrant assembly and lead	1	ea	$6,500	$6,500
	Tie-in to existing 250mm watermain	1	ea	$5,000	$5,000
	150mm Gate valve	1	ea	$1,500	$1,500
	250mm Gate valve	1	ea	$3,000	$3,000
				subtotal	$16,574
				Contingency and Engineering (40%)	$6,630
				total	$23,204
				rounded total	$23,000

Note: Estimates do not include land acquisition costs, nor legal fees

Cost estimate prepared without geotech or survey. Complete field investigations to refine estimate.

Appendix G

List of Miscellaneous Projects

URBAN systems

Water Project	Project Description (Miscellaneous Projects)	Project Cost	Refer to Figure	Misc. Priority
8.4	Broadwater & Oyama Roads - Watermain Looping	$950,000	8-5	
8.5	Oyama Water System - Optional PRV Replacement - Todd Road (East Hill)	$320,000	8-6	
8.6	Oyama Water System - Optional PRV Replacement - Oyama Road (Cemetery)	$320,000	8-6	
8.7	Oyama Water System - Optional PRV Replacement - MiddleBench (Harmen)	$320,000	8-6	
8.8	Oyama Water System - Optional PRV Replacement - MiddleBench (Alison)	$320,000	8-6	
8.9	Oyama Water System - Optional PRV Replacement - Oyama Road (Broadwater)	$320,000	8-6	
8.10	Oyama Water System - Optional PRV Replacement - Towgood Road	$320,000	8-6	
8.11	Oyama Water System - Optional PRV Replacement - Trewhitt Road	$320,000	8-6	
8.12	Replace hydrant assembly and lead - Oyama Road, 250m south of Crawford Road	$21,000	8-6	
8.13	Replace hydrant assembly and lead - Intersection of Oyama and Eyles Roads	$21,000	8-6	
8.14	Abandon GI watermain and reconnect services - Oyama Road at Eyles Road	$15,000	8-6	
8.15	Replace hydrant assembly and lead - Intersection of Oyama and Trewhitt Roads	$21,000	8-6	
8.16	Replace GI watermain - Trewhitt Road, south of PRV station	$13,000	8-6	
8.17	Replace hydrant assembly and lead - Trewhitt Road at PRV station	$21,000	8-6	
8.18	Abandon GI watermain and reconnect services - Trewhitt Road, north of PRV station	$12,000	8-6	
8.19	Replace hydrant assembly and lead - Trewhitt Road, 270m east of Oyama Road	$22,000	8-6	
8.20	Replace hydrant assembly and lead - Oyama Road, 280m south of Towgood Road	$21,000	8-6	
8.21	Replace hydrant assembly and lead - Middle Bench Road, 270m south of Towgood Road	$23,000	8-6	
8.22	Replace hydrant assembly and lead - Intersection of Middle Bench and Towgood Roads	$20,000	8-6	
8.23	Replace hydrant assembly and lead - Intersection of Middle Bench and Allison Roads	$20,000	8-6	
8.24	Replace hydrant assembly and lead - Middle Bench Road, 150m north of Allison Road	$20,000	8-6	
8.25	Abandoned GI watermain and reconnect services - Middle Bench Road near Harmen Road	$34,000	8-6	
8.26	Replace hydrant assembly and lead - Intersection of Middle Bench and East Hill Roads	$20,000	8-6	
8.27	Replace AC watermains and reconnect services - Middle Bench Road, North of East Hill Road	$141,000	8-6	
8.28	Replace hydrant assembly and lead - East Hill Road, 250m south of Todd Road	$20,000	8-6	
8.29	Replace hydrant assembly and lead - East Hill Road, 530m south of Todd Road	$20,000	8-6	
8.30	Abandon AC watermains and reconnect services - Middle Bench Road, 500m south of Todd Road	$25,000	8-6	
8.31	Replace watermains - Middle Bench Road, 500m south of Todd Road	$74,000	8-6	
8.32	Replace hydrant assembly and lead - Middle Bench Road, 400m south of Todd Road	$21,000	8-6	
8.33	Replace hydrant assembly and lead - Intersection of East Hill and Todd Roads	$25,000	8-6	
8.34	Replace 100mm AC watermain with 150mm PVC water - Lacresta Road	$95,000	8-7	
8.35	Replace 50mm GI watermain with 50mm PVC - Floral Road	$41,000	8-7	
8.36	Replace hydrant assembly and lead - Daniel Drive, north of Edan Place	$21,000	8-7	
8.37	Replace hydrant assembly and lead - Artella Road	$19,000	8-7	
8.38	Replace hydrant supply main - Bond Road, 160m north of Williams Road	$337,000	8-7	
8.39	Replace existing main, hydrant assembly and lead - OK Centre Road, 300m south of Robinson Road	$111,000	8-7	
8.40	Abandon GI watermain and reconnect services - Intersection of Camp and Tyndall Roads	$10,000	8-8	
8.41	Replace hydrant assembly and lead - Intersection of Seaton and Camp Roads	$21,000	8-9	
8.42	Replace existing 100mm watermain - Newene Road	$186,000	8-9	
8.43	Replace existing main, hydrant assembly and lead - Intersection of OK Centre and Read Roads	$42,000	8-9	
8.44	Replace existing main, hydrnat assembly and lead - Pollard Road	$31,000	8-9	
8.45	Replace existing 100mm and 150mm watermains - Shanks Road	$301,000	8-10	
8.46	Replace existing 75mm GI watermain - Seaton Road, West of Read Road	$111,000	8-10	
8.47	Replace existing main, hydrant assembly and lead - Mountainview Road, north of Janet Road	$89,000	8-10	
8.48	Abandon 75mm Steel main and reconnect services - Glenmore Road, south of Janet Road	$11,000	8-10	
8.49	Replace hydrant assembly and lead - Shanks Road, 140m south of Glenmore Road	$23,000	8-10	