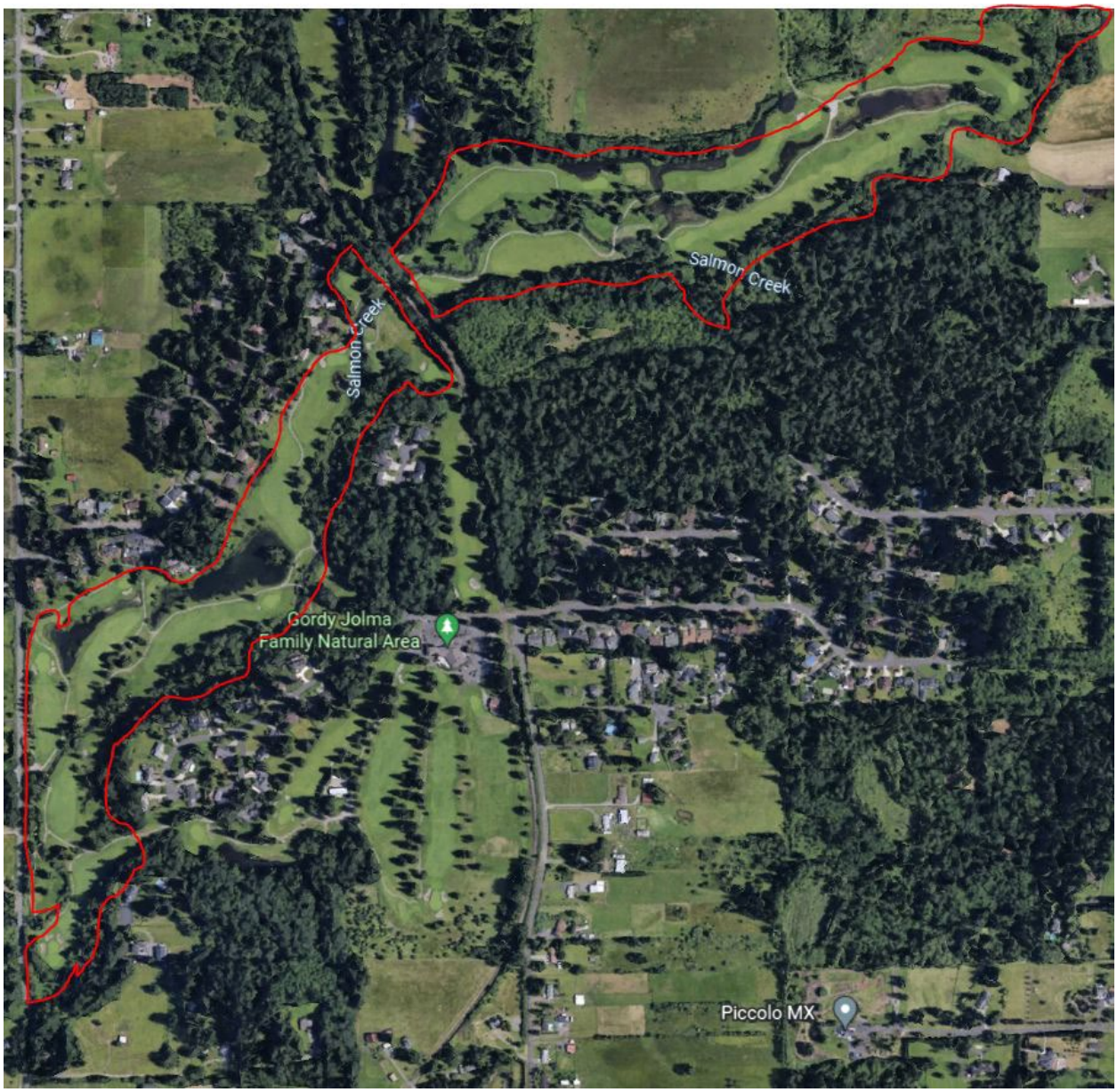
Exhibit F

Project Background Information

- BG-1 Selected Site Maps
- BG-2 WDFW Fish Passage Reports
- BG-3 Draft County Bridge Inspection Summary Report
- BG-4 Cedars Landing Subdivision Sewer
- BG-5 Cedars Village Subdivision Sewer
- BG-6 Cedars Sewer Repair
- BG-7 – Cedars Pump Station
- BG-8 Salmon Creek Bridge Hydraulic Report (offsite-downstream)
- BG-9 Smith Bridge Hydraulic Report (offsite-upstream)

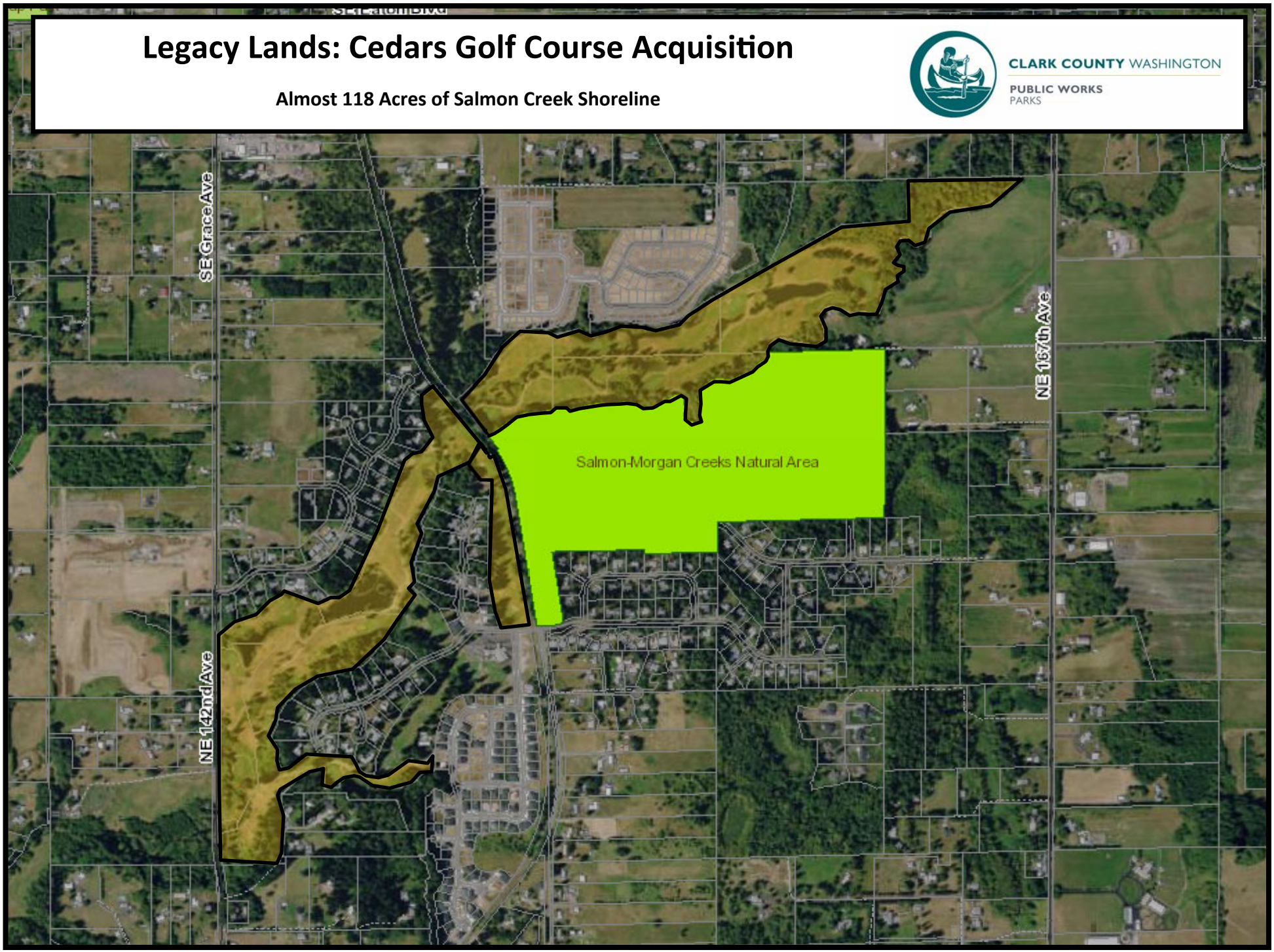
Salmon Creek Reconnection Design – Project area map
Landowner: Clark County
Project sponsor: Cowlitz Indian Tribe
SRFB # 23-1151

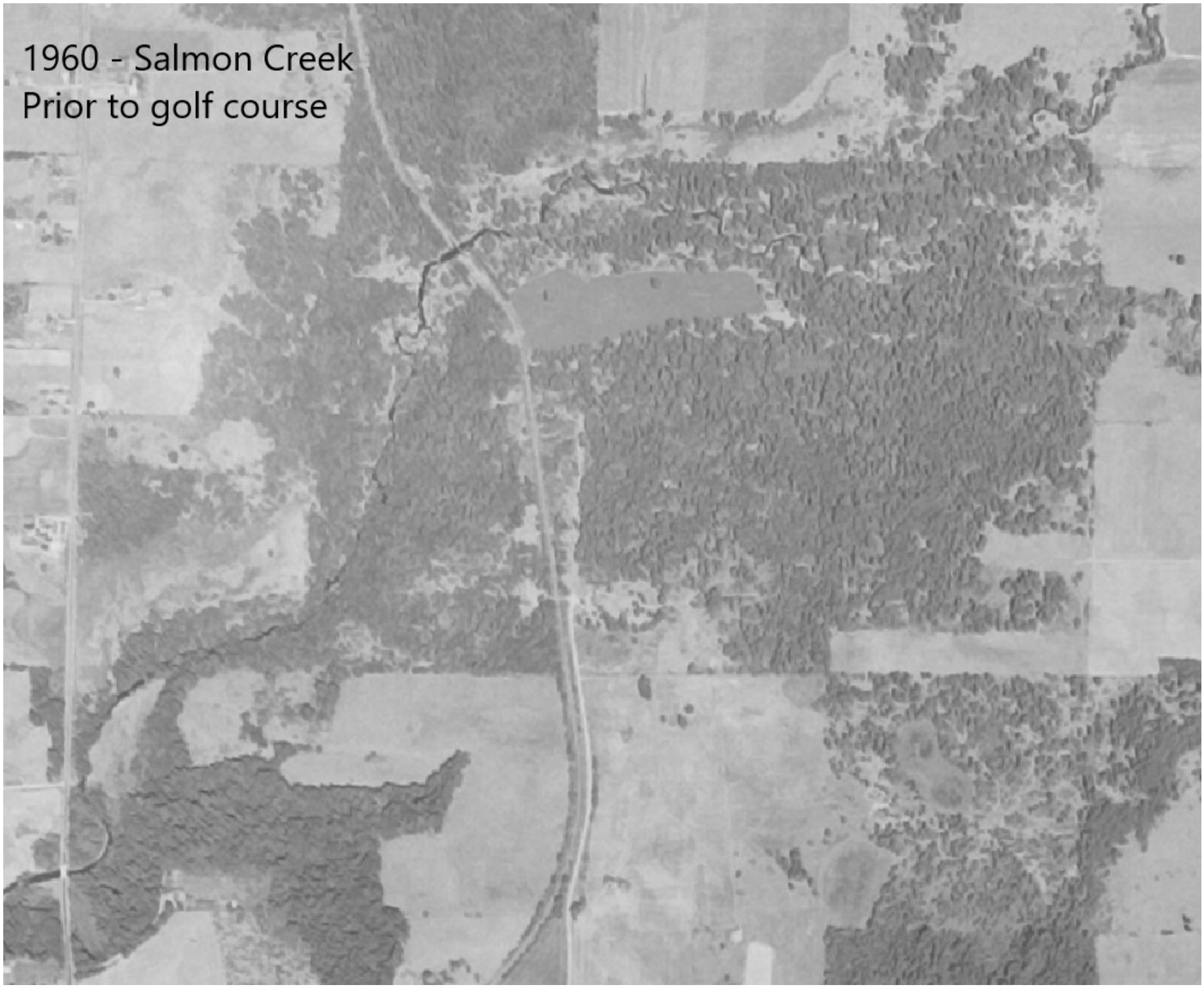


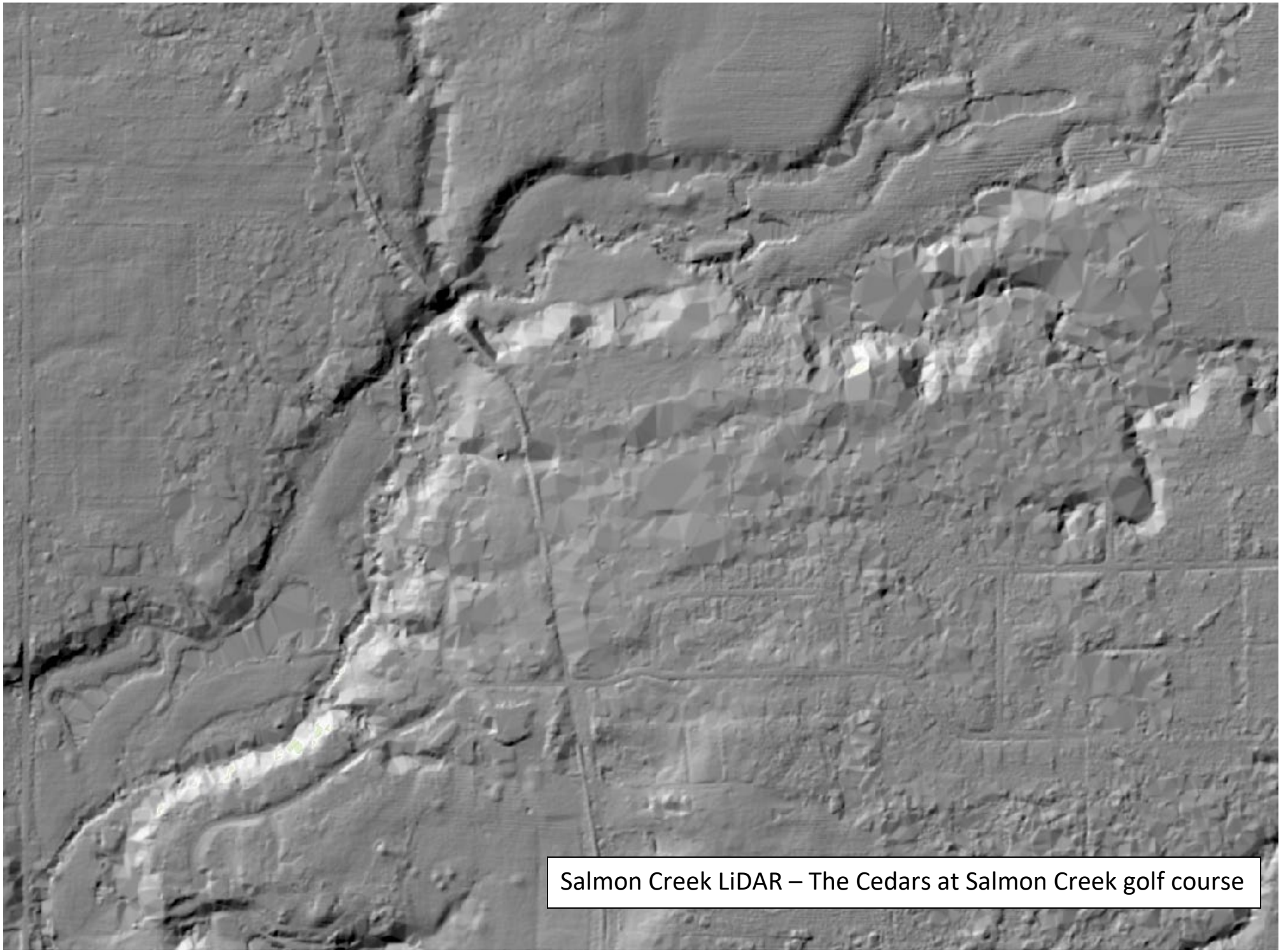
Legacy Lands: Cedars Golf Course Acquisition

Almost 118 Acres of Salmon Creek Shoreline

CLARK COUNTY WASHINGTON
PUBLIC WORKS
PARKS




1960 - Salmon Creek
Prior to golf course



Salmon Creek LiDAR – The Cedars at Salmon Creek golf course

WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 609728 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.759879
Longitude (WGS 84):	-122.512326
East (NAD 83 HARN)	1,126,834.8
North (NAD 83 HARN)	162,098.0

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Physical

General Location

Road Name:	
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	County
Name:	Clark County

PI Species

☐ Sockeye	☐ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☐ Culvert	☑ Dam	☐ Natural Barrier	☐ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

Non-motorized crossing- used as a walking path from neighborhood to golf course.

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**609728**				
Latitude:	**45.759879**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.512326**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source

Organization:	Washington Department of Fish and Wildlife		
Field Crew:	Harris;Fielding;Isle	Review Date:	4/26/2023

Description

Dam Name:		Type:	Concrete	Operated:	Year Round
Resevoir Name:		Span:	Full	Fishway Present:	No
Primary Purpose:	Recreation	Outlet:	Culvert		

Assessment Parameters

Length (m):	23.0
Height (m):	1.28
Water Surface Difference (m):	0.63
Plunge Pool Depth (m):	0.51

No Image Available

Results

Barrier:	Yes
Reason:	WS Drop
Passability (%):	67
Recheck:	

Description

A concrete sill placed with intention to backfill golf course pond. Six 0.76m overflow culverts lie atop the concrete slab and wingwalls with a walking surface above.

Comments

Erosion on LB of dam allows for water to pass around dam. WSD of 0.35 m on culvert 3.6 used for barrier determination. All pieces of dam showing wear

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**609728**				
Latitude:	**45.759879**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.512326**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Potential Habitat Gain

Survey Type:		Rearing (sq m):		Length (m):	
Significant Reach:	Unknown	Spawning (sq m):		**PI Total:**	

Washington Department of
Fish and Wildlife

Fish Passage & Diversion Screening Inventory Database
Report Cover Sheet

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WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 609729 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.760735
Longitude (WGS 84):	-122.509628
East (NAD 83 HARN):	1,127,531.2
North (NAD 83 HARN)	162,392.5

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Physical

General Location

Road Name:	access rd; SE 25th Ave
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	County
Name:	Clark County

PI Species

☐ Sockeye	☐ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☐ Culvert	☑ Dam	☐ Natural Barrier	☑ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

Pond is stocked with bass and receives its water from a diversion on MS Salmon Cr. Recently purchased by Clark Co. in 2023.

5/8/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**609729**				
Latitude:	**45.760735**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.509628**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source

Organization:	Washington Department of Fish and Wildlife		
Field Crew:	Harris;Fielding;Isle	Review Date:	4/26/2023

Description

Dam Name:		Type:	Earth Fill	Operated:	Year Round
Resevoir Name:		Span:	Full	Fishway Present:	No
Primary Purpose:	Irrigation	Outlet:	Standpipe		

Assessment Parameters

Length (m):	19.9
Height (m):	2.22
Water Surface Difference (m):	0.53
Plunge Pool Depth (m):	-99.99

No Image Available

Results

Barrier:	Yes
Reason:	Other
Passability (%):	0
Recheck:	

Description

Earthen dam separating golf course pond used for irrigation from outlet channel. Outlet standpipe is 0.46m CAL which runs under golf cart path and discharges to the North. Outlet is completely backwatered.

Comments

Large rock placed in standpipe to keep anchored at appropriate level, limiting any ability for fish manueverability. Slope of outlet pipe not measured.

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**609729**				
Latitude:	**45.760735**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.509628**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Potential Habitat Gain

Survey Type:		Rearing (sq m):		Length (m):	
Significant Reach:	Unknown	Spawning (sq m):		**PI Total:**	

5/8/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Surface Water Diversion Assessment Report

Site ID:	**609729**				
Latitude:	**45.760735**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.509628**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source

Organization:	Washington Department of Fish and Wildlife		
Field Crew:	Harris;Fielding;Isle	Review Date:	4/26/2023

Diversion Description

Type:	Pump	Point of Diversion:	LB	Diversion Dam:	Yes
Access By:	Vehicle	Location:	Offshore	Headgate:	No
Fish Bypass:	No	Fish Bypass Functioning:			
Fish Bypass Enclosure Status:					

Flow

Intake Pipe Outside Diameter (in):	-99.99 (Pump Only)	Water Right ID No:	
Diversion Channel Area (sq ft):	-99.9 (Gravity Only)	Power Meter No:	
Diversion Amount (gpm):	-999.99	SPI Total:	
Flow Derivation:			

Diversion Comments

Intake located on West side of pond extending from pumphouse. Appears that there is no screen

Is Diversion Screened? **No**

Screen Type:	
Screen Material:	
Mesh Size (in):	
Diameter (ft):	
Height (ft):	
Length (ft):	
Area (sq ft):	
Condition:	
Compliant (WDFW Criteria):	
Under Operation:	
Active Cleaning:	

No Image Available

Screen Comments

Recheck

Washington Department of
Fish and Wildlife

Fish Passage & Diversion Screening Inventory Database
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WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 609730 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.7592792
Longitude (WGS 84):	-122.5137371
East (NAD 83 HARN):	1,126,469.1
North (NAD 83 HARN)	161,888.5

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Physical

General Location

Road Name:	
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	County
Name:	Clark County

PI Species

☐ Sockeye	☐ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☐ Culvert	☑ Dam	☐ Natural Barrier	☐ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

Non motorized crossing

5/8/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**609730**				
Latitude:	**45.7592792**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.5137371**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source

Organization:	Washington Department of Fish and Wildlife		
Field Crew:	Harris;Fielding;Isle	Review Date:	4/26/2023

Description

Dam Name:		Type:	Concrete	Operated:	Year Round
Resevoir Name:		Span:	Full	Fishway Present:	No
Primary Purpose:	Recreation	Outlet:	Culvert		

Assessment Parameters

Length (m):	23.1
Height (m):	1.03
Water Surface Difference (m):	0.81
Plunge Pool Depth (m):	0.12

No Image Available

Results

Barrier:	Yes
Reason:	WS Drop
Passability (%):	33
Recheck:	

Description

Concrete dam with spillway into concrete open vault with shallow flow. A single culvert outlets the open top vault into another golf course pond, with 4 overflow culverts perched above.

Comments

Concrete dam used to backfill golf course pond- shallow sheet flow through open top vault and limited launching pool for fish to navigate WSD. Culvert has 8.66% slope, but backwatered by downstream pond.

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**609730**				
Latitude:	**45.7592792**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.5137371**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Potential Habitat Gain

Survey Type:		Rearing (sq m):		Length (m):	
Significant Reach:	Yes	Spawning (sq m):		**PI Total:**	

5/8/2023

Washington Department of
Fish and Wildlife

Fish Passage & Diversion Screening Inventory Database
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WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 609731 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.7607408
Longitude (WGS 84):	-122.5110459
East (NAD 83 HARN):	1,127,169.4
North (NAD 83 HARN)	162,403.8

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Physical

General Location

Road Name:	access rd; SE 25th Ave
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	Private
Name:	

PI Species

☐ Sockeye	☐ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☑ Culvert	☐ Dam	☐ Natural Barrier	☐ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

Culvert sits under access road with gate maintained by HOA. DS is a pond created by the previous golf course, two separate inputs about 80m US.

5/1/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Level A Culvert Assessment Report

Site ID:	**609731**				
Latitude:	**45.7607408**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.5110459**	Tributary To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source: Washington Department of Fish and Wildlife

Field Crew: Harris;Fielding;Isle Review Date: 4/26/2023

Culvert Details / **Level A Parameters**

ID	Shape	Material	Span	Rise	Length	WDIC	Apron	WSDrop	Location	Countersunk	Backwater	Slope (%)	Sediment
1.1	RND	PCC	1.68	1.68	13.20	1.68	NO	0.00		No	Yes	3.63	

All dimensions in meters

Channel Description

Toe Width (m):	
Average Width (m):	8.20
Culvert/Stream Width Ratio:	0.20

Plunge Pool

Length (m):	0.00
Max Depth (m):	-99.99
OHW Width (m):	-999.99

Road

Fill Depth (m):	4.00

No Image Available

Assessment Results

		Tidal Influence:	No	Tidegate Present:	No
Barrier:	Unknown	Passability (%):	Unknown	Method:	Level B
Reason:	ntrol Inaccessil	Fishway Present:	No	Recheck:	ER

Comments

Culvert outlets into large pond with no accessible control DS. Two 0.76m overflow pipes directly above main culvert

Potential Habitat Gain

Survey Type:		Spawning (sq m):		Length (m):	
Significant Reach:	Unknown	Rearing (sq m):		**PI Total**	

5/1/2023

Washington Department of
Fish and Wildlife

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WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 609732 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.758227
Longitude (WGS 84):	-122.519062
East (NAD 83 HARN):	1,125,100.6
North (NAD 83 HARN)	161,539.7

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Physical

General Location

Road Name:	access rd; SE 25th Ave
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	County
Name:	Clark County

PI Species

☐ Sockeye	☑ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☑ Culvert	☐ Dam	☐ Natural Barrier	☐ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

Outlet of this site is ~1m US of site 609732 on RB of Salmon Cr

5/8/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Level A Culvert Assessment Report

Site ID:	**609732**				
Latitude:	**45.758227**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.519062**	Tributary To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source: Washington Department of Fish and Wildlife

Field Crew: Harris;Fielding;Isle Review Date: 4/26/2023

Culvert Details / **Level A Parameters**

ID	Shape	Material	Span	Rise	Length	WDIC	Apron	WSDrop	Location	Countersunk	Backwater	Slope (%)	Sediment
1.2	RND	OTH	0.46	0.46	-999.90	-99.99		-99.99				-99.99	
2.2	RND	OTH	0.46	0.46	-999.90	-99.99		-99.99				-99.99	

All dimensions in meters

Channel Description

Toe Width (m):	
Average Width (m):	-99.99
Culvert/Stream Width Ratio:	-99.99

Plunge Pool

Length (m):	-999.99
Max Depth (m):	-99.99
OHW Width (m):	-999.99

Road

Fill Depth (m):	3.00

No Image Available

Assessment Results

		Tidal Influence:	No	Tidegate Present:	No
Barrier:	Unknown	Passability (%):	Unknown	Method:	Level A
Reason:	nsufficient Data	Fishway Present:	No	Recheck:	LA

Comments

Two culverts, both with CST outlets and PCC inlets. Full Level A was not performed- likely an internal grade break as the CST outlets may be sliplined through PCC culverts.

Potential Habitat Gain

Survey Type:		Spawning (sq m):		Length (m):	
Significant Reach:	Unknown	Rearing (sq m):		**PI Total**	

5/8/2023

Washington Department of
Fish and Wildlife

Fish Passage & Diversion Screening Inventory Database
Report Cover Sheet

The following report is extracted from the Washington Department of Fish and Wildlife's (WDFW) Fish Passage and Diversion Screening Inventory Database (FPDSI). WDFW makes every attempt to keep these reports in sync with FPDSI; however, the dynamic nature of the data and workflows associated with maintaining the database may result in short-term differences.

Users are encouraged to contact WDFW to discuss appropriate use of the data and how we can assist with fish passage barrier removal or inventory. Please visit the Fish Passage web site for contact information at: https://wdfw.wa.gov/species-habitats/habitat-recovery/fish-passage/about

Disclaimers:

- Data presented here represent a snapshot observation of conditions in a dynamic environment that is subject to change. Fish passage data are also collected from a variety of agencies and sources. Therefore, WDFW makes no guarantee concerning the data's content, accuracy, completeness, or the results obtained from use of the data. WDFW assumes no liability for the data represented here.
- These data are not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife.
- Note that some fish passage features, habitats or species may occur in areas not currently known to the WDFW Fish Passage division, and may not be reflected in this database. A lack of data does not necessarily indicate that a feature, habitat, or species are not present.
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- Bankfull width measurements included in these reports should not be used for fish passage crossing design. They are solely for assessment purposes.
- The barrier status reported in this document is based on the swimming abilities of adult salmonids. Passabilities are a qualitative value, and should not be interpreted as a quantitative calculation. Please see page 1-4 of the Fish Passage Inventory, Assessment and Prioritization Manual for further clarification: https://wdfw.wa.gov/publications/02061
- EXIF data presented with Image Reports may be erroneous due to camera battery failures and resetting of camera clock functions.

Abbreviations:

Most abbreviations in this report are defined in the Quick Reference Tables of the Fish Passage Inventory, Assessment, and Prioritization Manual. Additional commonly used abbreviations are defined as follows:

NFB = no potential salmonid use, **BB** = both banks, **LB** = left bank looking downstream, **RB** = right bank looking downstream, **US or U/S** = upstream, **DS or D/S** = downstream, **WSDrop** = water surface drop, **BFW** = bankfull width, **OHW** = ordinary high water, **SLW** = scour line width, **CMP** = corrugated metal pipe, $\mathbf{Q_{fp}}$ = fish passage flow, **V&D** = Velocity and Depth, **ROW** = Right of Way

The FPDSI database often uses default values such as '**-99.99**' or '**-999**' to represent null values.

WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 945073 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.758695
Longitude (WGS 84):	-122.513874
East (NAD 83 HARN):	1,126,428.8
North (NAD 83 HARN)	161,676.5

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Biological

General Location

Road Name:	access rd; SE 25th Ave
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	County
Name:	Clark County

PI Species

☐ Sockeye	☑ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☐ Culvert	☑ Dam	☐ Natural Barrier	☐ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

Coho juveniles observed at the DS end of dam (WDFW, 2023)

5/1/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**945073**				
Latitude:	**45.758695**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.513874**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source

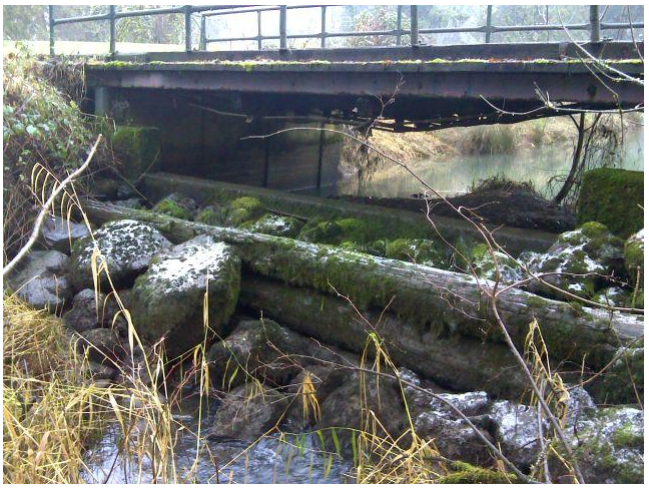
Organization:	Washington Department of Fish and Wildlife		
Field Crew:	Harris;Fielding;Isle	Review Date:	4/26/2023

Description

Dam Name:		Type:	Concrete	Operated:	Year Round
Resevoir Name:		Span:	Full	Fishway Present:	No
Primary Purpose:	Recreation	Outlet:	Spillway		

Assessment Parameters

Length (m):	7.7
Height (m):	1.40
Water Surface Difference (m):	1.01
Plunge Pool Depth (m):	0.25



Results

Barrier:	Yes
Reason:	WS Drop
Passability (%):	0
Recheck:	

Description

Concrete dam with spillway notch. Reinforced with large boulders and timber.

Comments

Dam used to create pond for golf course. On right bank, scouring on the outside of dam is allowing water to flow around rather than over spillway.

WDFW Fish Passage and Diversion Screening Inventory Database

Dam Assessment Report

Site ID:	**945073**				
Latitude:	**45.758695**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.513874**	Trib To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Potential Habitat Gain

Survey Type:		Rearing (sq m):		Length (m):	
Significant Reach:	Yes	Spawning (sq m):		**PI Total:**	

5/1/2023

Washington Department of
Fish and Wildlife

Fish Passage & Diversion Screening Inventory Database
Report Cover Sheet

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WDFW Fish Passage and Diversion Screening Inventory Database

Site Description Report

Site ID 609736 **Project** ☐ **Mitigated**

Geographic Coordinates

Latitude (WGS 84):	45.7582
Longitude (WGS 84):	-122.519115
East (NAD 83 HARN):	1,125,086.8
North (NAD 83 HARN)	161,530.2

Waterbody

Stream:	unnamed
Tributary To:	Salmon Cr
WRIA:	28
River Mile:	-999.99
Fish Use Potential:	Yes
FUP Criteria:	Physical

General Location

Road Name:	access rd; SE 25th Ave
Mile Post:	-999.99
County:	Clark
WDFW Region:	5

Owner

Type:	County
Name:	Clark County

PI Species

☐ Sockeye	☑ Chinook	☑ Sea Run Cutthroat
☐ Pink	☑ Coho	☑ Resident Trout
☐ Chum	☑ Steelhead	☐ Bull Trout

Associated Features

☑ Culvert	☐ Dam	☐ Natural Barrier	☐ Diversion
☐ Non-Culvert Xing	☐ Other	☐ Fishway	

Location/Directions

Site Comments

5/8/2023

WDFW Fish Passage and Diversion Screening Inventory Database

Level A Culvert Assessment Report

Site ID:	**609736**				
Latitude:	**45.7582**	Stream:	**unnamed**	WRIA:	**28**
Longitude:	**-122.519115**	Tributary To:	**Salmon Cr**	Fish Use Potential:	**Yes**

Data Source: Washington Department of Fish and Wildlife

Field Crew: Harris;Fielding;Isle Review Date: 4/26/2023

Culvert Details / **Level A Parameters**

ID	Shape	Material	Span	Rise	Length	WDIC	Apron	WSDrop	Location	Countersunk	Backwater	Slope (%)	Sediment
1.1	RND	PCC	0.76	0.76	29.20	0.08	NO	0.16	Outlet	No	No	1.40	

All dimensions in meters

Channel Description

Toe Width (m):	
Average Width (m):	3.34
Culvert/Stream Width Ratio:	0.23

Plunge Pool

Length (m):	-999.99
Max Depth (m):	0.54
OHW Width (m):	-999.99

Road

Fill Depth (m):	3.00

No Image Available

Assessment Results

		Tidal Influence:	No	Tidegate Present:	No
Barrier:	Yes	Passability (%):	33	Method:	Level A
Reason:	Slope	Fishway Present:	No	Recheck:	

Comments

Inlet and outlet sections broken and sloped. WSD directly into Salmon Cr, no plunge pool length/width taken. Some debris in Salmon Cr at outlet complicating fish manueverability

Potential Habitat Gain

Survey Type:		Spawning (sq m):		Length (m):	
Significant Reach:	Unknown	Rearing (sq m):		**PI Total**	

5/8/2023

Bridge Inspection Memorandum
Gordy Jolma Park

To:	Evelyn Ives, Project Manager, Clark County
From:	Bruce Johnson, Project Manager, Otak
Copies:	
Date:	February 16, 2024
Subject:	Inspection Reports for Gordy Jolma Park
Project No.:	Clark County Park Bridges Inspection and Load Rating, 021253.000

This memorandum transmits the bridge inspection report portion of the contracted work performed at Gordy Jolma Park (Salmon-Morgan Creeks Natural Area), NE 161st Ave, Brush Prairie, WA 98606.

In summary, the Gordy Jolma Bridge Nos 1 was found to be closed with a chain link fence and sign and in fair condition with some problems with the deck, rail, and severe corrosion on the railroad flatcar.

The Gordy Jolma Bridges No 2, 3 and 4 were found to be closed with chain link fence and signs and in poor condition with advanced corrosion, settling of an abutment and abutments that impinge on the waterway opening.

The Gordy Jolma Bridges No. 5, 6, and 8 were found to be in fair condition with some problems with the deck, rails, and corrosion.

The Gordy Jolma Bridge No 7 was found to be in fair condition with only minor problems.

The Gordy Jolma Bridge No 9 was found to be in poor condition with serious advanced corrosion and section loss and problems with the deck and rail.

The Gordy Jolma Bridge No 10 was found to be in very poor condition with serious advanced corrosion and section loss and broken, rotten main structural elements and problems with the deck and rail.

The Gordy Jolma Bridge No 11 was found to be in poor condition with serious advance corrosion and broken, loose main structural members and problem with the deck and rail.

A map showing the location and bridge numbers and the detailed inspection reports are attached.


Gated
Entrance
8
9
10
11
1
Gordy Jolma Park - Bridge
Locations
2
3
Gated
Entrance
4
5
Gated
Entrance
6
7

Client: Clark County

Clark County Parks and Lands Division

Bridge No. Gordy Jolma 1

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-1
Bridge Name:	Gordy Jolma No 1 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car – Peds/Bikes
Span Length:	51 feet

Description:

The bridge is comprised of an old steel railcar 51' in length (span length – 49') with a center U-shape main built-up riveted girder 131/5" deep and two rolled C-channel edge girders 131/8" deep with bottom flange cut outs at each end that are 8" deep. The deck is 10' wide and consists of 2" thick ribbed steel plate with oval indentions supported directly on the top flange of the girders.
The deck has a ½" neoprene patch full length along the west side.

A steel pipe railing system is attached to the side C-channel but has failed and is missing approximately 10' on the west side and 33' on the east side. The approach alignment forms a T-intersection with the main east-west trail on the north approach and continues to meet the main trail 181st Street entrance on the south approach.
The bridge is closed with a chain link fence barrier on the north end that is laying over flat on the deck. There is a 4 ½" ductile iron pipe (possible abandoned water line) and a 2" conduit (possible electrical wiring) along the east side of the bridge attached to the side beam.

Condition:

- Steel coating has failed, and paint has peeled off.
- Rail car steel has heavy corrosion, some minor pitting, and crevice corrosion throughout the flatcar.
- Secondary rail car elements (stringers and floorbeams) have heavy corrosion and pitting, with some bent and twisted sections. The deformations are likely from handling, not load induced.
- Steel decking has severe corrosion and loss of section is damaged over 25% of the surface primarily under the neoprene patch.
- Approach alignment has aa abrupt T intersection.
- The abutments have debris on the seats and timber elements on top of the seats are rotten. Some soil is spilling through from the approach fill.
- The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow.
- There is an 18" x 9" hole at the north bridge end where the backfill material has sloughed away causing a tripping hazard to pedestrians that use the bridge even though there is a "bridge closed" sign.
- The railing has failed with 10' missing on the west side and 33' missing on the east side and has openings exceeding the 6" maximum.

Recommendations:

- Option 1: Clean, sandblast and paint the rail car to stop further corrosion and section loss if the bridge is to be retained.
    - Clean debris from the abutment seats and girder bearing area.
    - Replace the steel decking.
    - Replace the rail with a rail system meeting the 6” maximum opening criteria.
    - Fill in the hole in the approach fill at the north abutment.
- Option 2: Replace the bridge and abutments to provide an unobstructed waterway opening.

Date Inspected: 12/15/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & I. Parker

BRIDGE NO. Gordy Jolma 1

BRIDGE TYPE	RR FLATCAR		45.757220		
CROSSING	SALMON CREEK_		LAT	INSPECTOR	BRUCE JOHNSON, ISAAC PARKER
			-122.519921		
YEAR BUILT	1970'S (EST)		LONG	DATE	12-15-2023
				STR. NO.	GJ-1

OBSERVATIONS

SUBSTRUCTURE		
1. **END BENTS**	Abutments	Fair
	Piles	Poor
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint on steel pile		Failed
4. Collision Damage		Fair
5. Scour		Fair
6. Settlement		Fair
1-Concrete abut, 18" x10' wide		
1-Steel pile @ext. girder corroded		
1-Caps, 8"x8" timber, 50-70% rot		
2-Signigicant debris		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Good
4. Channel Change		N/A
5. Riprap		N/A
Overall substructure condition, Fair		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Fair
2. Girder or Beams	Fair
3. Floor Beams	Fair
.	
5. Diaphragms, Bridging	Fair
6. Bearing Devices	Poor
7. Alignment of Members	Fair
8. Rivets or Bolts	Fair
9. Welds	Fair
10. Flange	Fair
11. Stiffeners	Fair
6- 8"x8" timber decayed, rot	
4-minor scrapes and gouges	
Overall Condition, Fair, Phi(c)=0.90	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface(neoprene)	Fair
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Failed
1Deck 2" ribbed steel, Failed 25% with neoprene patch.	
1.Heavy corrosion, pitting, section loss	
2. Bare deck with neoprene patch	
3. Gap filled with debris	
6. 2" pipe rail failed (50%)	
Loose posts bent and sagging	
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	Failed
APPR. ALINE.	
SIGNING	
1. Bridge closed	Poor
Overall Deck Condition, Poor, Phi(c)=0.85	

REMARKS AND RECOMMENDATIONS ARE ATTACHED

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No. 1
TYPE Flatcar NUMBER 1
INSPECTORS B. Johnson & I. Parker
DATE 12/15/2023
YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 2" thick steel ribbed deck plate. Steel pipe pedestrian rail has failed and has loose connections. Ef. Photo 1.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with one primary U-shaped girder and two C-channel side beams connected with overhang brackets or diaphragms. The structure has a 51' overall length. Edge beams are rolled 13 1/8"x4"x0.428" C-channels with coped cutouts to 8" depth at 6' from each beam end. Severe corrosion and some pitting are present on the steel. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.
Ref Photo 2.

60 (SUBSTRUCTURE)

Concrete abutment is 18" wide by 10' long with about 42" exposed on the front face. The girder bears directly on the concrete and two outside beams on a 8"x8" timber sill. The timber sill shows signs of decay up to 70% of the length with about ¼" of crush under the side girders. The side girders also have supplementary support from rectangular steel pile bearing about 8' from the end. Ref. Photo 3& 4. Debris on seats typical.

65 (APPROACH)

Approach alignment forms a T intersection with the main trail on the north approach and continues to intersect with the south entrance trail from 181st Street on the south approach.

OTHER

Some drift in channel.
Large loose rock rip rap protrudes into the channel, reducing the waterway opening.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No. 1
TYPE Rail car NUMBER 1
INSPECTORS B. Johnson & I. Parker
DATE 12/15/2023
YEAR BUILT 1970's (estimated)

58 (DECK)

Replace the damaged and highly corroded steel deck.
Consider installing a slip resistant surface on the steel deck plates.
Replace the railing.

59 (SUPERSTRUCTURE)

Monitor condition of rail car corrosion.
Conduct NDE testing of fatigue prone details on the rail car.
Clean and paint the steel rail car to preserve it and retard corrosion.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Rearranged the existing rip rap and add riprap to smooth the bank for better stream flow.

65 (APPROACH)

Repair the hole on the north approach at the bridge end.
Consider extending the railing onto the approaches.
Consider updating the bridge closed sign and place one on both approaches until the bridge is repaired or replaced.
Consider installing more effective fencing to close the bridge until safety items are repaired.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 1 Approach and Deck view.

Photo 2 – Gordy Jolma No 1 Elevation view.

Photo 3 – Gordy Jolma No 1 Abutment with loose rip rap

Photo 4 – Gordy Jolma No 1 Loss of paint and surface corrosion on rail car.

Photo 5 – Gordy Jolma No 1 Severe corrosion on deck plate and deck ribs.

Client: Clark County

Clark County Parks and Lands Division

Bridge No. Gordy Jolma 2

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-2
Bridge Name:	Gordy Jolma No 2 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car – Peds/Bikes
Span Length:	30 feet

Description:

The bridge is comprised of an old steel railcar 52’ in length (span length – 30’) with a variable depth box main girder and a constant depth exterior C-channel. The deck is 4”x12” timber planks supported directly on the top flange of the girders. The deck width is 12’-3” out-to-out.
A steel pipe railing system is attached to the top of a 6”x6” felloe guard but is loose in some areas.
The north approach alignment forms a T intersection with the main east-west trail and continues on connect with the side trail on the south approach of bridge GJ3. The bridge is closed with a chain link fence barrier on the north end.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, and crevice corrosion is widespread throughout the RR flatcar.
- Timber decking is heavily split with some rot over 50% of the surface.
- Timber felloe guard is heavily split and checked.
- Approach alignment has aa abrupt T intersection.
- The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow.
- Railing has openings exceeding the 6” limit.

Recommendations:

- Remove this bridge, including the abutments, to provide unobstructed stream flow through the bridge opening.
- If retained:
    - Clean, sandblast and paint the rail car to stop further corrosion and section loss and clean debris from the abutment seats and girder bearing area.
    - Replace the railing or retrofit to achieve minimum 6” openings.

Date Inspected:	12/20/2023
Inspecting Firm:	Otak
Inspectors:	B. Johnson & G. Villa

BRIDGE NO. Gordy Jolma 2

BRIDGE TYPE	RR FLATCAR		45.754215		
CROSSING	SALMON CREEK_		LAT	INSPECTOR	BRUCE JOHNSON, GIOVANNI VILLA
			-122.520711		
YEAR BUILT	1970'S (EST)		LONG	DATE	12-20-2023
				STR. NO.	GJ-2

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	Poor
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint on steel pile		Failed
4. Collision Damage		Fair
5. Scour		Fair
6. Settlement		Fair
1-Concrete abut, 18" x10' wide		
1-Steel pile @ext. girder corroded		
1-Caps, 8"x8" timber, 50-70% rot		
2-Signigicant debris		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Good
4. Channel Change		N/A
5. Riprap		N/A
Overall substructure condition, Fair		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Fair
2. Girder or Beams	Fair
3. Floor Beams	Fair
.	
5. Diaphragms, Bridging	Fair
6. Bearing Devices	Poor
7. Alignment of Members	Fair
8. Rivets or Bolts	Fair
9. Welds	Fair
10. Flange	Fair
11. Stiffeners	Fair
6- 8"x8" timber decayed, rot	
4-minor scrapes and gouges	
Overall Condition, Fair, Phi(c)=0.90	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Failed
1Deck 4x12 timber planks 50% split and rotten.	Poor
2. Bare deck with gravel	
6. 2" pipe rail bent with poor connections	
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	Loose
APPR. ALINE.	
SIGNING	
1. Bridge closed	Poor
Overall Deck Condition, Poor	

REMARKS AND RECOMMENDATIONS ARE ATTACHED

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No. 2
TYPE Flatcar NUMBER 2
INSPECTORS B. Johnson & G. Villa
DATE 12/20/2023
YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 4x12 timber deck planks. Steel pipe pedestrian rail is bent with poor connections to the felloe guard. Ref. Photo 1.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with one primary U-shaped girder and two C-channel side beams connected with overhang brackets or diaphragms. The structure has a 52' overall length. Edge beams are rolled C-channels. Severe corrosion and some pitting are present on the steel. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.
Ref Photo 2.

60 (SUBSTRUCTURE)

The End bents are 18" thick concrete with an exposed height of approximately 3 ½'. The main girder bears directly on the seat of the concrete abutment and the side channel beams are supported on timber blocking on the bridge seat. The timber blocking is split and decayed with rot present along the entire length, providing little or not support to the channel beams, A 4" steel box section strut provides support to the edge beams located about 5' from the abutment just inside of the coped section.

65 (APPROACH)

Approach alignment forms a T intersection with the main trail on the north approach and continues to intersect with the south entrance trail from 181st Street on the south approach.

OTHER

Some drift in channel.
The abutments are at the edge of the stream and obstruct the flow during high water events. Heavy riprap loosely placed around the abutment also obstruct the flow.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No. 2 INSPECTORS B. Johnson & G. Villa

TYPE Rail car NUMBER 2 DATE 12/20/2023

YEAR BUILT 1970's (estimated)

58 (DECK)

Replace the split and rotten timber deck if the bridge is to be retained.
Consider installing a slip resistant surface on the steel deck plates.
Replace the railing.

59 (SUPERSTRUCTURE)

Replace or remove the bridge.
Monitor condition of rail car corrosion, if it is to remain in place.
Clean and paint the steel rail car to preserve it and retard corrosion if it will remain in place.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Rearranged the existing rip rap and add riprap to smooth the bank for better stream flow.

65 (APPROACH)

Consider updating the bridge closed sign and place one on both approaches until the bridge is repaired or replaced.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 2 Approach and Deck view.

Photo 2 – Gordy Jolma No 2 Elevation view.

Photo 3 – Gordy Jolma No 2 Side view of deck and Abutment

Clark County
Department of Public Works

Bridge No. Gordy Jolma 3

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-3
Bridge Name:	Gordy Jolma No 3 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car
Span Length:	54 feet

Description:

The bridge is comprised of an old steel railcar 58’ in length (span length approximately – 54’) with a deep main U-girder and C-channel side beams that are coped at the ends. The deck is 2” thick ribbed steel plate with oval indentions on half the deck and steel diamond plate on half the deck with a 58’x 30” neoprene patch along the west side supported directly on the top flange of the girders and a ½”x12’x10’ steel plate patch on the south end. The deck width is 10’-6” out-to-out.
A steel pipe railing system is attached to the side of the edge beam. The north approach alignment forms a T intersection with the main east-west trail and continues south to connect with the side trail on the south approach of bridge GJ-2. The bridge is closed with a chain link fence barrier on the north end. There is a 2” conduit just west of the bridge that appeared to be attached to the bridge at one time, but the attachments have failed and the conduit is laying in the stream.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, and crevice corrosion is widespread throughout the RR flatcar.
- Steel decking is damaged over 25% of the surface.
- Approach alignment has an abrupt T intersection on the north.
- The abutments are at the edge of the stream on the south side and in the stream on the north side. The abutments obstruct the stream during high flows.
- Railing has openings exceeding the 6” limit.

Recommendations:

- Remove this bridge including the abutments to provide unobstructed stream flow through the bridge opening.
- If retained:
    - Clean, sandblast and paint the rail car to stop further corrosion and section loss and clean debris from the abutment seats and girder bearing area.
    - Replace the railing or retrofit to achieve minimum 6” openings.

Date Inspected: 12/20/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & I. Parker

BRIDGE NO. Gordy Jolma 3

BRIDGE TYPE	RR FLATCAR		45.753747		
CROSSING	SALMON CREEK		LAT -122.521042	INSPECTOR	BRUCE JOHNSON, ISAAC PARKER
YEAR BUILT	MID-1970'S (ESTIMATED)		LONG	DATE	12-20-2023
				STR. NO.	GJ-3

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	N/A
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	Fair
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint		Failed
4. Collision Damage		Fair
5. Scour		Poor
6. Settlement		Fair
1-Abut, spill-through with rock fill		
1-Caps, timber, with rot		
1-Wings, some sloughing		
2.Signigicant debris		
3-paint gone with heavy corrosion		
4-miron scrapes and gouges		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Good
4. Channel Change		N/A
5. Riprap		N/A
Overall Condition - Fair		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Fair
2. Girder or Beams	Fair
3. Floor Beams	Fair
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5. Diaphragms	Fair
6. Bearing Devices	N/A
7. Alignment of Members	Poor
8. Rivets or Bolts	Poor
9. Welds	Fair
10. Flange	Fair
11. Stiffeners	Fair
Overall Condition - Fair	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Fair
1. 2" steel ribbed deck plate	
broken along west side with ½" neoprene patch, diamond plate	
2. Bare deck with neoprene	
3. Narrow open gap	
6. Pipe rail. Poor paint, some Corrosion	
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	N/A
APPR. ALINE.	
SIGNING	
1. Posted	Poor
2. Legibility	Fair
3. Visibility	Poor
Overall Condition - Poor	

REMARKS (Key-in to item above)

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No 3 INSPECTORS B. Johnson & I. Parker

TYPE Flatcar NUMBER GJ-3 DATE 12/08/2023

DISTRICT _____ YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 2" thick steel ribbed deck plate and diamond plate with neoprene and steel plate repairs. Steel pipe pedestrian rail attached to side beams.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with a deep U-shaped main girder and C-channel side beams that are coped at the ends and connected with overhang brackets or diaphragms. The structure has a 58' overall length. Severe corrosion and some pitting are present on the steel. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.

60 (SUBSTRUCTURE)

The End bents are concrete abutment walls. The main girder bears directly on the seat of the concrete abutment and the side channel beams are supported on timber blocking on the bridge seat. The timber blocking is split and decayed with rot present.

65 (APPROACH)

Approach alignment has a T-intersection with the main trail on the north approach and continues to an intersection with the main trail entrance with 181st Street on the south approach.

OTHER

The abutments are at the edge of the stream and obstruct the stream during high flow.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME	Gordy Jolma Bridge No 3 2			INSPECTORS	B. Johnson & I. Parker
TYPE	Flatcar	NUMBER	GJ-3	DATE	12/08/2023
DISTRICT				YEAR BUILT	1970’ Estimated

58 (DECK)

Replace the damaged steel deck if the bridge is to be retained.
Consider installing a slip resistant surface on the steel deck plates.
Replace the railing if the bridge is to be retained.

59 (SUPERSTRUCTURE)

Replace or remove the bridge.
Monitor condition of rail car corrosion, if it is to remain in place.
Clean and paint the steel rail car to preserve it and retard corrosion if it will remain in place.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Place riprap to form a smooth bank for better stream flow.

65 (APPROACH)

Consider updating the bridge closed sign and place one on both approaches until the bridge is repaired or replaced.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 3 Deck view.

Photo 2 – Gordy Jolma No 3 Elevation view.

Photo 3 – Gordy Jolma No 3 view of failed 2” conduit in the stream.

Clark County
Department of Public Works

Bridge No. Gordy Jolma 4

BRIDGE INSPECTION SUMMARY
Bridge No. GJ-4
Bridge Name: Gordy Jolma Trail over Salmon Creek No 4
Location: Gordy Jolma County Park
Drainage: Salmon Creek
Bridge Type: Railroad Car
Span Length: 46' feet

Description:

The bridge is comprised of an old steel railcar 51' in length (span length approximately – 46') with a U-shaped main girder and constant depth exterior C-channel beams. The deck is 4"x6" timber planks with plywood patching along the west side and open holes along the east side where the deck has failed. The deck width is 10' out-to-out.
A steel pipe railing system is attached to the timber deck planks but has failed connections and is loose in some areas. The north approach alignment forms a T intersection with the main east-west trail and has a sharp curve to the west on the south side. The bridge is closed with a chain link fence barrier on the north end. A 9" ductile iron pipe is on the west side attached to the side beams.

Condition:

- The bridge has failed support at the southwest corner and has sagged or settled approximately 2'.
- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, and crevice corrosion is widespread throughout the RR flatcar.
- Timber decking has failed in over 50% of the surface and has large holes.
- Approach alignment has an abrupt T intersection on the north and sharp curve on the south.
- The abutments are at the edge of the stream on the south side and in the stream on the north side. The abutments obstruct the stream during high flows.
- The apparently abandoned ductile iron pipe is kinked and has failed attachments and it no longer stable.
- Railing has openings exceeding the 6" limit.

Recommendations:

- Remove this bridge and abutments to provide unobstructed stream flow through the bridge opening.
- If retained:
    - Clean, sandblast and paint the rail car to stop further corrosion and section loss and clean debris from the abutment seats and girder bearing area.
    - Replace the railing or retrofit to achieve minimum 6" openings.

Date Inspected: 12/20/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & I. Parker

BRIDGE NO. Gordy Jolma 4

BRIDGE TYPE	RR FLATCAR		45.751893		
CROSSING	SALMON CREEK		LAT -122.525107	INSPECTOR	BRUCE JOHNSON, ISAAC PARKER
YEAR BUILT	MID-1970'S (ESTIMATED)		LONG	DATE	12-20-2023
				STR. NO.	GJ-4

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	N/A
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	Fair
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint		Failed
4. Collision Damage		Fair
5. Scour		Poor
6. Settlement		Fair
1-Abut, spill-through with rock fill		
1-Footings, minor undermining		
1-Caps, 12"x12" timber, 50-70% rot		
1-Wings, rock wing some sloughing		
2.Signigicant debris		
3-paint gone with heavy corrosion		
4-miron scrapes and gouges		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Fair
4. Channel Change		N/A
5. Riprap		N/A
Overall Condition - Fair		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Fair
2. Girder or Beams	Fair
3. Floor Beams	Fair
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5. Diaphragms	Poor
6. Bearing Devices	N/A
7. Alignment of Members	Poor
8. Rivets or Bolts	Poor
9. Welds	Fair
10. Flange	
11. Stiffeners	
Overall Condition - Fair	

DECK	Condition Rating
1. Deck — Structural Condition	Failed
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Poor
1. 4x6 timber deck planks	Failed
2. Bare deck	
3. Narrow open gap	
6. Pipe rail. Poor paint, some Corrosion	
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	N/A
APPR. ALINE.	
SIGNING	
1. Posted	N/A
2. Legibility	N/A
3. Visibility	N/A
Overall Condition - Poor	

REMARKS (Key-in to item above)

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No 4 INSPECTORS B. Johnson & I. Parker

TYPE Flatcar NUMBER GJ-4 DATE 12/20/2023

DISTRICT _____ YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 4x6 timber deck planks. Steel pipe pedestrian rail has failed connections and is loose.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with one primary U-shaped girder and two C-channel side beams connected with overhang brackets or diaphragms. The structure has a 51' overall length. Edge beams are rolled C-channels. Severe corrosion and some pitting are present on the steel. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.

60 (SUBSTRUCTURE)

The End bents are concrete pier walls. The main girder bears directly on the seat of the concrete abutment and the side channel beams are supported on timber blocking on the bridge seat. The timber blocking is split and decayed with rot present.

65 (APPROACH)

Approach alignment has a T-intersection with the main trail on the north approach and continues to an intersection with the main trail entrance with 181st Street on the south approach.

OTHER

The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME	Gordy Jolma Bridge No 4			INSPECTORS	B. Johnson & I. Parker
TYPE	Flatcar	NUMBER	GJ-4	DATE	12/20/2023
DISTRICT				YEAR BUILT	2002

58 (DECK)

Replace the failed timber deck if the bridge is to be retained.
Replace the railing if the bridge is to be retained.

59 (SUPERSTRUCTURE)

Replace or remove the bridge.
Monitor condition of rail car corrosion, if it is to remain in place.
Clean and paint the steel rail car to preserve it and retard corrosion if it will remain in place.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Place riprap to form a smooth bank for better stream flow.

65 (APPROACH)

Consider updating the bridge closed sign and place one on both approaches until the bridge is repaired or replaced.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 4 Deck view.

Photo 2 – Gordy Jolma No 4 Elevation view.

Photo 3 – Gordy Jolma No 4 Hole in Deck due to timber plank failure.

Client: Clark County

Clark County Parks and Lands Division

Bridge No. Gordy Jolma 5

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-5
Bridge Name:	Gordy Jolma No 5 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car – Peds/Bikes
Span Length:	48 feet

Description:

The bridge is comprised of an old steel railcar 51' in length (span length – 48') with a center U-shape main built-up riveted girder 12-1/2" deep and two rolled C-channel edge girders 12" deep with bottom flange cut outs at each end that are 8" deep. The main girder bears directly on the concrete abutment and the side girders bear on a timber sill. The deck is 2" thick ribbed steel plate with oval indentions supported directly on the top flange of the girders, except for a 2' strip that is transverse timber planks near the center of the span. The deck has a 30" x ½" neoprene patch over 18' of the length along the east side. The deck has severe corrosion with loss of section, primarily under the neoprene patch. The deck is 10' out-to-out. A steel pipe railing system is attached to the side C-channel. The approach alignment forms a sharp curve to the east on the main on the north approach and a sharp curve to the west on main trail on the south approach.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, and crevice corrosion is widespread throughout the RR flatcar.
- Steel decking is damaged over 10% of the surface.
- Railing has openings exceeding the 6" limit.
- Approach alignment has a sharp curve on both approaches.
- The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow.
- A fallen tree is propped up on the south side of the bridge. Other debris is accumulating.

Recommendations:

- Clean, sandblast and paint the rail car to stop further corrosion and section loss.
- Replace the deck.
- Clean debris from the abutment seats and girder bearing area.
- Repair and add riprap to protect abutments due to the impinged waterway opening.
- Replace the railing or retrofit to achieve minimum 6" openings.

Date Inspected: 12/15/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & I. Parker

BRIDGE NO. Gordy Jolma 5

BRIDGE TYPE	RR FLATCAR		45.750988		
CROSSING	SALMON CREEK_		LAT	INSPECTOR	BRUCE JOHNSON, ISAAC PARKER
			-122.526282		
YEAR BUILT	1970'S (EST)		LONG	DATE	12-15-2023
				STR. NO.	GJ-5

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	Poor
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint on steel pile		Failed
4. Collision Damage		Fair
5. Scour		Fair
6. Settlement		Fair
1-Concrete abut, 30" x10' wide		Fair
1-Caps, 4"x12" timber, some rot		Poor
2-Some debris		Fair
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Poor
4. Channel Change		N/A
5. Riprap		N/A
Overall substructure condition, Fair		

SUPERSTRUCTURE		TYPE / SIZE
1. Stringers		Poor
2. Girder or Beams		Fair
3. Floor Beams		Fair
.		
5. Diaphragms, Bridging		Fair
6. Bearing Devices		Poor
7. Alignment of Members		Fair
8. Rivets or Bolts		Fair
9. Welds		Poor
10. Flange		Fair
11. Stiffeners		Fair
6- 4 x 12 timber, some rot		Poor
4-minor scrapes and gouges		Fair
9-Transverse weld on main		PoorFair
tension flange		
1-Stringers deformed, bent		Fair
Overall Condition, Fair, Phi(c)=0.90		

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Fair
1Deck 2" ribbed steel, Failed 10% with neoprene patch & timber.	Poor
1.Heavy corrosion, section loss	Poor
2. Bare deck	Poor
3. Gap filled with debris	Fair
6. 2" pipe rail	Fair
APPROACH CONDITION	
1. Pavement & Embankment	N/A
2. Shoulder Embankment	Fair
3. Railing	Fair
APPR. ALINE.	Poor
SIGNING	N/A
Overall Deck Condition, Poor	

REMARKS AND RECOMMENDATIONS ARE ATTACHED

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No. 5
TYPE Flatcar NUMBER GJ-5
INSPECTORS B. Johnson & I. Parker
DATE 12/15/2023
YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 2" thick steel ribbed deck plate, except for a 2' long section of timber plank decking near mid-span. A section along the east side has damage and was repaired with a neoprene pad of 10% of deck surface. Steel pipe pedestrian rail has loose connections. Ref. Photo 1.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with one primary U-shaped girder and two C-channel side beams connected with overhang brackets or diaphragms. The structure has a 51' overall length. Main girder is 12.5" deep, ¾" thick, with 3-7/8" flanges and 21" O-O width. Edge beams are rolled 12"x8"x0.74" C-channels with coped cutouts to 8" depth at 9' from each beam end. Surface corrosion is present on the steel. Areas of local distortions (bent and twisted stringers) and holes in members are present, however none appeared to be service related. One rough butt weld on the main girder, but with no signs of plate cracking.
Ref Photo 2.

60 (SUBSTRUCTURE)

Concrete abutment is 30" wide by 10' long with about 5' exposed on the front face. The girder bears directly on the concrete and two outside beams on a 4"x12" timber sill. The timber sill shows some decay. Ref. Photo 3& 4.
Debris on seats typical.

65 (APPROACH)

Approach alignment forms a sharp curve to the east on the north approach and a sharp curve to the west on the south approach.

OTHER

Loose rock rip rap is in front of the abutment. The abutment reduces the waterway opening slightly.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No. 5 INSPECTORS B. Johnson & I. Parker

TYPE Rail car NUMBER GJ DATE 12/15/2023

YEAR BUILT 1970's (estimated)

58 (DECK)

Replace the damaged steel deck and timber planks.
Consider installing a slip resistant surface on the steel deck plates.
Repair railing connections.

59 (SUPERSTRUCTURE)

Monitor condition of rail car corrosion.
Conduct NDE testing of fatigue prone details on the rail car.
Clean and paint the steel rail car to preserve it and retard corrosion.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Place rip rap to smooth the bank for better stream flow.

65 (APPROACH)

Consider extending the railing onto the approaches.

OTHER

Remove fallen tree from south side of bridge.
Trim back vegetation.

Photo 1 – Gordy Jolma No 5 Approach and Deck view.

Photo 2 – Gordy Jolma No 5 Elevation view.

Photo 3 – Gordy Jolma No 5 Abutment with loose rip rap

Photo 4 – Gordy Jolma No 5 Loss of paint, surface corrosion, and fatigue-prone weld on rail car.

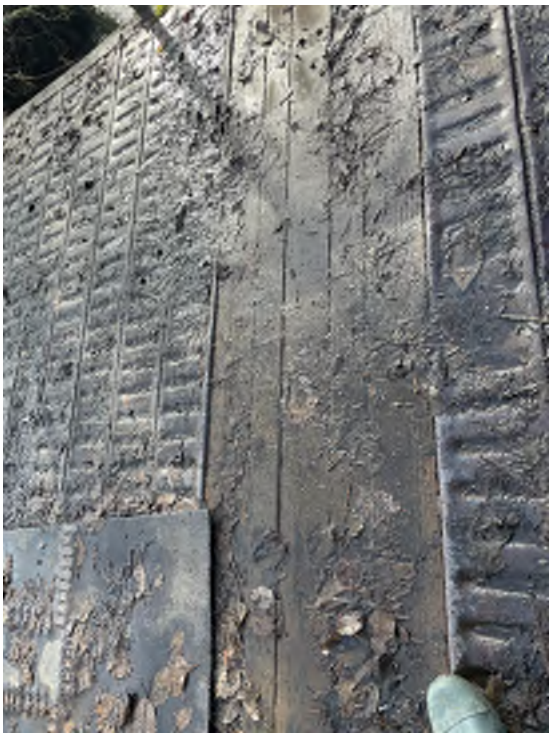

Photo 5 – Gordy Jolma No 5 Corrosion/damage on steel deck plate and timber deck plank section.

Client: Clark County

Clark County Parks and Lands Division

Bridge No. Gordy Jolma 6

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-6
Bridge Name:	Gordy Jolma No 6 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car – Peds/Bikes
Span Length:	49 feet

Description:

The bridge is comprised of an old steel railcar 51' in length (span length – 49') with a center U-shape main built-up riveted girder 14" deep and two rolled C-channel edge girders 12" deep with bottom flange cut outs at each end that are 8" deep. The main girder bears directly on the concrete abutment and the side girders bear on a timber sill. The deck is 2" thick ribbed transverse steel plate supported directly on the top flange of the girders, except for a transverse 2x8 timber plank near the center of the span. The deck has a ½"x30"x42' neoprene patch (with additional 12' extending onto the approach) along the east side and a ½"x4'x33' neoprene patch along the west side in total covering 50% of the deck. The deck also has a 2x12 patch at her south end of the bridge. A steel pipe railing system is attached to the side C-channel. The approach alignment forms a slight curve on the main trail on both approaches. There is a 2" conduit on the east side with some loose connections.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, and crevice corrosion is widespread throughout the RR flatcar.
- Steel decking is severely corroded with section loss over 50% of the surface primarily under the neoprene patches.
- Railing has openings exceeding the 6" limit.
- Approach alignment has a slight curve. There is a 12" drop off on the north approach.
- Woody debris is hung up in the waterway under the bridge.

Recommendations:

- Clean, sandblast and paint the rail car to stop further corrosion and section loss.
- Replace the deck.
- Clean debris from the abutment seats and girder bearing area.
- Replace the railing or retrofit to achieve minimum 6" openings.
- Remove woody debris from waterway opening under the bridge.

Date Inspected: 12/15/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & I. Parker

BRIDGE NO. Gordy Jolma 6

BRIDGE TYPE	RR FLATCAR	45.750029			
CROSSING	SALMON CREEK_	LAT		INSPECTOR	BRUCE JOHNSON, ISAAC PARKER
		-122.526471			
YEAR BUILT	1970'S (EST)	LONG		DATE	12-15-2023
				STR. NO.	GJ-6

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	Poor
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint on steel pile		Failed
4. Collision Damage		Fair
5. Scour		Fair
6. Settlement		Fair
1-Concrete abut, 16" x10' wide		Fair
1-Caps, timber sill, some rot		Fair
2-Some debris		Fair
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Good
4. Channel Change		N/A
5. Riprap		N/A
Overall substructure condition, Fair		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Fair
2. Girder or Beams	Fair
3. Floor Beams	Fair
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5. Diaphragms, Bridging	Fair
6. Bearing Devices	Poor
7. Alignment of Members	Fair
8. Rivets or Bolts	Fair
9. Welds	Fair
10. Flange	Fair
11. Stiffeners	Fair
6- timber sill, some rot	Poor
4-minor scrapes and gouges	Fair
1-Stringers corrosion, bends	Fair
Overall Condition, Fair, Phi(c)=0.90	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Fair
1Deck 2" ribbed steel, Failed 50% with neoprene and timber patches.	Poor
1.Heavy corrosion, section loss	Poor
2. Bare deck	Poor
3. Gap filled with debris	
6. 2" pipe rail w/ bent elements	Fair
APPROACH CONDITION	
1. Pavement & Embankment	N/A
2. Shoulder Embankment	Fair
3. Railing	Fair
APPR. ALINE.	Fair
SIGNING	N/A
Overall Deck Condition, Poor	

REMARKS AND RECOMMENDATIONS ARE ATTACHED

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No. 6
TYPE Flatcar NUMBER GJ-6

INSPECTORS B. Johnson & I. Parker
DATE 12/15/2023
YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 2" thick steel ribbed deck plate, except for a 8" long section of timber plank decking near mid-span and a 2x12 at the south end. A section along the east side and west side has damage and was repaired with a neoprene pad of 50% of deck surface. Steel pipe pedestrian rail extends onto the approaches. Ref. Photo 1.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with one primary U-shaped girder and two C-channel side beams connected with overhang brackets or diaphragms. The structure has a 51' overall length. Center girder is a U-shape 14" deep. Edge beams are rolled 12"x8"x0.74" C-channels with coped cutouts to 8" depth at 3.5' from each beam end. Surface corrosion is present on the steel. Areas of local distortions (bent and twisted stringers) and holes in members are present, however none appeared to be service related.
Ref Photo 2.

60 (SUBSTRUCTURE)

Concrete abutment is 16" wide by 10' long with about 5' exposed on the front face. The girder bears directly on the concrete and two outside beams on a timber sill. The timber sill shows some decay. Ref. Photo 3& 4. Debris on seats typical.

65 (APPROACH)

Approach alignment forms a slight curve on both approaches. The north approach has settled with some washout leaving a 12" drop off that is a potential tripping hazard.

OTHER

The abutment reduces the waterway opening slightly.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No. 6
TYPE Rail car NUMBER GJ-6
INSPECTORS B. Johnson & I. Parker
DATE 12/15/2023
YEAR BUILT 1970's (estimated)

58 (DECK)

Replace the damaged steel deck and timber planks.
Consider installing a slip resistant surface on the steel deck plates.
Repair railing connections.

59 (SUPERSTRUCTURE)

Monitor condition of rail car corrosion.
Conduct NDE testing of fatigue prone details on the rail car.
Clean and paint the steel rail car to preserve it and retard corrosion.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Place rip rap to smooth the bank for better stream flow.

65 (APPROACH)

Regrade the north approach to fill in the settlement drop off.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 6 Approach and Deck view.

Photo 2 – Gordy Jolma No 6 Elevation view.

Photo 3 – Gordy Jolma No 6 Abutment with loose rip rap

Photo 4 – Gordy Jolma No 6 Loss of paint, surface corrosion, and fatigue-prone weld on rail car.

Photo 5 – Gordy Jolma No 6 Corrosion/damage on steel deck plate and erosion and drop off at abutment.

Client: Clark County

Clark County Parks and Lands Division

Bridge No. Gordy Jolma 7

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-7
Bridge Name:	Gordy Jolma No 7 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car – Peds/Bikes
Span Length:	69 feet

Description:

The bridge is comprised of two 24.2" deep I-girders with 12.14" x ¾" flanges and welded K-diaphragms at a 30' spacing and sway bracing at 10' spacing. The bridge length is 70' with a span between center of bearings of 69'. The deck has 10-4"x12" treated deck planks running longitudinally, supported on treated timber 4" x 12" planks at 2'-0" centers on top of the girder flanges. The deck has a clear width of 8'-8" with a 6x6 felloe guard along the sides. A steel pipe railing system is attached to the girders with a welded steel angle. The approach alignment is steep and has a sharp curve on the south approach.

Condition:

- Steel appears to be weathering steel (no painted coating) and has a protective patina over most of the surface but with moss covering half of the upper side of the flange on the north exposure.
- Minor corrosion with some crevice corrosion at connections.
- Timber plank decking is has some checks and minor decay in 10% of the planks. Cross member timber supports are in good condition.
- Railing has openings exceeding the 6" limit.
- The abutments are set back approximately 15' from the edge of the stream.
- Gravel approach has settled or washed away 1"-2" on the north approach resulting in a minor tripping hazard.

Recommendations:

- Clean moss and debris off the girder flanges to prevent corrosion and loss of protective patina.
- Clean debris from the abutment seats and girder bearing area.
- Regrade the approaches to eliminate the bump at the north end.
- Replace the railing or retrofit to achieve minimum 6" openings.

Date Inspected: 12/15/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & I. Parker

BRIDGE NO. Gordy Jolma 7

BRIDGE TYPE	RR FLATCAR		45.749005		
CROSSING	SALMON CREEK_		LAT	INSPECTOR	BRUCE JOHNSON, ISAAC PARKER
			-122.526471		
YEAR BUILT	1970'S (EST)		LONG	DATE	12-15-2023
				STR. NO.	GJ-7

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	N/A
	Footings	Fair
	Footing Piles	N/A
	Caps	Na?
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Fair
3. Paint on steel pile		N/A
4. Collision Damage		N/A
5. Scour		N/A
6. Settlement		Fair
1-Concrete abut, 24" x10' wide		Fair
2-Some debris hung up on super-		Fair
and substructure		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Fair
4. Channel Change		N/A
5. Riprap		N/A
Overall substructure condition, Fair		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	N/A
2. Girder or Beams	Fair
3. Floor Beams	Fair
.	
5. Diaphragms, Bridging	Fair
6. Bearing Devices	Fair
7. Alignment of Members	Fair
8. Rivets or Bolts	Fair
9. Welds	Fair
10. Flange	Fair
11. Stiffeners	Fair
Overall Condition, Fair, Phi(c)=0.90	

DECK	Condition Rating
1. Deck — Structural Condition	Fair
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	Fair
5. Sidewalks	N/A
6. Railing, Posts	Fair
1Deck 4x12 treated timber planks.	Fair
Minor checks, splits and decay	Fair
Timber cross planks	Good
2. Bare deck	Fair
3. Gap filled with debris	
6. 2" pipe rail	
APPROACH CONDITION	
1. Pavement & Embankment	N/A
2. Shoulder Embankment	Fair
3. Railing	Fair
APPR. ALINE.	Poor
SIGNING	N/A
Overall Deck Condition, Fair, Phi(c) = 0.90	

REMARKS AND RECOMMENDATIONS ARE ATTACHED

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No. 7
TYPE Flatcar NUMBER GJ-7
INSPECTORS B. Johnson & I. Parker
DATE 12/15/2023
YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 4x12 treated timber planks running longitudinally with treated timber cross planks between the girders. Steel pipe pedestrian rail has loose connections. Ref. Photo 1.

59 (SUPERSTRUCTURE)

The superstructure is comprised of two 24.2" deep I-girders with 12.14" x ¾" flanges and welded K-diaphragms at a 30' spacing and sway bracing at 10' spacing. The structure has a 70' overall length.
Typical weathering steel patina is present on the steel.
Ref Photo 2.

60 (SUBSTRUCTURE)

Concrete abutment is 24" wide by 10' long with about 5' exposed on the front face. The girder bears directly on the 14" wide concrete seat. Ref. Photo 3& 4. Minor vegetation and debris on seats is typical.

65 (APPROACH)

Approach alignment forms a sharp and steep curve to the east on the north approach and a tangent approach on the west end.

OTHER

Loose large rock rip rap is in front of the abutment. The abutments are well above and set back from the waterway opening.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No. 7 INSPECTORS B. Johnson & I. Parker

TYPE Rail car NUMBER GJ-7 DATE 12/15/2023

YEAR BUILT 1970's (estimated)

58 (DECK)

Replace about 10% of the timber planks that are checked and split with the beginning of decay.

59 (SUPERSTRUCTURE)

Monitor condition of steel diaphragm and bracing connections for corrosion and pack rust.

Conduct NDE testing of fatigue prone details on the steel girders.

60 (SUBSTRUCTURE)

Clear debris and vegetation from seats.

Rearranged the existing rip rap and add riprap to smooth the protection in front of the abutments in case of extremely high flows.

65 (APPROACH)

Regrade the approaches to eliminate the bump at the west abutment.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 7 Approach and Deck view.

Photo 2 – Gordy Jolma No 7 Elevation view.

Photo 3 – Gordy Jolma No 7 Abutment

Photo 4 – Gordy Jolma No 7 Light patina on steel surfaces, beginning of crevice corrosion, and fatigue-prone details.

Photo 5 – Gordy Jolma No 7 Erosion and drop off at west abutment.

Clark County
Department of Public Works

Bridge No. Gordy Jolma 8

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ8
Bridge Name:	Gordy Jolma Trail over Salmon Creek No 8
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car
Span Length:	42.0 feet

Description:

The bridge is comprised of an old steel railcar 51' in length (span length – 42.0) with double-C-channel girders in the center and rolled C-channel edge girders 18" deep and coped about to 8" deep about 4' from the ends, with floorbeams and stringers supporting the deck. The deck is 2" thick ribbed steel plate with oval indentions supported directly on the top flange of the stringers.
A steel pipe railing system is attached to the top of a 6"x6" felloe guard but is loose in some areas.
The approach alignment forms a T intersection with the main east-west trail on the south approach.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, crevice corrosion and loss of section is widespread throughout the RR flatcar, especially on the stringers and floorbeams.
- Steel decking has surface corrosion with some flaking loss of section on the bottom.
- Pipe rail paint failed with flaking paint chips. One connection is missing at south end.
- Railing has openings exceeding the 6" limit.
- Approach alignment has an abrupt T intersection on the south. There is a 6" drop off on the northeast, northwest, and southeast corners on the approaches due to settlement or erosion. There is a 16" x 8" hole at the north end on the approach filled with a large rock that is a tripping hazard.
- The abutments are at the edge of the stream on the south side and in the stream on the north side. The abutments obstruct the stream during high flows.
- There is woody debris in the stream channel near the bridge.

Recommendations:

- Clean, sandblast and paint the rail car to stop further corrosion and section loss.
- Replace the deck.
- Clean debris from the abutment seats and girder bearing area.
- Add riprap to protect the abutment due to the impinged waterway opening.
- Regrade the approaches and fill in the gaps and settlement at both ends.
- Replace the railing or retrofit to achieve minimum 6" openings.
- Remove woody debris from the stream channel to reduce scour potential.

Date Inspected:	12/20/2023
Inspecting Firm:	Otak
Inspectors:	B. Johnson & G. Villa

BRIDGE NO. Gordy Jolma 8

BRIDGE TYPE	RR FLATCAR		45.758775		
CROSSING	SALMON CREEK		LAT -122.517108	INSPECTOR	BRUCE JOHNSON, GIOVANNI VILLA
YEAR BUILT	MID-1970'S (ESTIMATED)		LONG	DATE	12-20-2023
				STR. NO.	GJ-8

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	N/A
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	Fair
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint		Failed
4. Collision Damage		Fair
5. Scour		Poor
6. Settlement		Fair
1-Abut, spill-through with rock fill		
1-Footings, minor undermining		
1-Caps, 12"x12" timber, 50-70% rot		
1-Wings, rock wing some sloughing		
2.Signigicant debris		
3-paint gone with heavy corrosion		
4-miron scrapes and gouges		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Fair
4. Channel Change		N/A
5. Riprap		N/A
Overall Condition Fair, Phi(c)=0.90		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Poor
2. Girder or Beams	Fair
3. Floor Beams	Fair
.	
5. Diaphragms	Fair
6. Bearing Devices	N/A
7. Alignment of Members	Fair
8. Rivets or Bolts	Poor
9. Welds	Fair
10. Flange	Fair
11. Stiffeners	Fair
Overall Condition Fair, Phi(c)=0.90	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	N/A
3. Deck Joints	N/A
4. Curbs, Felloe Guards	Poor
5. Sidewalks	N/A
6. Railing, Posts	Fair
1. 2" steel ribbed deck plate	Poor
Corroded, section loss on bottom	
2. Bare deck	Fair
3. Narrow open gap	Fair
6. Pipe rail. Poor paint, some Corrosion	Fair
APPROACH CONDITION	
1. Pavement & Embankment	Poor
2. Shoulder Embankment	Poor
3. Railing	N/A
1, 2, - Settlement	Poor
APPR. ALINE.	
SIGNING	
1. Posted	N/A
2. Legibility	N/A
3. Visibility	N/A
Overall Condition Poor, Phi(c)=0.85	

REMARKS (Key-in to item above)

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No 8
TYPE RR Flatcar NUMBER GJ-08
DISTRICT

INSPECTORS B. Johnson & G. Villa
DATE 12/20/2023
YEAR BUILT 1970's (ESTIMATED)

58 (DECK)

Deck is comprised of 2" thick steel ribbed deck plate. Steel pipe pedestrian rail has failed and flaking paint with one missing connection.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with double-C-channel girders in the center and rolled C-channel edge girders 18" deep and coped about to 8" deep about 4' from the ends, with floorbeams and stringers supporting the deck. The structure has a 51' overall length. Edge beams are rolled 18"x4"x0.75" C-channels and double center girder are 12"x4"x0.75" rolled C-channels. The beams support a Floorbeam-stringer system that supports the decking. Severe corrosion and some pitting are present on the stringers and underside of the steel decking. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.

60 (SUBSTRUCTURE)

The End bents are 24" wide concrete piers with 8' exposed height, that are inset about 7' from the north end and 2.5' from the south end resulting in short cantilevered superstructure sections. The main girder bears directly on the seat of the concrete abutment and the side channel beams with timber blocking between girders on the bridge seats. The timber blocking is split and decayed with rot present along the entire length, providing little or no support to the channel beams.

65 (APPROACH)

Approach alignment has a T-intersection with the main trail on the north approach and provides access to a field on the north approach.

OTHER

The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME	Gordy Jolma Bridge No 8			INSPECTORS	B. Johnson & G. Villa
TYPE	Flatcar	NUMBER	GJ-8	DATE	12/20/2023
DISTRICT				YEAR BUILT	1970's Estimated

58 (DECK)

Replace the damaged steel deck.
Consider installing a slip resistant surface on the steel deck plates.
Repair railing connections.

59 (SUPERSTRUCTURE)

Monitor condition of rail car corrosion.
Replace stringers.
Clean and paint the steel rail car to preserve it and retard corrosion.

60 (SUBSTRUCTURE)

Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Place rip rap to smooth the bank for better stream flow.

65 (APPROACH)

Regrade the approaches to eliminate the holes and bump at the abutments.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 8 Approach and Deck view.

Photo 2 – Gordy Jolma No 8 Elevation view.

Photo 3 – Gordy Jolma No 8 Severe Corrosion and loss of section steel stringers and bottom of deck surface, crevice corrosion, and fatigue-prone details.

Photo 4 – Gordy Jolma No 8 Abutment and Cantilever Railcar section

Clark County
Department of Public Works

Bridge No. Gordy Jolma 9

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-9
Bridge Name:	Gordy Jolma No. 9 over Salmon Creek
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car
Span Length:	39 feet

Description:

The bridge is comprised of an old steel railcar 53' in length (span length – 39') with a center U-shape main built-up riveted girder 31-1/2" deep, tapering to 14.5" at the ends and two rolled C-channel edge girders 27" deep with bottom flange cut outs at each end that are 14.5" deep. The deck is 6x6 timber deck planks supported directly on the top flange of the girders.

A steel pipe railing system is attached to the top of a 6"x6" felloe guards but is loose and bent in some areas. The approach alignment has a sharp turn to the east on the north approach and a sharp turn to the west on the south approach. The fill has eroded on the north approach at the bridge end leaving large voids in the path.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, delamination of the steel plates and crevice corrosion is widespread throughout the RR flatcar.
- Timber decking has checks and splits and worn causing a rough surface and has gravel on portions.
- Railing has openings exceeding the 6" limit.
- Approach alignment has a sharp turn on both approaches.
- Abutments are at the edge of the stream. The abutments obstruct the stream during high flows.
- Minor scour and undermining of abutment footing at the northeast corner of the bridge.

Recommendations:

- Clean, sandblast and paint the rail car to stop further corrosion and section loss.
- Clean debris from the abutment seats and girder bearing area.
- Repair or replace damaged the timber deck planks to extend the life.
- Repair the minor undermining of the north footing and add riprap to protect the abutments due to the impinged waterway opening.
- Regrade the approaches and fill in the gaps and settlement at both ends.
- Replace the railing or retrofit to achieve minimum 6" openings.

Date Inspected: 12/20/2023
Inspecting Firm: Otak
Inspectors: B. Johnson & G. Villa

BRIDGE NO. Gordy Jolma 9

BRIDGE TYPE	RR FLATCAR		45.758584		
CROSSING	SALMON CREEK		LAT -122.514718	INSPECTOR	BRUCE JOHNSON, GIOVANNI VILLA
YEAR BUILT	1970'S (EST'D)		LONG	DATE	12-20-2023
				STR. NO.	GJ-9

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	N/A
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint		N/A
4. Collision Damage		N/A
5. Scour		Poor
6. Settlement		Fair
1-Abut, spill-through with rock fill		Fair
1-Footings, minor undermining		Poor
1-Caps, sills, timber, 50-70% rot		Poor
2.Signigicant debris		Poor
4-minor scrapes and gouges		Fair
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Fair
4. Channel Change		N/A
5. Riprap		N/A
Overall Condition – Fair, Phi(c)=0.90		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Poor
2. Girder or Beams	Poor
3. Floor Beams	Poor
.	
5. Diaphragms	Poor
6. Bearing Devices	Poor
7. Alignment of Members	Fair
8. Rivets or Bolts	Poor
9. Welds	Fair
10. Flange	Poor
11. Stiffeners	Poor
1,2,3 – Heavy corrosion, pitting and section loss	Poor
Overall condition – Poor, Phi(c)=0.85	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	N/A
3. Deck Joints	Fair
4. Curbs, Felloe Guards	Poor
5. Sidewalks	N/A
6. Railing, Posts	Fair
1. 6x6 timber planks split, checked, worn on top	Poor
2. Bare deck with loose gravel	Poor
3. Narrow open gap	Fair
4. 6x6 timber checked and split	Poor
5. N/A	
6. Pipe rail. Poor paint, some Corrosion	Poor
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	Poor
APPR. ALINE.	
SIGNING	
1. Posted	N/A
2. Legibility	N/A
3. Visibility	N/A
Overall condition – Poor, Phi(c)=0.85	

REMARKS (Key-in to item above)

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No 9
INSPECTORS B. Johnson & G. Villa
TYPE RR Flatcar NUMBER GJ-9
DATE 12/20/2023
DISTRICT
YEAR BUILT 1970's (Estimated)

58 (DECK)

Deck is comprised of 6x6 timber deck planks. Steel pipe pedestrian rail is bent and has isolated loose connections.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with one primary U-shaped girder and two C-channel side beams connected with overhang brackets or diaphragms. The structure has a 53' overall length. Edge beams are rolled C-channels with variable depth at the beam ends. Severe corrosion, some pitting, and loss of section are present on the steel. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.

60 (SUBSTRUCTURE)

The End bents are 24" thick concrete walls supported on exposed footings. The main girder bears directly on the seat of the concrete abutment and the side channel beams are supported on timber blocking on the bridge seat. The timber blocking is split and decayed with rot present along the entire length, providing little or no support to the channel beams.

65 (APPROACH)

Approach alignment has sharp curves on both approaches. The approach fill has settled and washed out a hole at the north end resulting in a tripping hazard.

OTHER

The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow. The leading edge of the north footing has minor undermining due to scour.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No 9 INSPECTORS B. Johnson & G. Villa
TYPE Steel Girder NUMBER GJ-9 DATE 11/20/2023
DISTRICT YEAR BUILT 1970's (Estimated)

58 (DECK)

Replace the damaged timber deck.
Consider replacing the steel rail and felloe guards, or repair railing connections.

59 (SUPERSTRUCTURE)

Monitor condition of rail car corrosion until the superstructure can be replaced.
If replacement is not done soon, clean and paint the steel rail car to preserve it and retard corrosion.

60 (SUBSTRUCTURE)

Consider complete bridge replacement to provide a larger waterway opening.
Replace the timber bearing under the side girders.
Clear debris and vegetation from seats.
Repair the undermining of the footing and place rip rap to smooth the bank for better stream flow.

65 (APPROACH)

Regrade the approaches to eliminate the holes and bump at the abutments.

OTHER

Trim back vegetation.

Photo 1 – Gordy Jolma No 9 Approach and Deck view.

Photo 2 – Gordy Jolma No 9 Elevation view

Photo 3 – Gordy Jolma No 9 Abutment and Railcar underside

Photo 4 – Gordy Jolma No 9 Abutment Scour

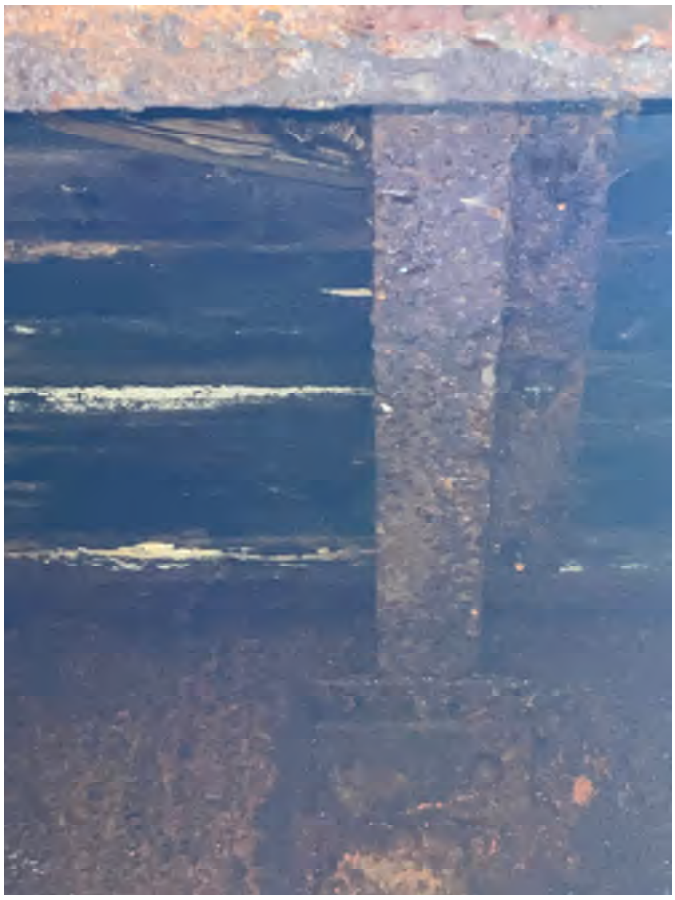


Photo 5 – Gordy Jolma No 9 Railcar beam and cross beam severe corrosion and deep pitting

Photo 6 – Gordy Jolma No 9 Railcar main beam severe corrosion and deep pitting

Photo 7 – Gordy Jolma No 9 Approach settlement and hole at north end, tripping hazard

Clark County
Department of Public Works

Bridge No. Gordy Jolma 10

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-10
Bridge Name:	Gordy Jolma No. 10 over dam
Location:	Gordy Jolma County Park
Drainage:	Salmon Creek
Bridge Type:	Railroad Car
Span Length:	26 feet

Description:

The bridge is comprised of an old steel railcar 31' in length (span length – 26') with 5-constant depth 8.5"x5"x1/4" I girders with draped steel rods providing third point support to 6"x6" timber cross beams and two constant depth rolled C-channel edge girders 8"x1"x1/4". The deck is transverse 2"x6" timber wearing surface supported by transverse 4"x12" treated timber planks supported directly on the top flange of the girders. Some of the deck wearing surface is decayed and has a plywood patch on the north approach. The deck has a 6x6 felloe guard and 2x6 edge curb.
A steel pipe railing system is attached to the top of a 6"x6" felloe guard but is loose in some areas. The approach alignment has a sharp turn to the west on the north approach and a sharp turn to the east on the south approach. The bridge spans a check dam constructed of reinforced concrete wall tied into the abutments, with logs and heavy riprap in the spillway that results in a drop in stream bed elevation of approximately 4'. The check dam forms an impoundment of local runoff with a 4' drop in water elevation across the check dam. A 4" ductile iron pipe and 2" conduit along the east side.

Condition:

- Heavy corrosion, some pitting, delamination of the steel plates and crevice corrosion is widespread throughout the RR flatcar.
- The steel rods are loose, bent and not providing support to the timber cross beams.
- The timber cross beams are split and decayed with rot throughout, so they provide negligible support to the main I girders.
- Timber decking is checked, split, with rot in ends and areas under the plywood patch.
- Steel pipe railing has loose, failed connections and is bent over 30 degrees at the SW corner.
- Railing has openings exceeding the 6" limit.
- Approach alignment has a sharp turn on both approaches.
- The abutments are at the edge of the stream on both ends. They obstruct the stream during high flows.

Recommendations:

- Option 1: Replace the steel railcar due to section loss and broken steel rod supports.
- Option 2, if retained:
    - Clean, sandblast and paint the steel after replacing steel rods and timber cross beams.
    - Replace the railing or retrofit to achieve minimum 6" openings.
    - Clean debris from the abutment seats and girder bearing area.
- Repair the spill way and conduct a hydraulic analysis to determine the need for the check dam.

Date Inspected:	12/20/2023
Inspecting Firm:	Otak
Inspectors:	B. Johnson & G. Villa

BRIDGE NO. Gordy Jolma 10

BRIDGE TYPE	RR FLATCAR		45.758775		
CROSSING	SALMON CREEK		LAT -122.513876	INSPECTOR	BRUCE JOHNSON, GIOVANNI VILLA
YEAR BUILT	1970'S (EST'D)		LONG	DATE	12-20-2023
				STR. NO.	GJ-10

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	Fair
	Piles	N/A
	Footings	Fair
	Footing Piles	N/A
	Caps	Poor
	Wings	N/A
	Backwalls, Bulkheads	Fair
.2. Debris on Seats		Poor
3. Paint		N/A
4. Collision Damage		N/A
5. Scour		Poor
6. Settlement		Fair
1-Abut, part of check dam		Fair
1-Caps, sills, timber, 50-70% rot		Poor
2.Signigicant debris		Poor
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		Fair
2. Embankment Erosion		Fair
3. Vegetation		Fair
4. Channel Change		N/A
5. Riprap		Fair
Overall Condition – Fair, Phi(c)=0.90		

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	N/A
2. Girder or Beams	Poor
3. Floor Beams	Poor
.	
5. Diaphragms	Poor
6. Bearing Devices	Poor
7. Alignment of Members	Poor
8. Rivets or Bolts	Poor
9. Welds	Poor
10. Flange	Poor
11. Stiffeners	Poor
1,2,3 – Heavy corrosion, pitting and section loss	Poor
Overall condition – Poor, Phi(c)=0.85	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	Fair
3. Deck Joints	Fair
4. Curbs, Felloe Guards	Poor
5. Sidewalks	N/A
6. Railing, Posts	Fair
1. 6x6 timber planks split, checked, worn on top	Poor
2. 2x6 deck surface	Poor
3. Narrow open gap	Fair
4. 6x6 timber checked and split	Poor
5. N/A	
6. Pipe rail. Poor paint, some Corrosion	Fair
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	Poor
APPR. ALINE.	
SIGNING	
1. Posted	N/A
2. Legibility	N/A
3. Visibility	N/A
Overall condition – Poor, Phi(c)=0.85	

REMARKS (Key-in to item above)

BRIDGE INSPECTION REMARKS

NAME Gordy Jolma Bridge No 10
INSPECTORS B. Johnson & G. Villa
TYPE RR Flatcar NUMBER GJ-10
DATE 12/20/2023
DISTRICT
YEAR BUILT 1970's (Estimated)

58 (DECK)

Deck is comprised of 6x6 timber deck planks and 2x6 wearing surface with 6x6 felloe guards and 2x6 edge curb. Steel pipe pedestrian rail is bent and has isolated loose connections.

59 (SUPERSTRUCTURE)

The superstructure is comprised of a steel rail car with 5-constant depth 8.5"x5"x1/4" I girders with draped steel rods providing third point support to 6"x6" timber cross beams and two constant depth rolled C-channel edge girders 8"x1"x1/4". The structure has a 31' overall length. Severe corrosion, some pitting, and loss of section are present on the steel. The timber cross beams are split and rotten and tie bars are failed with loose and broken connections. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related.

60 (SUBSTRUCTURE)

The End bents are tied into the check dam with 8" backwalls supporting the rail car. The main girder bears directly on the back wall of the concrete abutment.

65 (APPROACH)

Approach alignment has sharp curves on both approaches. The approach fill has settled and washed out a hole at the north end and south end resulting in a tripping hazard.

OTHER

The abutments are at the edge of the stream and obstruct the stream during high flows with heavy loose riprap that also obstruct the flow. The check dam impounds the load runoff to a depth of about 4' forming a small lake. There is significant woody debris and logs blocking the channel just downstream of the bridge. The 2" conduit on the east side is broken with loose electrical wires exposed. The connections of the 4" ductile iron pipe and 2" conduit are loose or broken.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No 10
TYPE Steel Girder NUMBER GJ-10
DISTRICT
INSPECTORS B. Johnson & G. Villa
DATE 11/20/2023
YEAR BUILT 1970's (Estimated)

58 (DECK)

Replace the damaged timber deck.
Consider replacing the steel rail and felloe guards, or repair railing connections.

59 (SUPERSTRUCTURE)

Replace the superstructure due to severe corrosion, section loss and failed members.
Monitor condition of rail car corrosion until the superstructure can be replaced.
If replacement is not done soon, clean and paint the steel rail car to preserve it and retard corrosion, replace the timber crossbeams and tie rods.

60 (SUBSTRUCTURE)

Clear debris and vegetation from seats.

65 (APPROACH)

Regrade the approaches to eliminate the holes and bump at the abutments.

OTHER

Trim back vegetation. Clean out the woody debris and logs blocking the channel downstream of the bridge. Repair the 2" conduit and loose electrical wires that are exposed in the broken conduit.

Photo 1 – Gordy Jolma No 10 Approach and Deck view.

Photo 2 – Gordy Jolma No 9 Elevation view and check dam

Photo 3 – Gordy Jolma No 10 Severe railcar corrosion and section loss and loose tie rods

Photo 4 – Gordy Jolma No 10 Rotten timber floorbeams and loose tie rods

Photo 5 – Gordy Jolma No 10 Approach sloughing and hole at northwest corner

Photo 6 – Gordy Jolma No 10 Approach sloughing and hole at southwest corner

Photo 7 – Gordy Jolma No 10 Railcar steel section loss and timber deck rot and decay

Clark County
Department of Public Works

Bridge No. Gordy Jolma 11

BRIDGE INSPECTION SUMMARY

Bridge No.	GJ-11
Bridge Name:	Gordy Jolma No 11 over Spill Slope
Location:	Gordy Jolma County Park
Drainage:	South Bank of Salmon Creek
Bridge Type:	Railroad Car
Span Length:	28.0 feet

Description:

The bridge is an "half-bridge" located directly under the Chelatchie Prairie Railroad Bridge owned by Clark County. The south half of the bridge is buried within the south berm slope of the railroad bridge. The half-bridge is comprised of an old steel railcar 30' in length (span length – 28') with 5 (estimated)-constant depth 8"x4"x1/4" C-channels with 4"x8" timber backer beams supported by steel rods providing third point support to 6"x6" timber cross beams and a C-channel edge beam 8"x4"x1/4". The deck is transverse 3"x12" deck planks, except at the west end there is 6' of 2x6 decking. Some of the deck planks are decayed and have a plywood patch over 50% of the bridge. A steel pipe railing system is attached to the side of the edge C-channel on the south side of the bridge that extends onto both approaches. The north edge of the half-bridge has a wall of 5 10"x10" treated timber beams that act as a retaining wall for the railroad bridge south berm slope and that wall is slightly tilted away from the berm slope toward the trail. The approach alignment is relatively straight and "Y's" into the main trial to the 181St entrance and to the west connecting to Bridge GJ1 to the north.

Condition:

- Steel coating has failed and peeled off.
- Heavy corrosion, some pitting, delamination of the steel plates and crevice corrosion is widespread throughout the RR flatcar.
- The steel rods are loose, bent and not providing support to the timber cross beams.
- The timber cross beams are split and decayed with rot throughout, so they provide negligible support to the main I girders.
- Timber decking is in poor condition with decay throughout.
- Railing has openings exceeding the 6" limit.
- Approach alignment is satisfactory on both approaches. Steel rail on the west approach is bent & tilted.
- The abutments are assumed to be treated timber on grade but are buried and not accessible for inspection but are assumed to be in poor condition.

Recommendations:

- Option 1: Replace the timber deck and retrofit or replace the railing to achieve minimum 6" openings for a 10 to 15-year service life.
- Option 2: Replace the half-bridge by constructing a retaining wall at the downslope edge and place fill for a 50-year service life.

Date Inspected:	12/20/2023
Inspecting Firm:	Otak
Inspectors:	B. Johnson & G. Villa

BRIDGE NO. Gordy Jolma 11

BRIDGE TYPE	RR FLATCAR	45.757900			
CROSSING	SALMON CREEK	LAT -122.519046	INSPECTOR	BRUCE JOHNSON, GIOVANNI VILLA
YEAR BUILT	MID-1970'S (ESTIMATED)	LONG	DATE	12-20-2023
			STR. NO.	GJ-11

OBSERVATIONS

SUBSTRUCTURE		
1. END BENTS	Abutments	N/A
	Piles	N/A
	Footings	N/A
	Footing Piles	N/A
	Caps	N/A
	Wings	N/A
	Backwalls, Bulkheads	N/A
.2. Debris on Seats		N/A
3. Paint		N/A
4. Collision Damage		N/A
5. Scour		N/A
6. Settlement		N/A
Abutments or grade beam support		
Is buried in the approach fill, unable		
To view or inspect		
5-stream is stable heavy rock bed and isolated heavy rocks on banks		
CHANNEL & CHAN. PROTECT.		
1. Channel Scour		N/A
2. Embankment Erosion		Fair
3. Vegetation		Fair
4. Channel Change		N/A
5. Riprap		N/A

SUPERSTRUCTURE	TYPE / SIZE
1. Stringers	Poor
2. Girder or Beams	Poor
3. Floor Beams	Poor
.	
5. Diaphragms	Poor
6. Bearing Devices	N/A
7. Alignment of Members	Poor
8. Rivets or Bolts	Poor
9. Welds	Poor
10. Flange	Poor
11. Stiffeners	Poor
Heavy corrosion, section loss	Poor
Overall Condition – Poor, Phi(c)=0.85	

DECK	Condition Rating
1. Deck — Structural Condition	Poor
2. Wearing Surface	Poor
3. Deck Joints	N/A
4. Curbs, Felloe Guards	N/A
5. Sidewalks	N/A
6. Railing, Posts	Poor
1. Timber planks, patched with	
plywood and 2x6	
2. Bare deck	
3. Narrow open gap	
6. Pipe rail. Poor paint, some Corrosion	
Tilted 30 degrees on west side	
APPROACH CONDITION	
1. Pavement & Embankment	Fair
2. Shoulder Embankment	Fair
3. Railing	Poor
APPR. ALINE.	
SIGNING	
1. Posted	N/A
2. Legibility	N/A
3. Visibility	N/A
Overall Condition – Poor, Phi(c)=0.85	

REMARKS (Key-in to item above)

BRIDGE INSPECTION REMARKS

NAME	Gordy Jolma Bridge No 11			INSPECTORS	B. Johnson & G. Villa
TYPE	Flatcar	NUMBER	GJ-11	DATE	12/20/2023
DISTRICT				YEAR BUILT	1970's (ESTIMATED)

58 (DECK)

The deck is transverse 3"x12" deck planks, except at the west end there is 6' of 2x6 decking. Some of the deck planks are decayed and have a plywood patch over 50% of the bridge.
A steel pipe railing system is attached to the side of the edge C-channel on the south side of the bridge that extends onto both approaches.

59 (SUPERSTRUCTURE)

The half-bridge is comprised of an old steel railcar 30' in length (span length – 28') with 5 (estimated)-constant depth 8"x4"x1/4" C-channels with 4"x8" timber backer beams supported by steel rods providing third point support to 6"x6" timber cross beams and a C-channel edge beam 8"x4"x1/4". Tie rods are loose, providing limited support. Severe corrosion and some pitting are present on the steel. Areas of local distortions (bends) and holes (burned through, not rusted) through members are present, however none appeared to be service related. The superstructure is buried on the south side in the railroad bridge spill slope and unable to be inspected, but it is likely highly corroded.

60 (SUBSTRUCTURE)

The End bents are buried in the approach fill and unable to be inspected.

65 (APPROACH)

Approach alignment has a sharp turn to the south on the west approach that continues to an intersection with the main trail entrance at 181st Street. The west approach also continues straight on to the south side of Bridge No GJ-1. The east approach continues straight to an intersection with the approach to Bridge No GJ-8.

OTHER

The south side of the half-bridge is a retaining wall of 10" x 10" treated timber beams placed 4 high with a 6" x 10" cap. While the 46" high wall appeared stable, it is leaning into the trail slightly. The timber wall continues onto the east approach, retaining the RR Bridge spill slope.

BRIDGE MAINTENANCE RECOMMENDATIONS

NAME Gordy Jolma Bridge No 11 INSPECTORS B. Johnson & G. Villa

TYPE Flatcar NUMBER GJ-11 DATE 12/20/2023

DISTRICT _____ YEAR BUILT 1970's Estimated

58 (DECK)

Replace the deck due to rot and splits. Replace the rail that is bent and loose on the west approach.

59 (SUPERSTRUCTURE)

Replace the half-bridge with a concrete slab or a down slope retaining wall and fill. Monitor condition of rail car until it can be replaced.

60 (SUBSTRUCTURE)

Replace the bridge.

65 (APPROACH)

Re-grade the approach due to uneven surface on the east approach causing a tripping hazard. Replace the rail.

OTHER

Monitor condition and alignment of the upslope timber retaining wall and trim back vegetation.

Photo 1 – Gordy Jolma No 11 Approach and Deck view.

Photo 2 – Gordy Jolma No 11 Deck damage, patching and uneven surface.

Photo 3 – Gordy Jolma No 11 Elevation View and RR Bridge timber pile bent along north side.

Photo 4 – Gordy Jolma No 11 Side Beam corrosion and loose tie rod.

Photo 5 – Gordy Jolma No 11 Interior beam severe corrosion, pitting and loss of section.

Photo 6 – Gordy Jolma No 11 Interior beam severe corrosion, pitting and loss of section.

CEDARS LANDING SUBDIVISION

NW 1/4 SECTION 11 & 12, T3N, R2E, W.M.

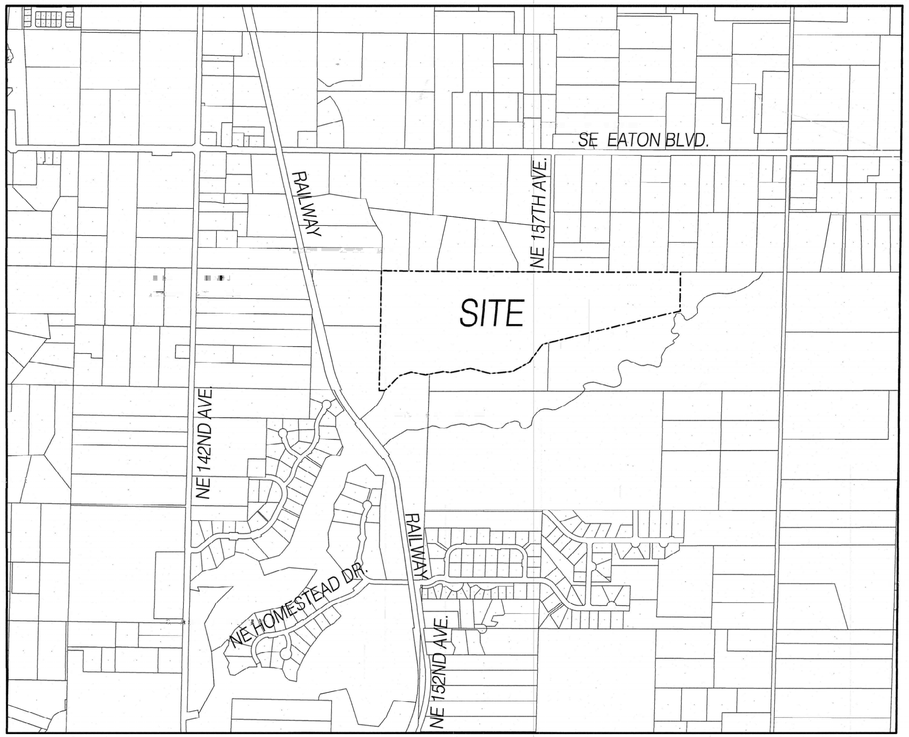
PROJECT PARCEL NUMBERS: 194343-000, 194572-000, 194599-000, 194600-000, 986041-462

THE CONTRACTOR SHALL NOTIFY THE FOLLOWING UTILITY COMPANIES OR DEPARTMENTS A MINIMUM OF 48 HOURS BEFORE CONSTRUCTION

CITY OF BATTLE GROUND	(360) 342-5000
BATTLE GROUND PUBLIC WORKS	(360) 342-5350
BATTLE GROUND POLICE DEPARTMENT	(360) 342-5100
CENTURYLINK (KEITH MEISNER)	(360) 699-3720
COMCAST (MICHELLE JANSON-MOE)	(360) 316-1051
FIRE DISTRICT #3	(360) 892-2331
CLARK PUBLIC UTILITIES (ELECTRIC)	(360) 992-8558
CLARK PUBLIC UTILITIES (WATER)	(360) 992-8022
CLARK REGIONAL WASTEWATER DISTRICT	(360) 993-8810
NW NATURAL GAS	(360) 571-5465
UTILITY LOCATE	(800) 424-5555

LEGEND

- PERIMETER OF SITE
- RIGHT-OF-WAY LINE
- CENTERLINE OF ROAD
- FACE OF CURB
- LOT LINE
- EASEMENT LINE
- STM — STORM SEWER LINE
- STM — EXIST STORM SEWER
- SAN — SANITARY SEWER LINE
- SAN — EXIST SANITARY SEWER
- W — WATER SERVICE LINE
- W — EXIST WATER LINE
- 123 — GRADED CONTOUR LINE
- 123 — EXIST CONTOUR LINE
- MANHOLE
- WATER VALVE AND BOX
- FIRE HYDRANT ASSEMBLY
- SANITARY CLEAN OUT
- CATCH BLOCK
- THRUST BLOCK
- WATER SERVICE METER
- TELEPHONE RISER
- GAS RISER
- ELECTRIC RISER
- UTILITY POLE
- UTILITY POLE W/ LIGHT
- SIGN POST



VICINITY MAP

NOT TO SCALE

CLARK PUBLIC UTILITIES - WATER

UTILITY WORK ORDER NO. 542851

SIGNED BY _____ DATE 05/13/2019

CLARK PUBLIC UTILITIES - WATER SERVICES
DEVELOPER INSTALLED WATER MATERIAL LIST

INSTALLED WATER ITEM	MATERIAL	QUANTITY	UNITS
8" PVC WATER MAIN		7897	LF
FIRE HYDRANT		10	EA
6" DIP WATER MAIN		84	LF
1" WATER SERVICE LINE		163	EA
2" WATER SERVICE LINE		1	EA

NOTES:

1. PIPE MATERIAL ABBREVIATIONS:
   - PVC - POLYVINYL CHLORIDE PIPE
   - DIP - DUCTILE IRON PIPE
   - HDPE - HIGH DENSITY POLYETHYLENE PIPE
2. QUANTITIES LISTED WITHIN THIS TABLE ARE NOT FOR BIDDING PURPOSES, BUT FOR USE BY CLARK PUBLIC UTILITIES TO DETERMINE THE INSTALLED WATER SYSTEM VALUE.

VERTICAL DATUM

ELEVATIONS SHOWN HEREON ARE NGVD1929 (47) A.K.A. CLARK COUNTY DATUM BASED ON TIES TO CLARK COUNTY BENCHMARK NO. 320 (PRAIRIE-69)' ELEVATION =391.14'. THE BENCHMARK IS LOCATED ON THE EAST SIDE OF THE RAILROAD CROSSING AT THE NW QUADRANT OF NE 181ST ST. AND NE 152ND AVE.

NOTE:

1) THIS APPROVAL IS BASED ON THE CITY OF BATTLE GROUND'S REQUIREMENTS ONLY. THE DEVELOPER/CONTRACTOR IS RESPONSIBLE FOR ACQUIRING AND COMPLYING WITH ANY NECESSARY STATE AND FEDERAL PERMITS PRIOR TO BEGINNING ANY ON SITE CONSTRUCTION.

2) THE STORMWATER FACILITY WILL BE PRIVATELY OWNED AND MAINTAINED .

APPROVED FOR CONSTRUCTION

Mark Hersey 6/4/19
City Engineer Approval Date:

Public Works Director Date:

APPLICANT:

RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205
PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

CONTACT:

OLSON ENGINEERING, INC.
222 E. EVERGREEN BLVD.
VANCOUVER, WA 98660
PHONE: (360) 695-1385
FAX: (360) 695-8117
CONTACT: PETER TUCK
EMAIL: peter@olsonengr.com

SHEET INDEX:

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CLIENT:

RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205

PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

COVER SHEET FOR:
CEDARS LANDING SUBDIVISION

OLSON ENGINEERING, INC.
LAND SURVEYORS
ENGINEERS
360-695-1385
503-639-3496
222 E. EVERGREEN, VANCOUVER, WA 98660

PETER A. TUCK — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER
4/16/19

CHANGES / REVISIONS

DESCRIPTION:	DATE:

RECORD DRAWING

Sheets marked "RECORD DRAWING" in this set provide information used during construction, and do not necessarily represent what was constructed on site.
Sheets marked "ASBUILT" include information collected or revised following construction.

DESIGNED: CDC/GCO
DRAWN: TAS
CHECKED: PAT
DATE: APRIL 2019
SCALE: NTS

CEDARS LANDING SUBDIVISION
JOB NO.: 8959.02.01

SHEET
C1.0

SANITARY LATERAL TABLE

LOT #	END LAT IE (FT)		LENGTH (FT)	DOWNSTREAM MH	STA. FROM DOWNSTREAM MH	DEPTH @ T/C (FT)		DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)	
80	262.94		38.0	SA24	0+72.52	6.0		6.00	
81	263.46		37.5	SA24	1+27.35	6.0		6.00	
82	263.85		26.3	SG1	0+07.52	6.0		5.72	
83	264.14		20.5	SG1	0+36.72	6.0		6.00	
84	259.26		22.0	SB1	1+67.50	6.0		6.02	
85	258.64		22.0	SB1	1+07.50	6.0		6.01	
86	258.03		22.0	SB1	0+47.50	6.0		6.01	
87	257.42		22.0	SA20	2+20.01	6.0		6.01	
88	256.88		24.0	SA20	1+60.01	6.0		7.98	
89	256.27		24.0	SA20	1+00.01	6.0		8.02	
90	255.84		22.0	SA20	0+50.01	6.0		8.92	
91	~~253.53~~	253.97	~~23.6~~ 19.7	SA19	~~2+88.54~~ 2+85.94	6.0	END	16.00	EDGE OF ROAD
92	~~257.00~~	254.90	~~22.0~~ 22.2	SA19	~~2+88.54~~ 2+28.00	6.0	END	16.00	EDGE OF ROAD
93	~~257.60~~	254.19	~~22.0~~ 21.6	SA19	~~1+48.54~~ 1+63.45	6.0	END	16.00	EDGE OF ROAD
94	~~248.91~~	255.88	~~27.0~~ 26.3	SA20	~~1+88.18~~ 1+00.52	12.0*		6.00	
95	~~256.30~~	255.05	~~29.0~~ 31.73	SA20	~~1+88.54~~ 1+61.07	12.0*		7.88	
96	251.06	NV	29.0	SA20	2+24.31	12.0*		7.97	
97	251.79	NV	29.0	SA21	0+51.41	12.0*		8.00	
98	~~252.50~~	252.92	~~29.0~~ 24.9	SA21	~~1+21.41~~ 1+21.07	12.0*		8.00	
99	~~252.95~~	253.16	25.2	SA21	~~1+68.41~~ 1+65.52	12.0*		6.00	
100	~~252.10~~	253.40	~~31.0~~ 34.0	SA22	~~0+16.06~~ 0+47.43	12.0*		6.00	
101	~~252.99~~	254.33	~~30.0~~ 30.5	SA23	~~0+94.58~~ 0+94.52	12.0*		6.00	
102	254.59	NV	36.5	SA23	0+71.20	12.0*		6.00	
103	255.28	NV	43.5	SA23	1+34.28	12.0*		6.00	
104	262.80		22.0	SD1	1+67.50	6.0		6.04	
105	261.35		22.0	SD1	1+01.50	6.0		6.02	
106	259.90		22.0	SA21	0+76.52	6.0		6.00	
107	258.44		22.0	SA21	1+99.51	6.0		6.00	
108	256.98		22.0	SA21	1+33.51	6.0		6.04	
109	~~253.50~~	255.15	~~32.0~~ 32.4	~~SA24~~ SA20	~~0+72.52~~ 0+63.37	8.0		6.00	
110	253.71		36.0	SA20	0+73.47	8.0		6.00	
111	254.58		36.0	SA20	1+35.01	8.0		6.00	
112	255.24		36.0	SA20	1+99.51	8.0		5.98	
113	255.90		36.0	SB1	0+33.00	8.0		6.00	
114	256.57		36.0	SB1	0+99.00	8.0		6.00	
115	257.24		36.0	SB1	1+65.00	8.0		6.01	
116	262.64		36.0	SD1	1+59.98	6.0		5.98	
117	265.45		24.0	SD2	1+25.00	6.0		6.03	
118	263.30		24.0	SA24	1+08.34	6.0		6.00	
119	262.62		24.0	SA24	0+44.36	6.0		6.00	
120	~~258.10~~	260.47	~~21.4~~ 21.2	SA23	~~2+21.47~~ 2+23.62	6.0		6.10	
121	~~261.50~~	261.36	~~16.1~~ 16.6	SA23	~~1+78.98~~ 1+78.85	6.0		6.00	
122	~~259.98~~	257.42	~~21.2~~ 24.2	SA23	~~1+18.10~~ 1+15.83	6.0		6.00	
123	~~259.98~~	257.66	~~27.7~~ 282	SA23	~~0+36.11~~ 0+36.17	6.0		6.00	
124	~~247.54~~	255.67	~~30.0~~ 34.4	SA21	~~0+73.14~~ 1+01.98	14.1		6.00	
125	250.40		36.0	SA21	1+18.00	12.2		6.00	
126	254.01		36.0	SA21	1+79.00	9.9		6.00	
127	257.87		36.0	SD1	0+10.50	7.5		6.00	
128	258.24		36.0	SD1	0+84.00	8.7		6.00	
129	264.67		20.7	SG2	0+91.65	6.0	END	20.69	TOTAL LENGTH
130	264.63		13.0	SG2	0+89.16	6.0	END	13.03	TOTAL LENGTH
131	264.72		13.5	SG2	0+05.00	6.0	END	11.00	EDGE OF ROAD
132	265.46		38.0	SD2	1+23.00	6.0		6.00	
133	265.32		38.0	SD2	0+65.98	6.0		5.98	
134	264.92		36.0	SD2	1+64.95	6.0		5.96	
135	265.66		36.0	SD2	2+12.89	6.0		5.96	
136	266.02		36.0	SD2	2+63.97	6.0		5.99	
137	265.43		36.0	SD2	3+43.05	6.0		6.00	
138	264.61		22.0	SD3	1+54.12	6.0		6.00	
139	264.60		36.0	SD3	1+52.00	6.0		5.96	
140	263.43		36.0	SD3	0+87.50	7.6		6.00	
141	266.14		36.0	SD3	0+22.50	6.0		5.94	
142	265.07		36.0	SD3	0+42.50	6.0		5.98	
143	264.21		36.0	SD3	0+80.00	6.0		6.00	
144	262.32		36.0	SB3	0+94.18	7.0		6.00	
145	263.51		22.0	SB3	1+02.00	6.0		6.03	
146	262.89		22.0	SB3	0+40.00	6.0		6.02	
147	262.27		22.0	SB2	3+78.00	6.0		6.02	
148	261.65		22.0	SB2	3+16.00	6.0		6.00	
149	261.03		22.0	SB2	2+54.00	6.0		6.01	
150	260.41		22.0	SB2	1+92.00	6.0		6.00	
151	259.79		22.0	SB2	1+30.00	6.0		6.00	
152	257.80		38.0	SB2	0+73.50	8.0		6.00	
153	258.02		36.0	SB2	0+77.05	7.3		6.00	
154	258.60		36.0	SB2	1+41.05	7.3		6.00	
155	259.23		36.0	SB2	2+11.05	7.4		6.00	
156	259.81		36.0	SB2	2+75.05	7.4		5.98	
157	260.49		36.0	SB2	3+51.05	7.5		6.03	
158	265.41		22.0	SD2	3+45.05	6.0		6.00	
159	265.98		22.0	SD2	2+81.05	6.0		5.99	
160	265.64		22.0	SD2	2+11.05	6.0		6.00	
161	264.54		22.0	SD2	1+41.05	6.0		6.01	
162	263.54		22.0	SD2	0+77.05	6.0		6.02	

NV = NOT VERIFIED

NOTES:
1) ALL GRAVITY LATERALS SHALL BE 4" PVC PIPE AND HAVE A 2% MIN. SLOPE PER DETAIL SS3.0, SHEET C9.9
2) MARK END OF LATERAL WITH GREEN STAKE 10' - 2" X 4"

NOTE:

1) SEE C.O.B. STD. NOTES AND DETAILS FOR PIPE, LATERALS, MANHOLES AND CLEANOUT INSTALLATION ON SHEETS C9.8 AND C9.9.
2) ALL PVC SANITARY MAINS TO BE 3034 PVC.

PETER A TUCK — STATE OF WASHINGTON — 21417 — REGISTERED PROFESSIONAL ENGINEER

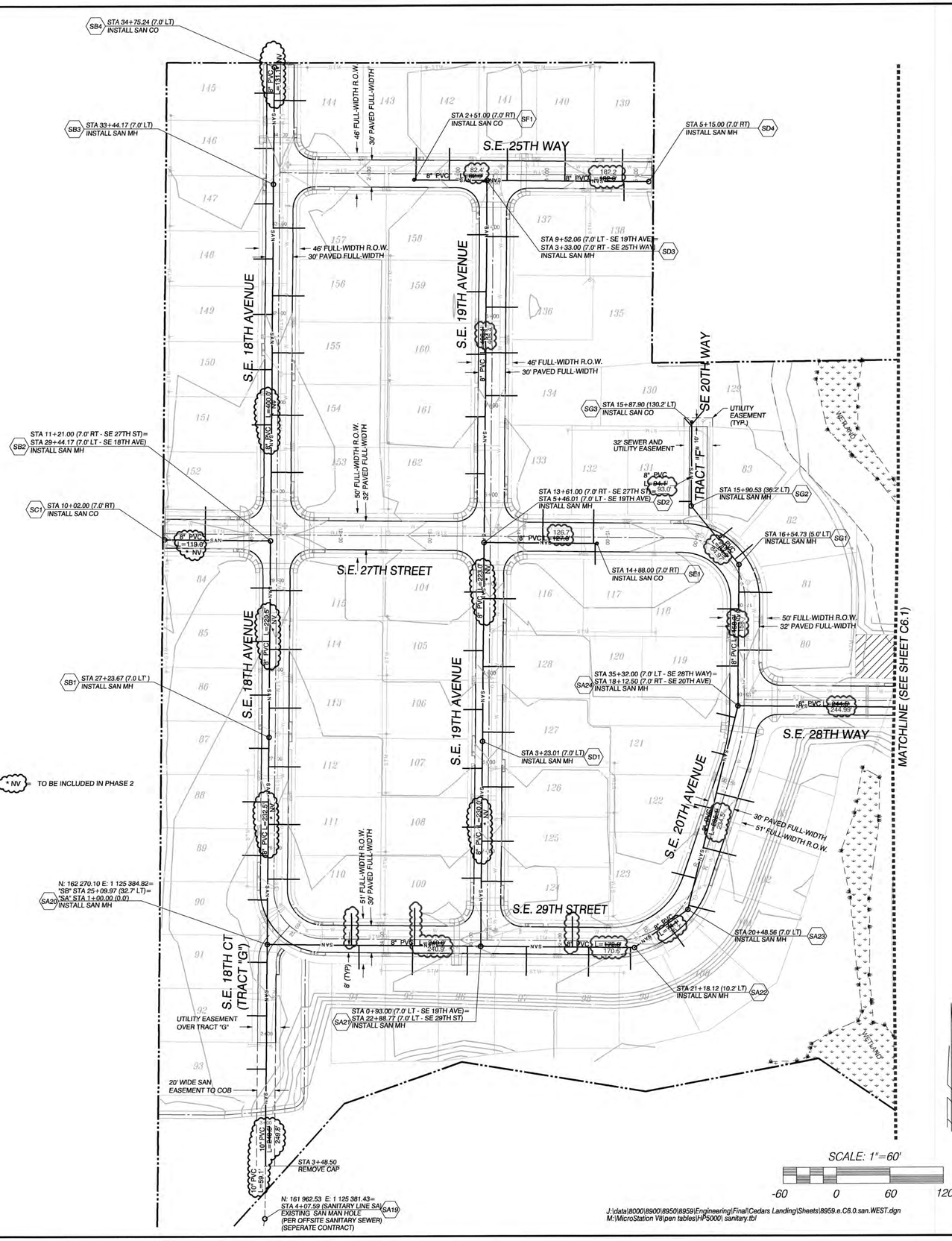
4/29/2020

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY ____ FOR:

A N/A

- ☐ ☒ GRADING
- ☐ ☒ STORM SEWER
- ☒ ☐ SANITARY SEWER
- ☐ ☒ WATER

☐ ☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION



CLIENT:
RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205

PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

AS-BUILT

SANITARY SEWER PLAN (WEST) FOR:

CEDARS LANDING SUBDIVISION

OLSON ENGINEERING
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9836

PETER A TUCK — STATE OF WASHINGTON — 21417 — REGISTERED PROFESSIONAL ENGINEER

4/16/19

CHANGES / REVISIONS

DESCRIPTION:	DATE:
REVISE LATERAL TABLE	7/31/19

PAT

DESIGNED: CDC/GCO
DRAWN: TAS
CHECKED: PAT
DATE: APRIL 2019
SCALE: H: 1"=60'
V:

CEDARS LANDING SUBDIVISION

JOB NO.: 8959.02.01

SHEET

C6.0

SANITARY LATERAL TABLE

LOT #	END LAT IE (FT)	LENGTH (FT)	DOWNSTREAM MH	STA. FROM DOWNSTREAM MH	DEPTH @ T/C (FT)	DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)
1	~~260.19~~ 258.86	~~39.8~~ 37.7	SA34	~~0+39.84~~ 0+31.53	6.0	6.00
2	~~261.79~~ 257.75	~~40.0~~ 37.2	SA33	0+75.78	6.0	6.00
3	~~260.89~~ 260.28	~~97.0~~ 36.8	SK1	~~0+67.70~~ 0+67.44	6.0	6.00
4	~~261.19~~ 260.36	~~40.0~~ 31.7	SK2	~~0+05.00~~ 0+00.00	6.0	6.00
5	~~261.19~~ 260.79	~~40.0~~ 32.4	SK2	~~0+67.01~~ 0+67.79	6.0	6.00
6	~~261.79~~ 260.83	~~40.0~~ 36.5	SK2	~~1+30.01~~ 1+26.34	6.0	6.00
7	~~262.09~~ 261.29	~~40.0~~ 34.7	SK2	~~1+86.55~~ 1+83.93	6.0	6.00
8	~~262.09~~ 262.77	~~40.0~~ 37.4	SK3	~~0+56.70~~ 0+53.89	6.0	6.00
9	~~262.09~~ 263.43	~~41.0~~ 46.1	SK3	~~0+97.15~~ 0+92.15	6.0	6.00
10	~~263.09~~ 262.48	43.3	SH3	~~0+44.37~~ 0+40.92	6.0	6.00
11	~~263.49~~ 261.89	~~39.4~~ 38.0	SH3	~~0+38.48~~ 0+33.26	6.0	6.00
12	~~260.54~~ 262.24	~~40.0~~ 37.3	SH2	~~1+47.04~~ 1+43.80	6.0	6.00
13	~~263.04~~ 261.68	~~40.0~~ 37.2	SH2	~~0+97.50~~ 0+94.15	6.0	6.00
14	~~263.09~~ 262.73	~~40.0~~ 36.6	SH2	~~0+61.10~~ 0+32.90	6.0	6.00
15	~~261.49~~ 260.42	~~40.0~~ 37.3	SH1	~~0+92.00~~ 0+89.06	6.0	6.00
16	~~261.24~~ 259.34	~~40.0~~ 22.9	SH1	~~0+75.15~~ 0+74.51	6.0	6.00
17	~~262.09~~ 262.09	~~42.0~~ 21.6	SH2	~~1+39.14~~ 1+37.39	6.0	6.00
18	~~262.09~~ 261.66	21.8	SI1	0+04.49	6.0	6.00
19	~~260.79~~ 261.61	~~40.0~~ 27.7	SI1	~~0+83.98~~ 0+61.80	6.0	6.00
20	~~262.14~~ 261.47	20.4	SI1	0+96.51	6.0	6.00
21	~~260.89~~ 260.29	~~41.7~~ 20.8	SJ1	~~0+84.50~~ 0+84.97	6.0	6.00
22	~~260.17~~ 259.66	~~40.0~~ 38.7	SA30	~~1+29.41~~ 1+29.77	6.0	6.00
23	~~259.06~~ 258.35	~~41.0~~ 26.7	SA30	~~1+87.01~~ 1+87.63	12.0*	6.00
24	~~254.19~~ 258.58	~~41.0~~ 24.5	SA31	~~0+86.09~~ 0+83.77	12.0*	6.00
25	~~254.19~~ 260.62	23.9	SA31	~~1+57.09~~ 1+56.95	12.0*	6.00
26	~~257.79~~ 256.83	~~22.3~~ 22.3	SA32	~~0+13.00~~ 0+13.22	12.0*	6.00
27	~~255.14~~ 259.34	~~41.0~~ 23.8	SA32	~~0+81.38~~ 0+71.81	12.0*	6.00
28	~~261.64~~ 260.18	~~41.0~~ 26.4	SA33	~~0+97.54~~ 0+39.98	6.0	6.00
29	~~261.04~~ 258.99	~~41.0~~ 26.1	SA33	~~1+02.99~~ 1+00.63	6.0	6.00
30	~~260.14~~ 258.81	~~42.0~~ 31.3	SA34	~~0+28.28~~ 0+27.33	6.0	6.11
31	~~262.44~~ 259.75	~~41.0~~ 29.4	SA34	~~0+89.57~~ 0+90.79	6.0	6.00
32	~~262.54~~ 258.79	~~41.0~~ 26.5	SA34	~~1+49.67~~ 1+50.27	6.0	6.00
33	~~262.14~~ 259.48	~~41.0~~ 26.5	SA34	~~2+09.52~~ 2+11.13	6.0	6.00
34	~~261.89~~ 258.97	~~41.0~~ 26.1	SA34	~~2+29.57~~ 2+69.59	6.0	6.00
35	~~259.09~~ 258.91	24.0	SA34	~~0+29.00~~ 3+28.99	6.0	6.00
36	~~261.09~~ 258.92	~~37.1~~ 37.7	SA32	~~0+56.17~~ 0+64.19	6.0	6.00
37	~~260.59~~ 259.63	~~39.4~~ 40.1	SA31	~~2+01.51~~ 1+76.13	6.0	6.00
38	~~260.09~~ 260.31	~~40.0~~ 38.4	SA31	1+16.18	6.0	6.00
39	~~259.99~~ 259.52	~~40.0~~ 38.5	SA31	~~0+50.59~~ 0+60.15	6.0	6.00
40	~~259.09~~ 259.55	~~39.1~~ 37.8	SJ1	~~0+01.00~~ 0+24.46	6.0	6.00

LOT #	END LAT IE (FT)	LENGTH (FT)	DOWNSTREAM MH	STA. FROM DOWNSTREAM MH	DEPTH @ T/C (FT)	DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)
41	~~260.49~~ 259.66	37.6	SJ1	0+70.75	6.0	6.00
42	~~260.59~~ 260.36	35.6	SJ1	~~0+24.04~~	6.0	6.00
43	~~262.09~~ 261.55	38.2	SI1	~~0+92.00~~ 0+94.93	6.0	6.00
44	~~262.09~~ 262.28	~~40.0~~ 32.2	SI1	~~0+56.04~~ 0+50.31	6.0	6.00
45	~~262.09~~ 261.95	~~40.0~~ 36.9	SH2	~~1+14.55~~ 1+44.21	6.0	6.00
46	~~262.07~~ 263.00	~~40.0~~ 22.7	SH2	~~0+58.86~~ 0+66.33	6.0	6.00
47	~~260.55~~ 263.21	~~40.0~~ 20.2	SH3	~~0+17.74~~ 0+20.68	6.0	6.00
48	~~260.89~~ 263.77	~~40.0~~ 23.5	SH3	~~0+86.00~~ 0+89.74	6.0	6.00
49	~~260.59~~ 262.73	~~40.0~~ 23.5	SK3	~~0+41.00~~ 0+41.50	6.0	6.00
50	~~260.89~~ 261.84	~~40.0~~ 21.3	SK2	~~0+89.04~~ 2+18.10	6.0	6.00
51	~~261.09~~ 260.17	~~40.0~~ 24.5	SK2	~~1+59.04~~ 1+56.72	6.0	6.00
52	~~261.59~~ 260.64	~~40.0~~ 24.6	SK2	~~0+89.04~~ 0+89.80	6.0	6.00
53	~~261.39~~ 261.07	~~40.0~~ 23.9	SK1	~~1+00.00~~ 1+03.48	6.0	6.00
54	~~260.07~~ 258.90	~~40.0~~ 39.4	SA30	~~0+50.74~~ 0+50.68	6.0	6.00
55	~~260.49~~ 257.94	~~40.0~~ 38.1	SA28	~~0+45.00~~ 2+45.81	6.0	6.00
56	~~260.09~~ 258.20	~~40.0~~ 35.2	SA28	~~1+26.00~~ 1+65.89	6.0	6.00
57	~~257.70~~ 257.87	~~40.0~~ 37.7	SA28	~~0+99.50~~ 0+99.61	6.0	6.00
58	~~257.41~~ 257.30	~~40.0~~ 39.0	SA28	~~0+34.00~~ 0+34.96	6.0	6.00
59	~~257.71~~ 256.88	~~40.0~~ 40.2	SA27	~~2+39.04~~ 2+25.04	6.0	6.00
60	~~256.76~~ 256.86	~~40.0~~ 40.1	SA27	~~1+59.04~~ 1+58.13	6.0	6.00
61	~~257.04~~ 254.49	~~42.0~~ 43.2	SA26	~~1+20.00~~ 1+17.84	6.0	12.00
62	~~259.00~~ 255.07	~~40.0~~ 39.5	SA26	~~0+10.19~~ 0+50.03	6.0	6.00
63	~~259.19~~ 256.47	~~40.0~~ 22.6	SH1	~~0+06.00~~ 0+06.79	6.0	6.00
64	~~259.39~~ 256.60	~~37.4~~ 38.0	SH1	~~0+14.00~~ 0+17.60	6.0	6.00
65	~~259.00~~ 257.61	~~40.0~~ 29.5	SA26	~~0+58.17~~ 0+58.10	6.0	6.00
66	~~257.79~~ 255.60	~~40.0~~ 34.9	SA26	~~1+26.00~~ 1+26.25	6.0	13.60
67	~~257.79~~ 255.67	~~40.0~~ 34.4	SA26	~~1+84.72~~ 1+82.77	6.0 END	N/A
68	256.42	39.5	SA27	0+00.00	6.0** END	N/A
69	~~259.00~~ 253.60	~~42.7~~ 21.4	SA27	~~0+56.10~~ 0+55.91	12.0*	6.00
70	~~259.00~~ 253.30	~~40.0~~ 32.4	SA27	~~1+39.10~~ 0+37.75	12.0*	12.00
71	~~259.00~~ 253.79	~~40.0~~ 28.4	SA27	~~0+10.68~~ 2+12.56	12.0*	12.00
72	~~251.01~~ 254.62	30.0	SA28	~~0+20.77~~ 0+22.08	12.0*	12.00
73	~~251.08~~ 256.05	~~40.0~~ 30.8	SA28	~~0+85.77~~ 0+85.30	12.0*	12.00
74	~~251.14~~ 254.98	~~40.0~~ 30.5	SA28	~~1+49.07~~ 1+49.35	12.0*	12.00
75	~~252.17~~ 255.61	~~24.0~~ 25.1	SA28	~~2+14.64~~ 2+10.20	12.0*	6.00
76	~~252.40~~ 256.52	~~40.0~~ 24.8	SA29	~~0+08.14~~ 0+10.10	12.0*	6.00
77	~~252.00~~ 256.85	~~40.0~~ 25.0	SA29	~~0+00.00~~ 0+64.61	12.0*	6.00
78	~~252.00~~ 255.56	~~41.0~~ 25.3	SA30	0+44.46 0+44.77	12.0*	6.00
79	~~252.00~~ 257.56	~~41.0~~ 24.8	SA30	~~1+14.04~~ 1+14.58	12.0*	6.00

* DAY LIGHT BASEMENT (GRAVITY)
** DAYLIGHT BASEMENT W/GRINDER PUMP

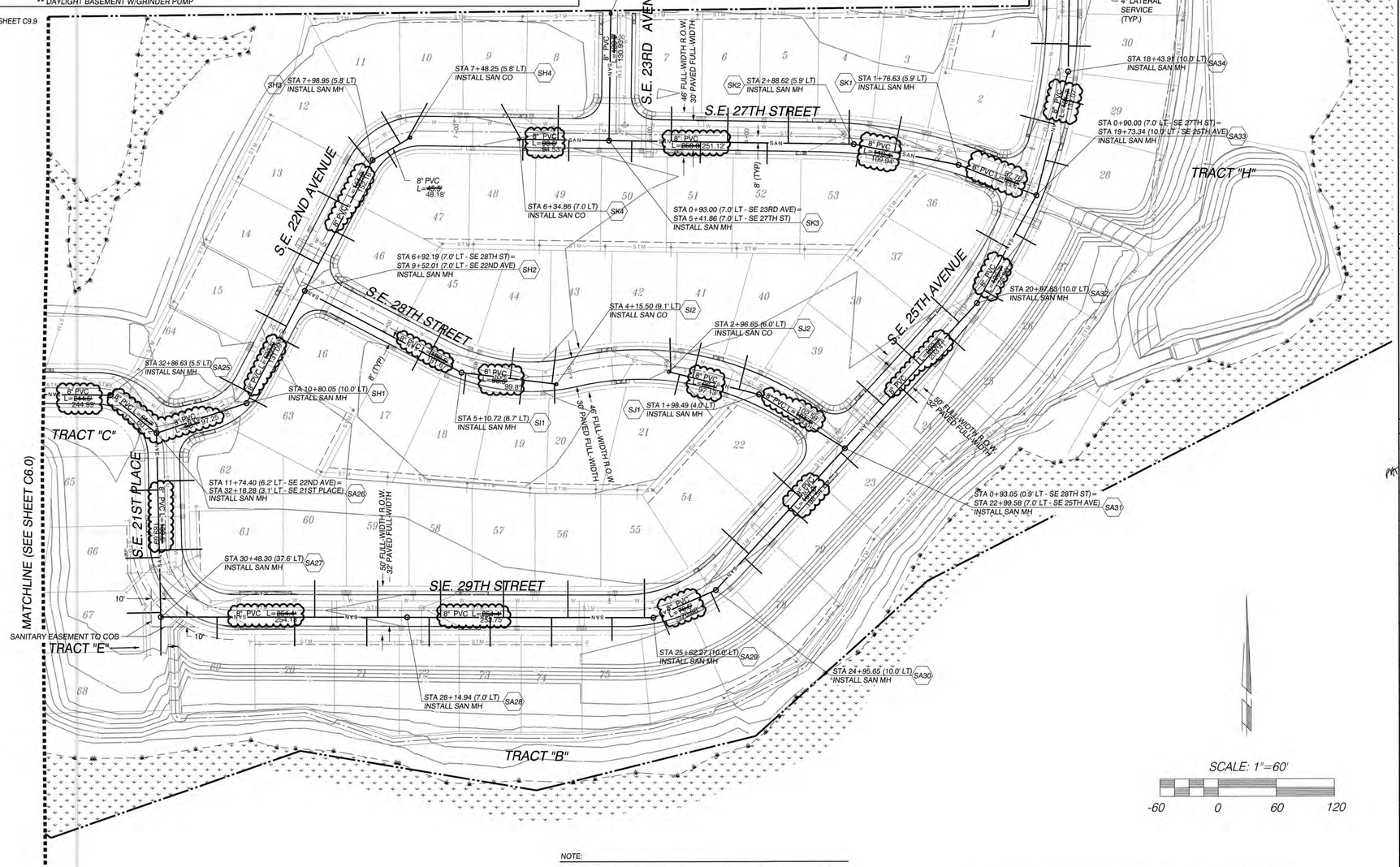
NOTES:
1) ALL GRAVITY LATERALS SHALL BE 4" PVC PIPE AND HAVE A 2% MIN. SLOPE PER DETAIL SS3.0, SHEET C9.9
2) MARK END OF LATERAL WITH GREEN STAKE 10' - 2" X 4"

PETER A TUCKER — STATE OF WASHINGTON — 31861 — REGISTERED PROFESSIONAL ENGINEER
3/10/20

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY ~~ ~~ FOR:

A N/A
☐ ☒ GRADING
☒ ☐ STORM SEWER
☒ ☐ SANITARY SEWER
☐ ☐ WATER

☐ ☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION



SCALE: 1"=60'
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NOTE:
1) SEE C.O.B. STD. NOTES AND DETAILS FOR PIPE, LATERALS, MANHOLES AND CLEANOUT INSTALLATION ON SHEETS C9.8 AND C9.9.
2) ALL PVC SANITARY MAINS TO BE 3034 PVC.

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M:\MicroStation V8\pen tables\HP5000\ sanitary.tbl

CLIENT:
RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205

PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

AS-BUILT

SANITARY SEWER PLAN (EAST) FOR:

CEDARS LANDING SUBDIVISION

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-369-9068

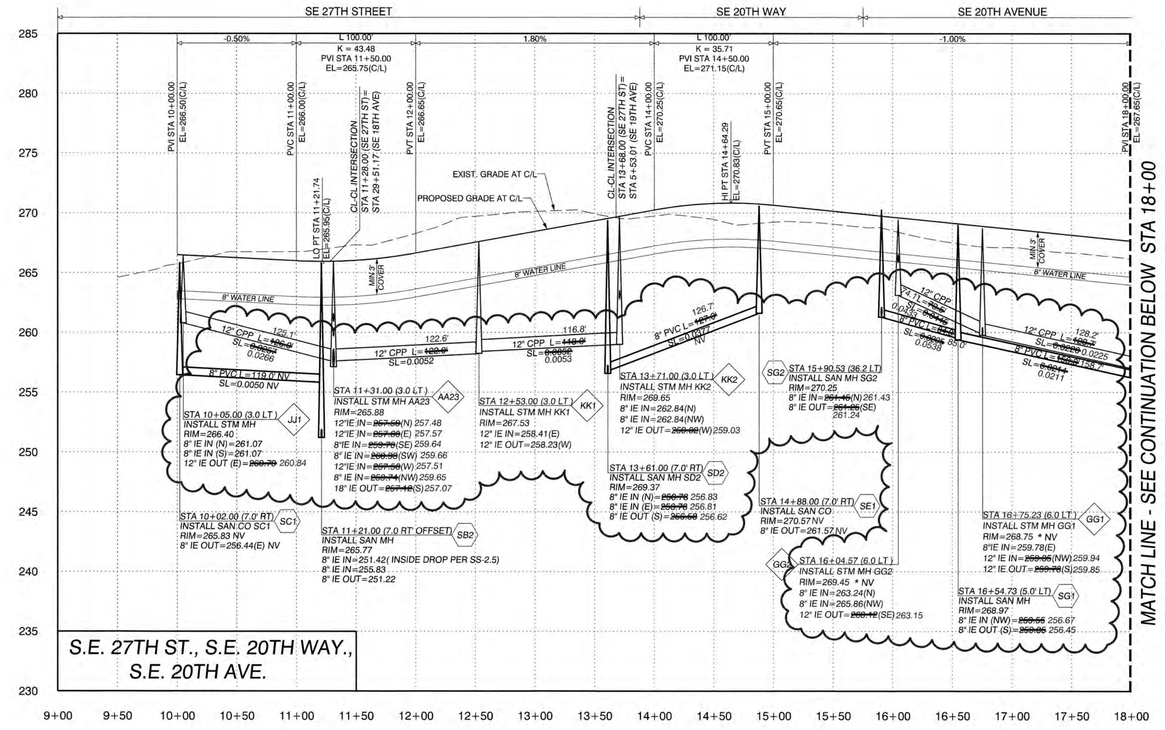
PETER A TUCKER — STATE OF WASHINGTON — 31861 — REGISTERED PROFESSIONAL ENGINEER
4/16/19

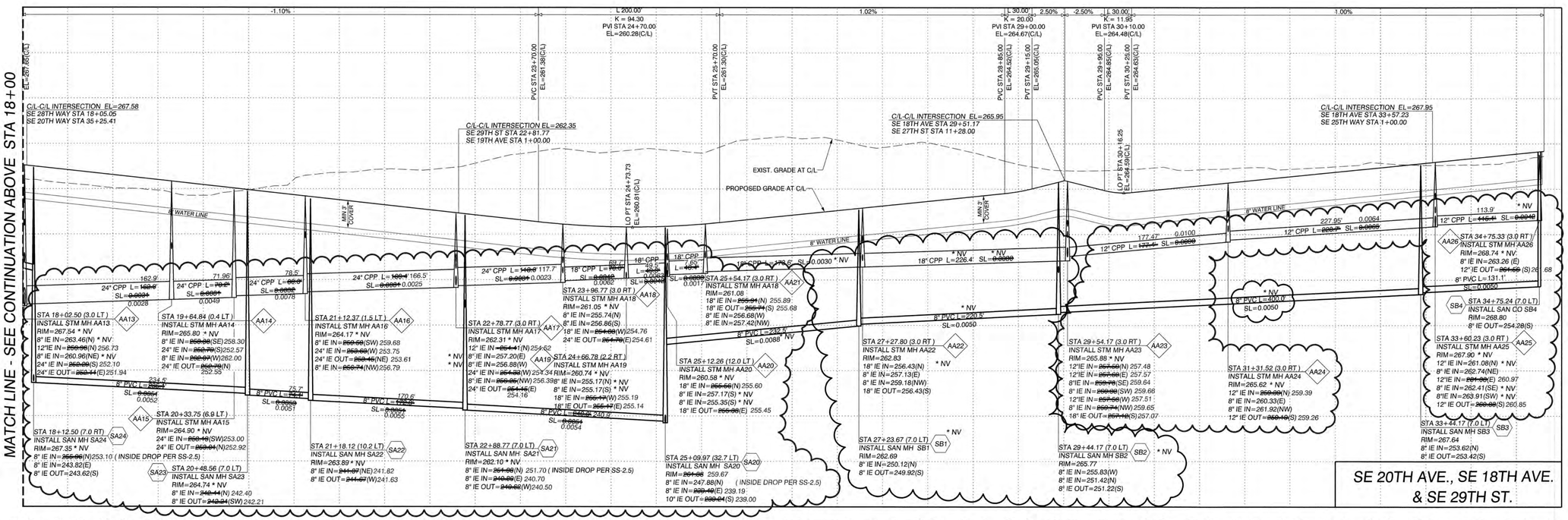
CHANGES / REVISIONS	
DESCRIPTION:	DATE:
REVISE LATERAL TABLE	7/31/19

DESIGNED: CDC/GCO
DRAWN: TAS
CHECKED: PAT
DATE: APRIL 2019
SCALE: H: 1"=60'

CEDARS LANDING SUBDIVISION
JOB NO.: 8959.02.01

SHEET
C6.1





* NV = TO BE INCLUDED IN PHASE 2

PETER A TUCK STATE OF WASHINGTON 21810 REGISTERED PROFESSIONAL ENGINEER
6/29/2020

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY FOR:

A N/A
- GRADING
- STORM SEWER
- SANITARY SEWER
- WATER
- LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

FINAL RIMS HAVE NOT BEEN SET
THIS WILL BE COMPLETED WITH PHASE 2

PETER A TUCK STATE OF WASHINGTON 21810 REGISTERED PROFESSIONAL ENGINEER
4/16/19

CHANGES / REVISIONS	
DESCRIPTION:	DATE:
REVISED SD2 AND SG1 IE'S	7/31/19
REVISED SA24, SB3 AND SB4	7/31/19

DESIGNED: CDC/GCO
DRAWN: TAS
CHECKED: PAT
DATE: APRIL 2019
SCALE: H: 1"=60' V: 1"=6'

CEDARS LANDING SUBDIVISION
JOB NO.: 8959.02.01

SHEET
C8.1

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AS-BUILT

PROFILE FOR S.E.18TH AVE.,S.E. 20 AVE., S.E. 27TH ST. AND S.E. 29TH ST. FOR:

CEDARS LANDING SUBDIVISION

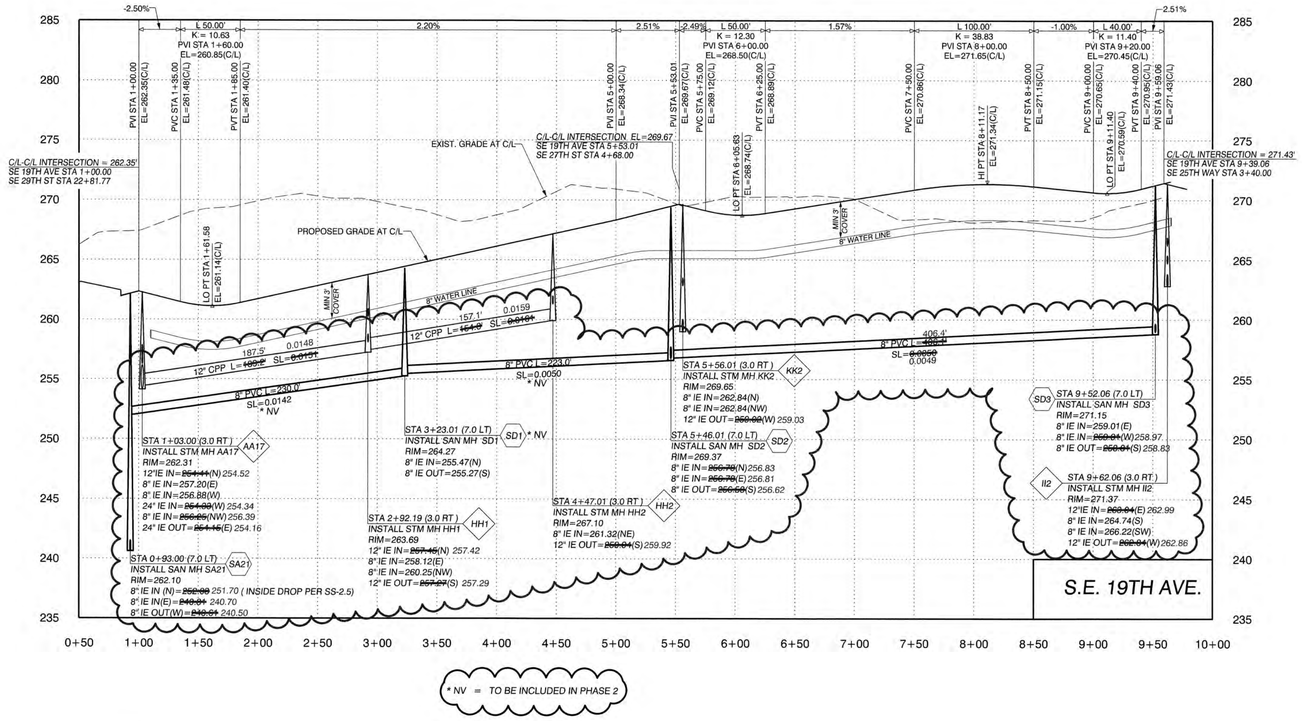
CLIENT:
RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205
PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.906.0936

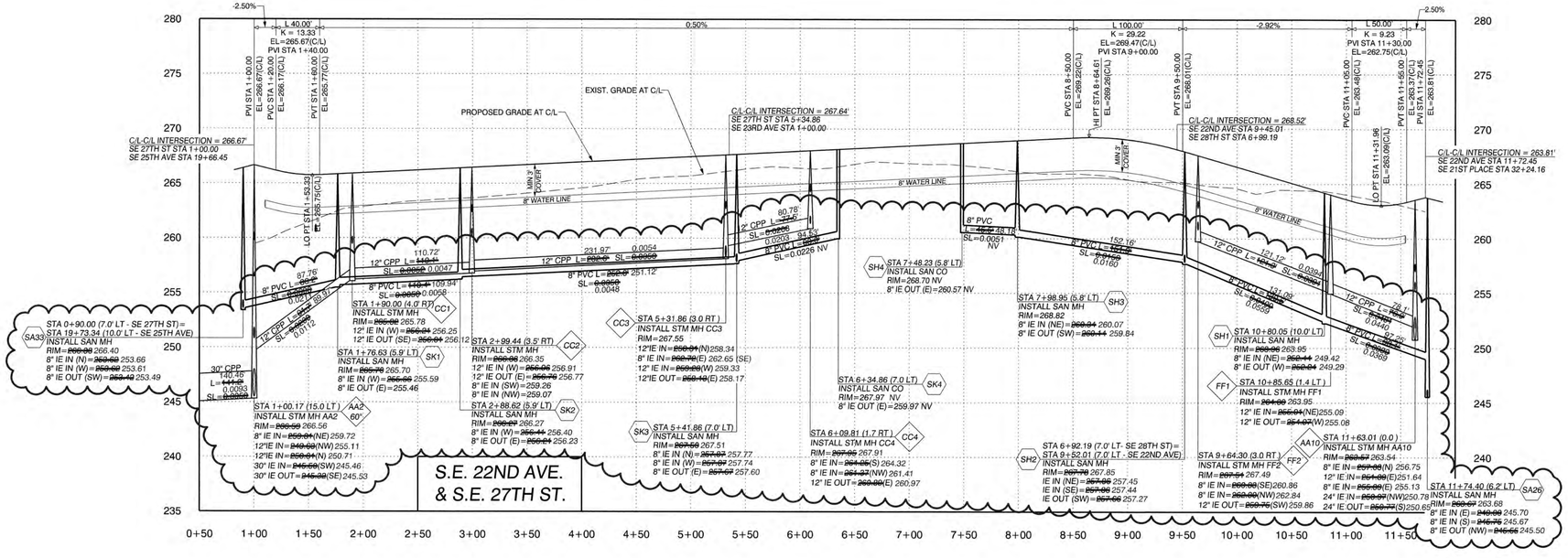
AS-BUILT

PROFILE S.E. 22ND AVE. S.E. 27TH ST AND S.E. 19TH AVE. FOR:

CEDARS LANDING SUBDIVISION



* NV = TO BE INCLUDED IN PHASE 2



CLIENT:
RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205

PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-906-0908

PETER A. TUCEK
STATE OF WASHINGTON
21817
REGISTERED
PROFESSIONAL ENGINEER
6/24/2020

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY [ ] FOR:

A N/A

- ☐ ☒ GRADING
- ☒ ☐ STORM SEWER
- ☐ ☐ SANITARY SEWER
- ☒ ☐ WATER

☐ ☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

FINAL RIMS HAVE NOT BEEN SET FOR AA17, SA21, HH1-HH2, SD1-SD3, KK2 & II2 THIS WILL BE COMPLETED WITH PHASE 2

PETER A. TUCEK
STATE OF WASHINGTON
21817
REGISTERED
PROFESSIONAL ENGINEER
4/16/19

CHANGES / REVISIONS	
DESCRIPTION:	DATE:
REVISED SD2 AND AA2 IE'S	7/31/19

PM

DESIGNED: CDC/GCO

DRAWN: TAS

CHECKED: PAT

DATE: APRIL 2019

SCALE: H: 1"=60'
V: 1"=6'

CEDARS LANDING SUBDIVISION

JOB NO.: 8959.02.01

SHEET

C8.2

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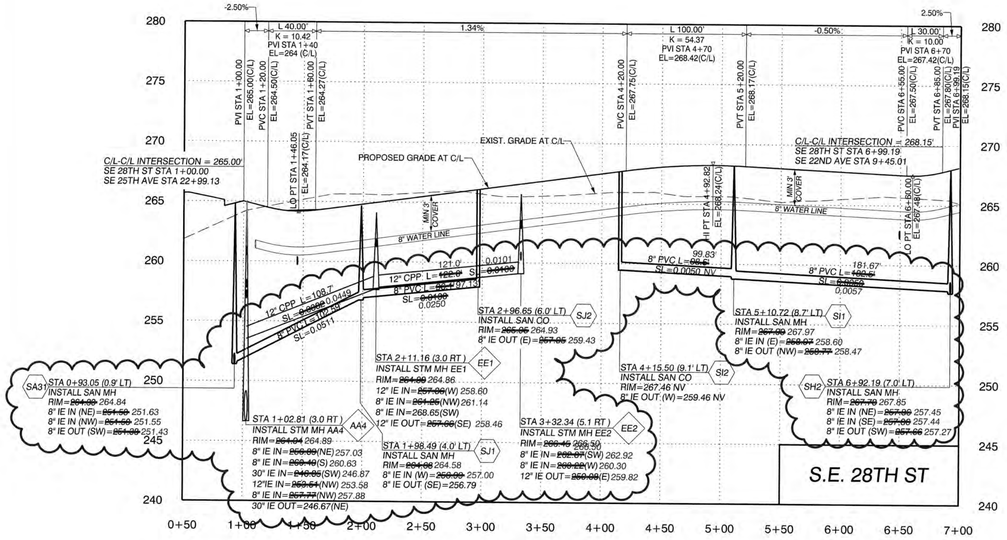
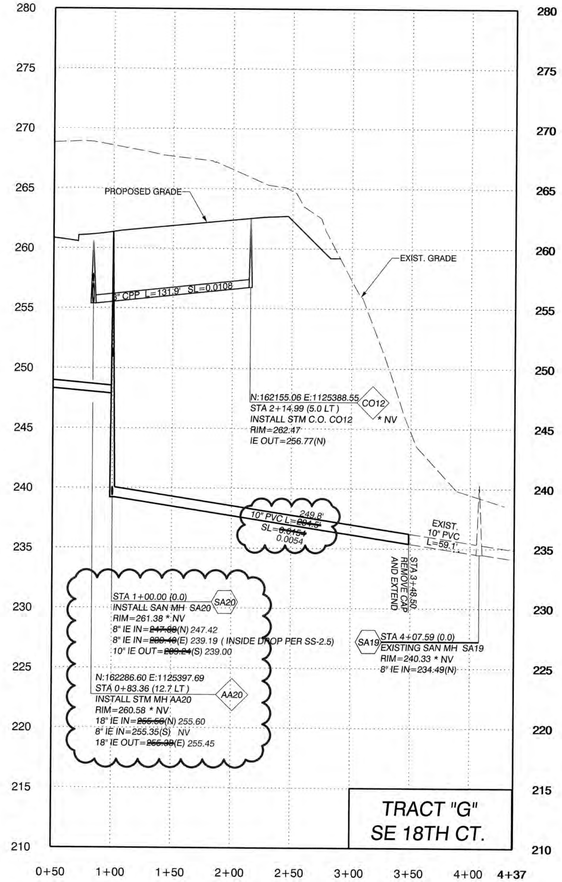
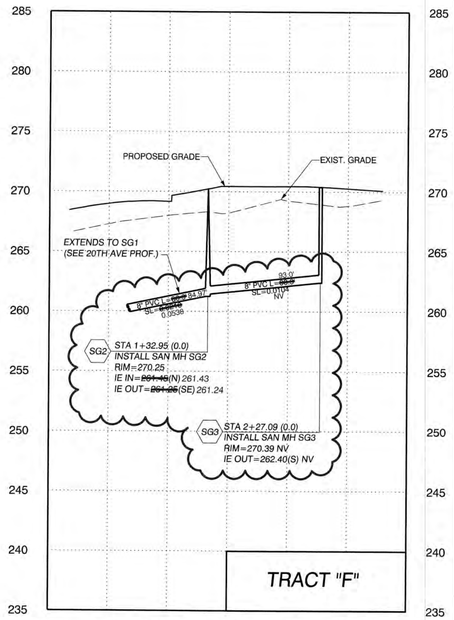
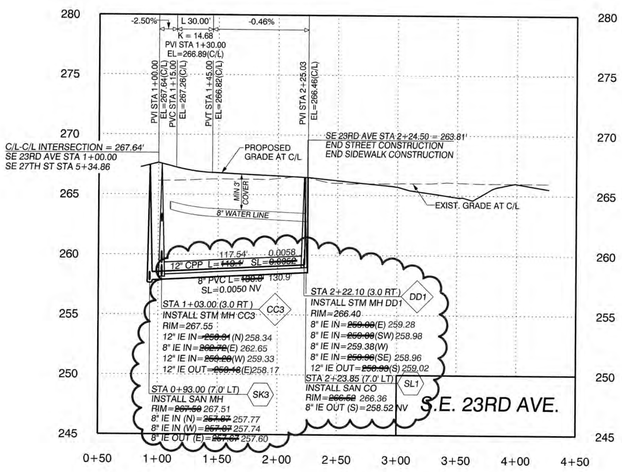
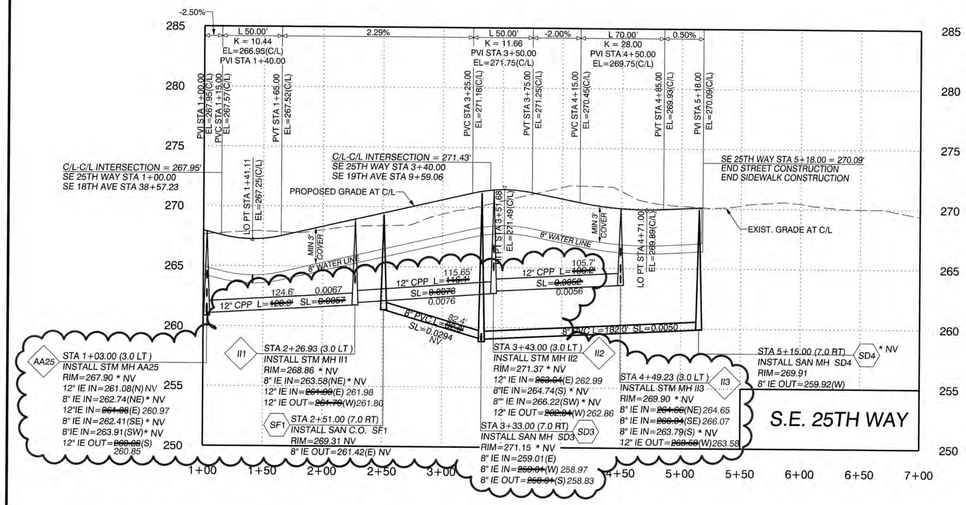
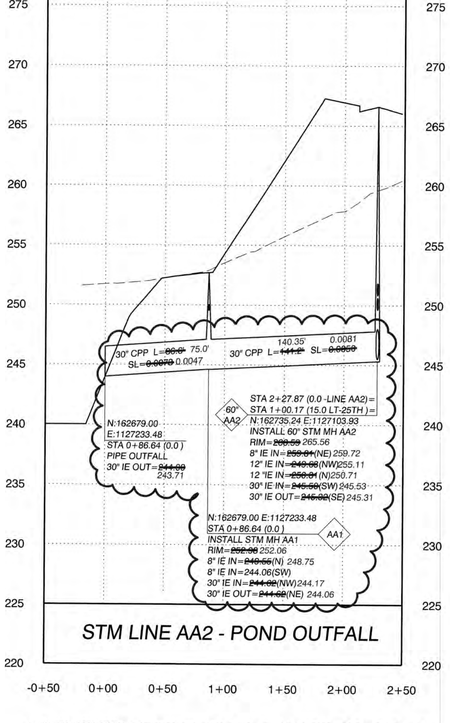












* NV = TO BE INCLUDED IN PHASE 2

PETER A. TUCK
STATE OF WASHINGTON
21911
REGISTERED
PROFESSIONAL ENGINEER
6/29/2020

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY _____ FOR:

A N/A

- ☐ ☒ GRADING
- ☐ ☐ STORM SEWER
- ☒ ☐ SANITARY SEWER
- ☐ ☒ WATER
- ☐ ☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

FINAL RIMS HAVE NOT BEEN SET FOR AA1, AA20, II1-II3, SA19, SA20, SF1, SD3, SD4, SG2 & SG3 THIS WILL BE COMPLETED WITH PHASE 2

AS-BUILT

CLIENT:
RALSTON INVESTMENTS, LLC
1440 SW TAYLOR AVE
PORTLAND, OR 97205
PH: (503) 819-0792
CONTACT: TIM RALSTON
EMAIL: tim@ralstoninvestments.com

PROFILE FOR S.E. 28TH ST., S.E. 23RD AVE. AND S.E. 25TH WAY FOR:

CEDARS LANDING SUBDIVISION

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9936

PETER A. TUCK
STATE OF WASHINGTON
21911
REGISTERED
PROFESSIONAL ENGINEER
6/16/19

CHANGES / REVISIONS

DESCRIPTION:	DATE:
REVISED EE1, EE2 AND AA2	7/31/19

PAT

DESIGNED: CDC/GCO
DRAWN: TAS
CHECKED: PAT
DATE: APRIL 2019
SCALE: H: 1"=60' V: 1"=6'

CEDARS LANDING SUBDIVISION
JOB NO.: 8959.02.01

SHEET
C8.3

J:\data\8000\8900\8950\8959\Engineering\Final\Cedars Landing\Sheets\8959.e.C8.0.profile-sheets.dgn
M:\MicroStation V8\pen tables\HP-5000\profile.tbl

CEDARS VILLAGE

NW 1/4 SECTION 11 & 14, T3N, R2E, W.M.

PROJECT PARCEL NUMBERS: 195019-000, 195101-000, 194329-000

APPLICANT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

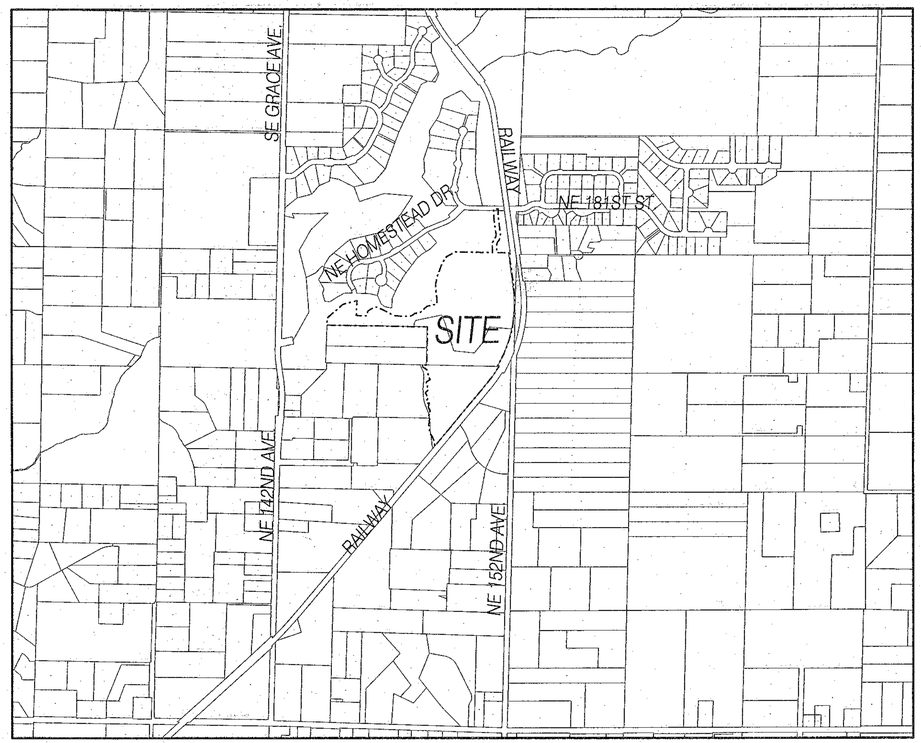
PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

CONTACT:

OLSON ENGINEERING, INC.
222 E. EVERGREEN BLVD.
VANCOUVER, WA 98660
PHONE: (360) 695-1385
FAX: (360) 695-8117
CONTACT: CHRIS WONDERLY
EMAIL: chris@olsonengr.com

THE CONTRACTOR SHALL NOTIFY THE FOLLOWING UTILITY COMPANIES OR DEPARTMENTS A MINIMUM OF 48 HOURS BEFORE CONSTRUCTION

CITY OF BATTLE GROUND	(360) 342-5000
BATTLE GROUND PUBLIC WORKS	(360) 342-5350
BATTLE GROUND POLICE DEPT.	(360) 342-5100
CENTURYTYLINK (KEITH MEISNER)	(360) 699-3720
COMCAST (MICHELLE JANSON-MOE)	(360) 316-1051
CLARK COUNTY FIRE & RESCUE	(360) 892-2331
CLARK PUBLIC UTILITIES (ELECTRIC)	(360) 992-8558
CLARK PUBLIC UTILITIES (WATER)	(360) 992-8022
CLARK REGIONAL WASTEWATER DISTRICT	(360) 993-8810
NW NATURAL GAS	(360) 571-5465
UTILITY LOCATE	(800) 424-5555



VICINITY MAP

NOT TO SCALE

LEGEND

	PERIMETER OF SITE
	RIGHT-OF-WAY LINE
	CENTERLINE OF ROAD
	FACE OF CURB
	LOT LINE
	EASEMENT LINE
STM	STORM SEWER LINE
STM	EXIST STORM SEWER
SAN	SANITARY SEWER LINE
SAN	EXIST SANITARY SEWER
W	WATER SERVICE LINE
W	EXIST WATER LINE
123	GRADED CONTOUR LINE
123	EXIST CONTOUR LINE
MANHOLE	WATER SERVICE METER
WATER VALVE AND BOX	TELEPHONE RISER
FIRE HYDRANT ASSEMBLY	GAS RISER
SANITARY CLEAN OUT	ELECTRIC RISER
CATCH BASIN	UTILITY POLE
THRUST BLOCK	UTILITY POLE W/ LIGHT
	SIGN POST

DATUM

ELEVATIONS FOR THIS SURVEY ARE BASED ON CLARK COUNTY VERTICAL DATUM UTILIZING BENCHMARK 4-2-008, DESCRIBED AS A BRASS CAP IN CONC. CASE LOCATED AT THE INTERSECTION OF 239TH ST. AT 102ND AVE. ELEVATION=279.139.

CITY OF BATTLE GROUND
PUBLIC IMPROVEMENT SUMMARY:

SEWER	PIPE LENGTH	6378 FT
	MANHOLES	39
	CLEANOUT	3
STORM	PIPE LENGTH	
	12" CPP	3877 FT
	18" CPP	330 FT
	24" CPP	1003 FT
	MANHOLES	38
	CATCHBASINS	3
	DITCH INLETS	2
	CURB INLETS	37
	8" CPP	918 FT

NOTE: PIPE LENGTHS GIVEN ARE MAINS ONLY

NOTE:

1) THIS APPROVAL IS BASED ON THE CITY OF BATTLE GROUND'S REQUIREMENTS ONLY. THE DEVELOPER/CONTRACTOR IS RESPONSIBLE FOR ACQUIRING AND COMPLYING WITH ANY NECESSARY STATE AND FEDERAL PERMITS PRIOR TO BEGINNING ANY ON SITE CONSTRUCTION.

2) THE STORMWATER FACILITY WILL BE OWNED AND MAINTAINED BY: PRIVATE OWNED

APPROVED FOR CONSTRUCTION

Mark Hervey 11/3/17
City Engineer Approval Date:

Scott P. Sawyer 11/8/17
Public Works Director Date:

CLARK COUNTY PUBLIC UTILITY DISTRICT
WATER SYSTEM
R.I.D. NO. 521976
APPROVED FOR CONSTRUCTION RAM 9/25/2017
MANAGER DATE

SHEET INDEX:

RECORD DRAWING
Sheets marked "RECORD DRAWING" in this set provide information used during construction, and do not necessarily represent what was constructed on site.
Sheets marked "ASBUILT" include information collected or revised following construction.

RECORD DRAWING

J:\data\8000\8900\8950\8959\Engineering\Final\Cedars Village\Design\8959.e.C1.0.cover.dgn
M:\MicroStation V8\pen tables\OCE table setup\OCE mono_noshade.tbl

CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

COVER SHEET FOR: CEDARS VILLAGE

OLSON ENGINEERING
LAND SURVEYORS
ENGINEERS
ENGINEERING INC.
360-695-1385
360-695-8117
222 E. EVERGREEN, VANCOUVER, WA 98660

CHRIS A. WONDERLY
STATE OF WASHINGTON
92827
REGISTERED
PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO
DRAWN: GCO
CHECKED: CRW
DATE: MAY 2017
SCALE: H: 1"=800' V:

CEDARS VILLAGE
JOB NO.: 8959.02.02

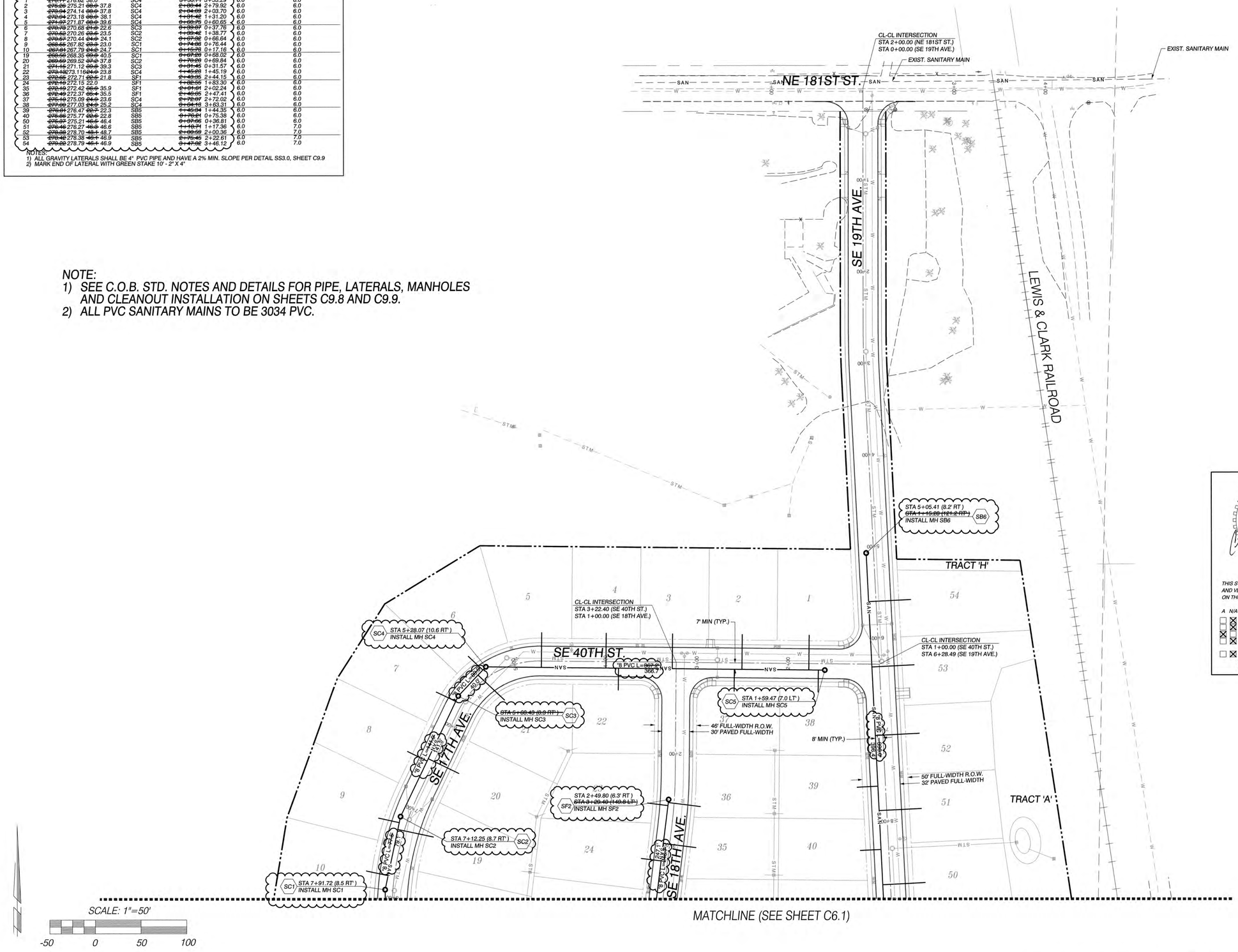
SHEET
C1.0

SANITARY LATERAL TABLE

LOT #	END LAT IE (FT)	LENGTH (FT)	DOWNSTREAM MH	STA. FROM DOWNSTREAM MH	DEPTH @ T/C (FT)	DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)
1	~~270.77~~ 276.62 38.0		SC4	~~0+59.71~~ 3+53.29	6.0	6.0
2	~~275.26~~ 275.21 ~~00.0~~ 37.8		SC4	~~2+00.44~~ 2+79.92	6.0	6.0
3	~~270.04~~ 274.14 ~~00.0~~ 37.8		SC4	~~0+34.09~~ 2+03.70	6.0	6.0
4	~~270.04~~ 273.18 ~~00.0~~ 38.1		SC4	~~1+31.42~~ 1+31.20	6.0	6.0
5	~~271.97~~ 271.87 ~~00.0~~ 39.6		SC4	~~0+60.75~~ 0+60.65	6.0	6.0
6	~~270.70~~ 270.68 ~~21.0~~ 22.6		SC3	~~1+38.07~~ 0+37.76	6.0	6.0
7	~~270.62~~ 270.26 ~~03.5~~ 23.5		SC2	~~1+39.42~~ 1+38.77	6.0	6.0
8	~~270.57~~ 270.44 ~~24.0~~ 24.1		SC2	~~0+57.26~~ 0+66.64	6.0	6.0
9	~~268.55~~ 267.82 ~~03.0~~ 23.0		SC1	~~0+74.95~~ 0+76.44	6.0	6.0
10	~~267.91~~ 267.79 ~~24.0~~ 24.7		SC1	~~0+15.75~~ 0+17.16	6.0	6.0
19	~~268.52~~ 268.35 ~~00.0~~ 40.5		SC1	~~0+57.01~~ 0+58.02	6.0	6.0
20	~~269.59~~ 269.52 ~~37.0~~ 37.8		SC2	~~0+70.20~~ 0+69.84	6.0	6.0
21	~~271.15~~ 271.12 ~~00.0~~ 39.3		SC3	~~0+31.45~~ 0+31.57	6.0	6.0
22	~~274.10~~ 273.11 ~~24.0~~ 23.8		SC4	~~1+45.85~~ 1+45.19	6.0	6.0
23	~~272.65~~ 272.71 ~~22.5~~ 21.8		SF1	~~2+43.95~~ 2+44.15	6.0	6.0
24	~~275.10~~ 275.15 22.0		SF1	~~1+82.55~~ 1+83.30	6.0	6.0
35	~~272.10~~ 272.42 ~~06.0~~ 35.9		SF1	~~2+01.01~~ 2+02.24	6.0	6.0
36	~~272.49~~ 272.37 ~~05.4~~ 35.5		SF1	~~2+46.85~~ 2+47.41	6.0	6.0
37	~~275.10~~ 275.09 ~~24.0~~ 23.6		SC4	~~2+75.97~~ 2+72.02	6.0	6.0
38	~~277.00~~ 277.03 ~~24.0~~ 25.2		SC4	~~0+04.16~~ 3+63.31	6.0	6.0
39	~~276.91~~ 276.47 ~~22.5~~ 22.3		SB5	~~1+75.44~~ 1+44.36	6.0	6.0
40	~~275.98~~ 275.77 ~~25.0~~ 22.8		SB5	~~0+76.21~~ 0+75.38	6.0	6.0
50	~~276.37~~ 275.21 ~~46.5~~ 46.4		SB5	~~0+37.66~~ 0+36.81	6.0	6.0
51	~~276.46~~ 276.27 ~~46.0~~ 46.6		SB5	~~1+19.71~~ 1+17.36	6.0	7.0
52	~~278.88~~ 278.70 ~~48.1~~ 48.7		SB5	~~2+00.59~~ 2+00.36	6.0	7.0
53	~~278.42~~ 278.38 ~~46.1~~ 46.9		SB5	~~2+75.46~~ 2+22.61	6.0	7.0
54	~~278.28~~ 278.79 ~~46.1~~ 46.9		SB5	~~0+47.82~~ 3+46.12	6.0	7.0

NOTES:
1) ALL GRAVITY LATERALS SHALL BE 4" PVC PIPE AND HAVE A 2% MIN. SLOPE PER DETAIL SS3.0, SHEET C9.9
2) MARK END OF LATERAL WITH GREEN STAKE 10' - 2" X 4"

NOTE:
1) SEE C.O.B. STD. NOTES AND DETAILS FOR PIPE, LATERALS, MANHOLES AND CLEANOUT INSTALLATION ON SHEETS C9.8 AND C9.9.
2) ALL PVC SANITARY MAINS TO BE 3034 PVC.



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CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

SANITARY SEWER PLAN (NORTH) FOR:

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9386

CHRIS R. WONDRA
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY ( ) FOR:

A N/A
- [ ] [X] GRADING
- [ ] [X] STORM SEWER
- [X] [ ] SANITARY SEWER
- [ ] [X] WATER

[ ] [X] LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CHRIS R. WONDRA
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO

DRAWN: GCO

CHECKED: CRW

DATE: MAY 2017

SCALE: H: 1"=50'
V:

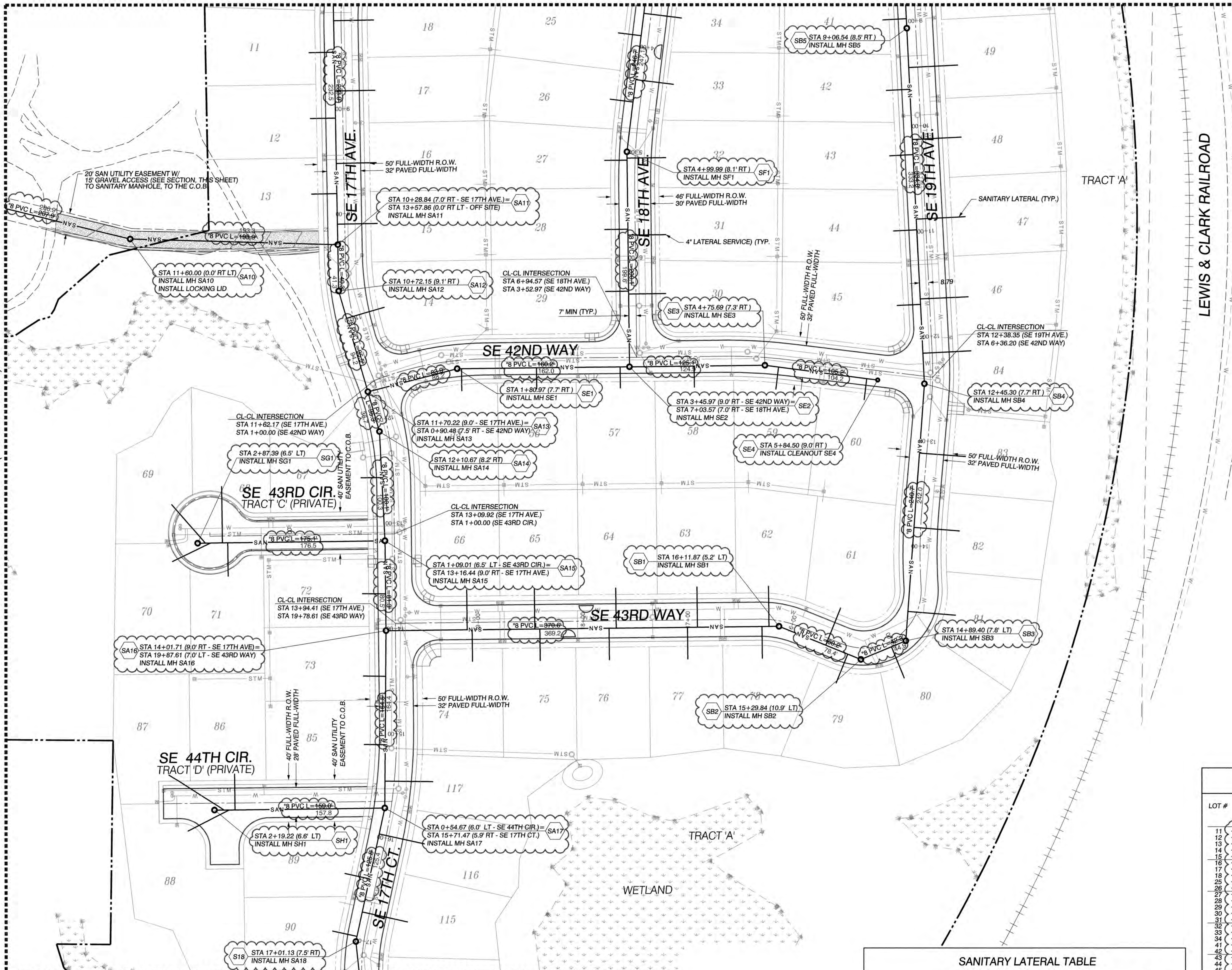
CEDARS VILLAGE

JOB NO.: 8959.02.02

SHEET

C6.0

MATCHLINE (SEE SHEET C6.0)



MATCHLINE (SEE SHEET C6.2)

NOTE:
1) SEE C.O.B. STD. NOTES AND DETAILS FOR PIPE, LATERALS, MANHOLES AND CLEANOUT INSTALLATION ON SHEETS C9.8 AND C9.9.
2) ALL PVC SANITARY MAINS TO BE 3034 PVC.

SCALE: 1"=50'

-50 0 50 100

12" GRAVEL
GEOTEXTILE FABRIC
COMPACTED SUBGRADE (95% OF MAX. DRY DENSITY PER STANDARD PROCTOR TEST)

GRAVEL ACCESS

SANITARY LATERAL TABLE

LOT #	END LAT IE (FT)	LENGTH (FT)	DOWN-STREAM MH	STA. FROM DOWN-STREAM MH	DEPTH @ T/C (FT)	DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)
73	~~271.99~~ 272.10	~~21.2~~ 22.6	SA16	~~0+43.32~~ 0+41.86	6.0	6.0
74	~~270.54~~ 270.21	~~30.0~~ 30.4	SA16	~~0+82.14~~ 0+80.88	6.0	6.0
75	~~271.64~~ 271.61	~~30.0~~ 30.6	SA16	~~1+46.62~~ 1+44.83	6.0	6.0
76	~~272.76~~ 272.51	~~30.0~~ 30.8	SA16	~~2+12.56~~ 2+11.26	6.0	6.0
77	~~274.03~~ 273.32	30.0	SA16	~~2+87.30~~ 2+86.60	6.0	6.0
78	~~275.24~~ 275.50	~~30.0~~ 31.3	SA16	~~3+58.38~~ 3+57.51	6.0	6.0
79	~~276.64~~ 276.34	~~29.6~~ 31.1	SB1	~~0+70.67~~ 0+70.83	6.0	6.0
80	~~276.97~~ 276.24	~~32.0~~ 34.2	SB2	~~0+31.50~~ 0+31.17	6.0	6.0
81	~~277.08~~ 276.98	~~45.4~~ 45.2	SB3	~~0+27.92~~ 0+27.07	6.0	5.1
82	~~276.75~~ 276.51	~~43.3~~ 43.4	SB3	~~1+07.89~~ 1+06.50	6.0	6.0
83	~~276.33~~ 275.99	~~44.0~~ 44.9	SB3	~~1+78.71~~ 1+78.10	6.0	6.0
84	~~276.09~~ 276.08	~~45.3~~ 45.8	SB4	~~0+29.10~~ 0+27.25	6.0	6.0
85	~~273.23~~ 273.08	~~20.0~~ 21.0	SA16	~~1+08.24~~ 1+07.95	6.0	6.0
86	~~277.50~~ 273.20	~~34.1~~ 35.2	SA17	~~1+42.74~~ 1+42.18	6.0	6.0
87	~~277.87~~ 274.23	~~62.4~~ 63.2	SA17	~~1+53.26~~ 1+53.69	6.0	10.9
88	~~277.50~~ 273.43	~~44.0~~ 43.6	SA17	~~1+48.27~~ 1+47.83	6.0	N/A
89	~~275.68~~ 275.76	~~24.0~~ 24.3	SA17	~~0+68.81~~ 0+68.69	6.0	6.0
90	~~276.79~~ 276.49	~~23.8~~ 24.1	SA17	~~1+24.67~~ 1+24.18	6.0	6.0
115	~~276.22~~ 276.22	~~44.0~~ 44.5	SA17	~~1+00.96~~ 0+99.99	6.0	6.0
116	~~274.71~~ 274.77	~~43.9~~ 44.4	SA17	~~0+25.15~~ 0+24.95	6.0	6.0
117	~~273.71~~ 274.56	~~45.5~~ 46.8	SA16	~~1+42.06~~ 1+42.48	6.0	6.0

SANITARY LATERAL TABLE

LOT #	END LAT IE (FT)	LENGTH (FT)	DOWN-STREAM MH	STA. FROM DOWN-STREAM MH	DEPTH @ T/C (FT)	DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)
11	~~266.89~~ 266.88	~~24.0~~ 23.9	SA11	~~1+82.82~~ 1+78.92	6.0	6.0
12	~~266.04~~ 266.01	24.0	SA11	~~1+20.31~~ 1+19.99	6.0	6.0
13	~~265.17~~ 265.00	~~24.0~~ 22.9	SA11	~~0+48.39~~ 0+48.03	5.9	6.0
14	~~264.94~~ 264.79	~~37.3~~ 33.4	SA12	~~0+26.00~~ 0+25.77	6.0	6.0
15	~~265.19~~ 265.01	~~38.0~~ 38.4	SA11	~~0+19.49~~ 0+19.75	5.5	6.0
16	~~265.70~~ 265.34	~~38.0~~ 32.6	SA11	~~0+77.11~~ 0+75.75	5.6	6.0
17	~~266.29~~ 266.19	~~38.0~~ 39.0	SA11	~~1+46.00~~ 1+46.29	6.0	6.0
18	~~267.20~~ 267.23	38.0	SA11	~~2+12.62~~ 2+12.51	6.0	6.0
25	~~271.82~~ 271.88	~~22.0~~ 21.9	SF1	~~1+11.30~~ 1+11.92	6.0	6.0
26	~~271.50~~ 271.48	~~22.0~~ 21.5	SF1	~~0+47.79~~ 0+48.30	6.0	6.0
27	~~271.28~~ 270.64	~~21.3~~ 20.9	SE2	~~1+96.25~~ 1+96.17	6.0	6.0
28	~~270.90~~ 270.66	~~22.0~~ 22.4	SE2	~~1+30.72~~ 1+31.32	6.0	6.0
29	~~270.61~~ 270.45	~~22.0~~ 21.9	SE2	~~0+71.80~~ 0+72.34	6.0	6.0
30	~~270.59~~ 270.56	~~35.3~~ 35.6	SE2	~~0+69.11~~ 0+68.96	6.0	5.3
31	~~270.87~~ 270.74	~~36.0~~ 37.8	SE2	~~1+25.18~~ 1+24.91	6.0	6.0
32	~~271.25~~ 271.32	~~36.8~~ 37.7	SE2	~~1+98.21~~ 1+97.77	6.0	6.0
33	~~271.61~~ 271.73	~~36.0~~ 36.5	SF1	~~0+69.15~~ 0+70.05	6.0	6.0
34	~~271.98~~ 271.89	~~36.0~~ 35.9	SF1	~~1+32.61~~ 1+33.04	6.0	6.0
41	~~275.10~~ 275.05	~~22.5~~ 22.7	SB5	~~0+09.09~~ 0+08.49	6.0	6.0
42	~~274.71~~ 274.50	~~22.5~~ 23.3	SB4	~~2+80.00~~ 2+78.47	6.0	6.0
43	~~274.75~~ 274.44	~~22.4~~ 22.2	SB4	~~2+17.79~~ 2+16.23	6.0	6.0
44	~~275.14~~ 275.03	~~22.3~~ 22.4	SB4	~~1+46.42~~ 1+45.41	6.0	6.0
45	~~275.56~~ 274.98	~~22.2~~ 22.4	SB4	~~0+75.34~~ 0+73.48	6.0	6.0
46	~~275.48~~ 275.43	~~45.8~~ 46.9	SB4	~~0+80.66~~ 0+79.51	6.0	6.0
47	~~274.98~~ 274.92	46.7	SB4	~~1+56.60~~ 1+54.50	6.0	7.0
48	~~274.61~~ 275.05	~~46.6~~ 46.7	SB4	~~2+32.14~~ 2+30.19	6.0	7.0
49	~~274.60~~ 274.56	~~46.5~~ 46.3	SB4	~~3+00.68~~ 2+98.17	6.0	7.0
55	~~266.25~~ 263.18	~~21.0~~ 20.9	SE1	~~0+04.17~~ 0+02.98	5.6	6.0
56	~~267.82~~ 267.88	~~20.0~~ 20.1	SE1	~~0+75.68~~ 0+75.07	6.0	6.0
57	~~270.88~~ 271.03	~~20.0~~ 20.2	SE1	~~1+55.28~~ 1+54.26	6.0	6.0
58	~~272.03~~ 271.92	~~20.0~~ 20.1	SE2	~~0+61.63~~ 0+61.52	6.0	6.0
59	~~272.85~~ 272.85	~~20.1~~ 21.6	SE3	~~0+13.00~~ 0+12.73	6.0	6.0
60	~~274.30~~ 274.32	~~20.0~~ 21.0	SE3	~~0+97.96~~ 0+97.59	6.0	6.0
61	~~276.19~~ 276.09	~~38.0~~ 38.3	SB1	~~0+48.07~~ 0+48.13	6.0	6.0
62	~~275.16~~ 275.40	~~38.0~~ 39.1	SA16	~~3+65.02~~ 3+64.20	6.0	6.0
63	~~274.04~~ 273.79	~~38.0~~ 38.3	SA16	~~2+96.83~~ 2+96.59	6.0	6.0
64	~~272.73~~ 272.40	~~38.0~~ 44.1	SA16	~~2+19.37~~ 2+18.90	6.0	6.0
65	~~271.42~~ 271.00	~~38.0~~ 39.1	SA16	~~1+41.91~~ 1+41.03	6.0	6.0
66	~~270.32~~ 272.10	~~38.0~~ 39.1	SA16	~~0+77.35~~ 0+76.02	6.0	6.0
67	~~268.08~~ 288.01	19.8	SA14	~~0+43.81~~ 0+41.77	6.0	6.0
68	~~269.04~~ 268.66	~~53.4~~ 53.9	SA15	~~1+54.94~~ 1+54.98	4.9	6.3
69	~~269.01~~ 268.89	~~48.7~~ 50.1	SA15	~~1+70.97~~ 1+69.39	5.0	6.2
70	~~268.82~~ 268.32	~~40.1~~ 39.0	SA15	~~1+66.26~~ 1+67.77	5.2	6.2
71	~~268.56~~ 268.60	~~31.7~~ 31.7	SA15	~~1+49.88~~ 1+49.88	2.3	6.6
72	~~270.24~~ 270.28	~~22.0~~ 23.2	SA15	~~0+50.21~~ 0+48.39	6.0	6.0

NOTES:
1) ALL GRAVITY LATERALS SHALL BE 4" PVC PIPE AND HAVE A 2% MIN. SLOPE PER DETAIL SS3.0, SHEET C9.9
2) MARK END OF LATERAL WITH GREEN STAKE 10' - 2" X 4"

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M:\MicroStation V8\pen tables\OCE table setup\OCE sanitary.tbl

CLIENT:

TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

SANITARY SEWER PLAN (MIDDLE) FOR:

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9936

CHRIS R. WONDERLY
STATE OF WASHINGTON
32827
REGISTERED PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY (cloud) FOR:

A	N/A	
☐	☒	GRADING
☐	☒	STORM SEWER
☒	☐	SANITARY SEWER
☐	☒	WATER
☐	☒	LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CHRIS R. WONDERLY
STATE OF WASHINGTON
32827
REGISTERED PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO

DRAWN: GCO

CHECKED: CRW

DATE: MAY 2017

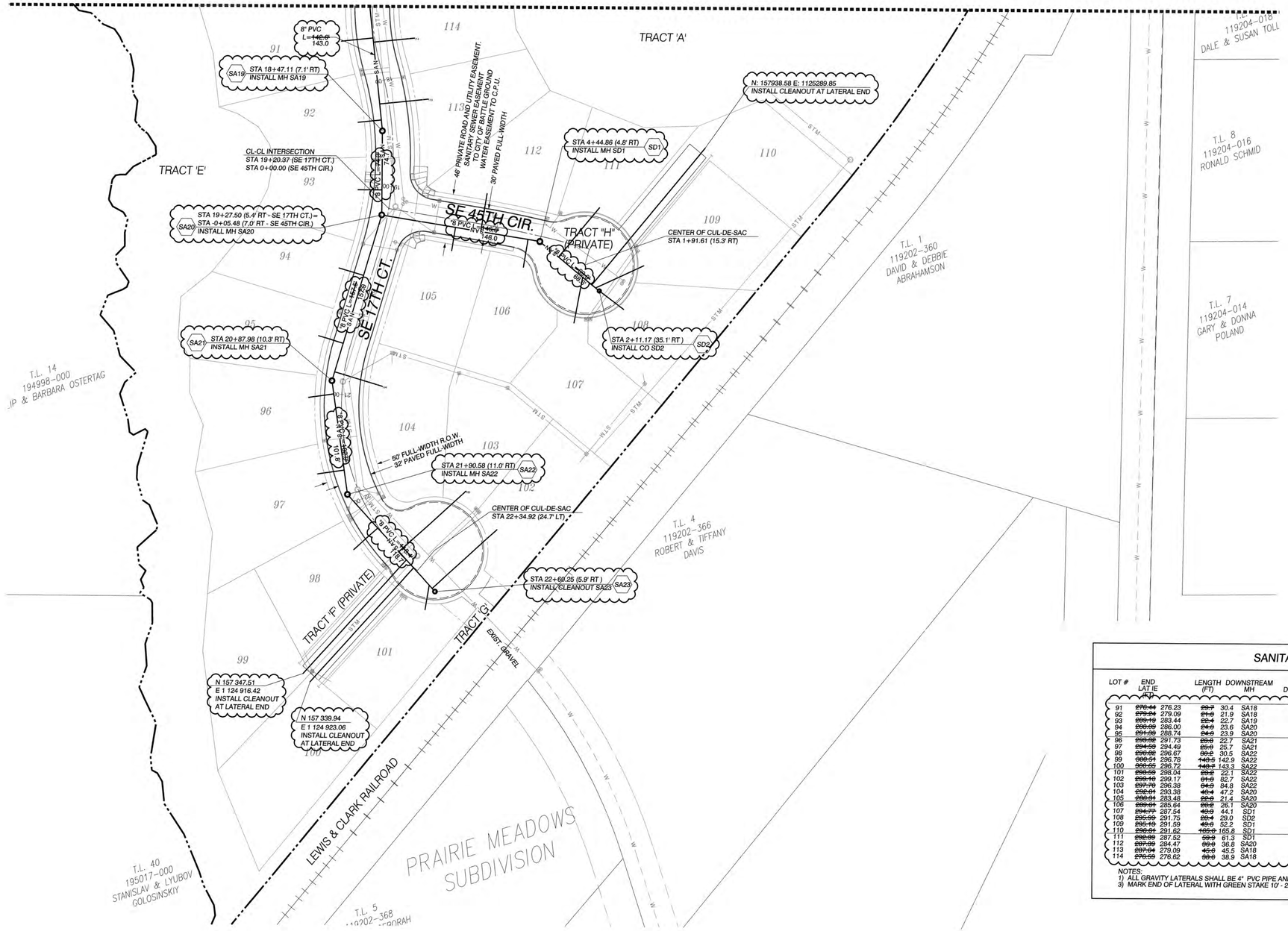
SCALE: H: 1"=50' V:

CEDARS VILLAGE

JOB NO.: 8959.02.02

SHEET

C6.1



SANITARY LATERAL TABLE

LOT #	END LAT IE (FT)	LENGTH (FT)	DOWNSTREAM MH	STA. FROM DOWNSTREAM MH	DEPTH @ T/C (FT)	DISTANCE FROM BACK OF SIDEWALK TO LAT END (FT)
91	~~270.44~~ 276.23	~~29.7~~ 30.4	SA18	~~0+59.50~~ 0+59.93	5.2	6.0
92	~~279.24~~ 279.09	~~21.0~~ 21.9	SA18	~~1+36.94~~ 1+36.87	6.0	6.0
93	~~283.19~~ 283.44	~~22.1~~ 22.7	SA19	~~0+54.39~~ 0+54.27	6.0	6.0
94	~~286.09~~ 286.00	~~24.8~~ 23.6	SA20	~~0+59.90~~ 0+58.92	6.0	6.0
95	~~291.39~~ 288.74	~~24.0~~ 23.9	SA20	~~1+24.91~~ 1+24.53	6.0	6.0
96	~~290.82~~ 291.73	~~23.0~~ 22.7	SA21	~~0+12.07~~ 0+11.84	6.0	6.1
97	~~294.59~~ 294.49	~~25.9~~ 25.7	SA21	~~0+84.11~~ 0+83.56	6.0	6.1
98	~~296.82~~ 296.67	~~30.2~~ 30.5	SA22	~~0+42.19~~ 0+44.11	6.0	6.0
99	~~300.51~~ 296.78	~~140.5~~ 142.9	SA22	~~0+82.26~~ 0+82.01	6.0	5.1
100	~~300.55~~ 296.72	~~140.7~~ 143.3	SA22	~~0+92.01~~ 0+92.51	6.0	6.2
101	~~299.59~~ 298.04	~~29.2~~ 22.1	SA22	~~1+13.99~~ 1+14.95	6.0	6.0
102	~~299.16~~ 299.17	~~81.8~~ 82.7	SA22	~~1+16.06~~ 1+15.59	6.0	3.6
103	~~297.79~~ 296.38	~~84.0~~ 84.8	SA22	~~0+71.99~~ 0+71.56	6.0	4.7
104	~~292.01~~ 293.38	~~46.1~~ 47.2	SA20	~~1+52.99~~ 1+52.93	6.0	6.0
105	~~289.01~~ 283.48	~~29.0~~ 21.4	SA20	~~0+69.99~~ 0+69.85	6.0	6.0
106	~~289.01~~ 285.64	~~29.2~~ 26.1	SA20	~~1+39.70~~ 1+39.61	6.0	6.8
107	~~294.77~~ 287.54	~~40.9~~ 44.1	SD1	~~0+52.11~~ 0+51.48	6.0	5.4
108	~~295.59~~ 291.75	~~29.4~~ 29.0	SD2	~~0+00.00~~ 0+00.00	6.0	6.0
109	~~295.10~~ 291.59	~~49.0~~ 52.2	SD1	~~0+67.77~~ 0+65.26	6.0	6.0
110	~~292.01~~ 291.62	~~165.0~~ 165.8	SD1	~~0+62.16~~ 0+61.01	6.0	6.0
111	~~292.09~~ 287.52	~~59.0~~ 61.3	SD1	~~0+22.00~~ 0+21.81	6.0	5.4
112	~~287.99~~ 284.47	~~39.0~~ 36.8	SA20	~~0+39.91~~ 0+94.23	6.0	6.0
113	~~287.04~~ 279.09	~~45.0~~ 45.5	SA18	~~1+21.95~~ 1+21.65	6.0	4.5
114	~~276.59~~ 276.62	~~39.0~~ 38.9	SA18	~~0+63.45~~ 0+63.14	5.4	5.0

NOTES:
1) ALL GRAVITY LATERALS SHALL BE 4" PVC PIPE AND HAVE A 2% MIN. SLOPE PER DETAIL SS3.0, SHEET C9.9
3) MARK END OF LATERAL WITH GREEN STAKE 10' - 2" X 4"

NOTE:
1) SEE C.O.B. STD. NOTES AND DETAILS FOR PIPE, LATERALS, MANHOLES AND CLEANOUT INSTALLATION ON SHEETS C9.8 AND C9.9.
2) ALL PVC SANITARY MAINS TO BE 3034 PVC.

SCALE: 1"=50'

-50 0 50 100

CHRIS R. WONDRA — STATE OF WASHINGTON — 32827 — REGISTERED PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY ( ) FOR:

A N/A
- [X] [X] GRADING
- [X] [X] STORM SEWER
- [X] [ ] SANITARY SEWER
- [X] [X] WATER

[ ] [X] LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CHRIS R. WONDRA — STATE OF WASHINGTON — 32827 — REGISTERED PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO
DRAWN: GCO
CHECKED: CRW
DATE: MAY 2017
SCALE: H: 1"=50' V:

CEDARS VILLAGE
JOB NO.: 8959.02.02

SHEET
C6.2

CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205
PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

SANITARY SEWER PLAN (SOUTH) FOR:
CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.893.6686

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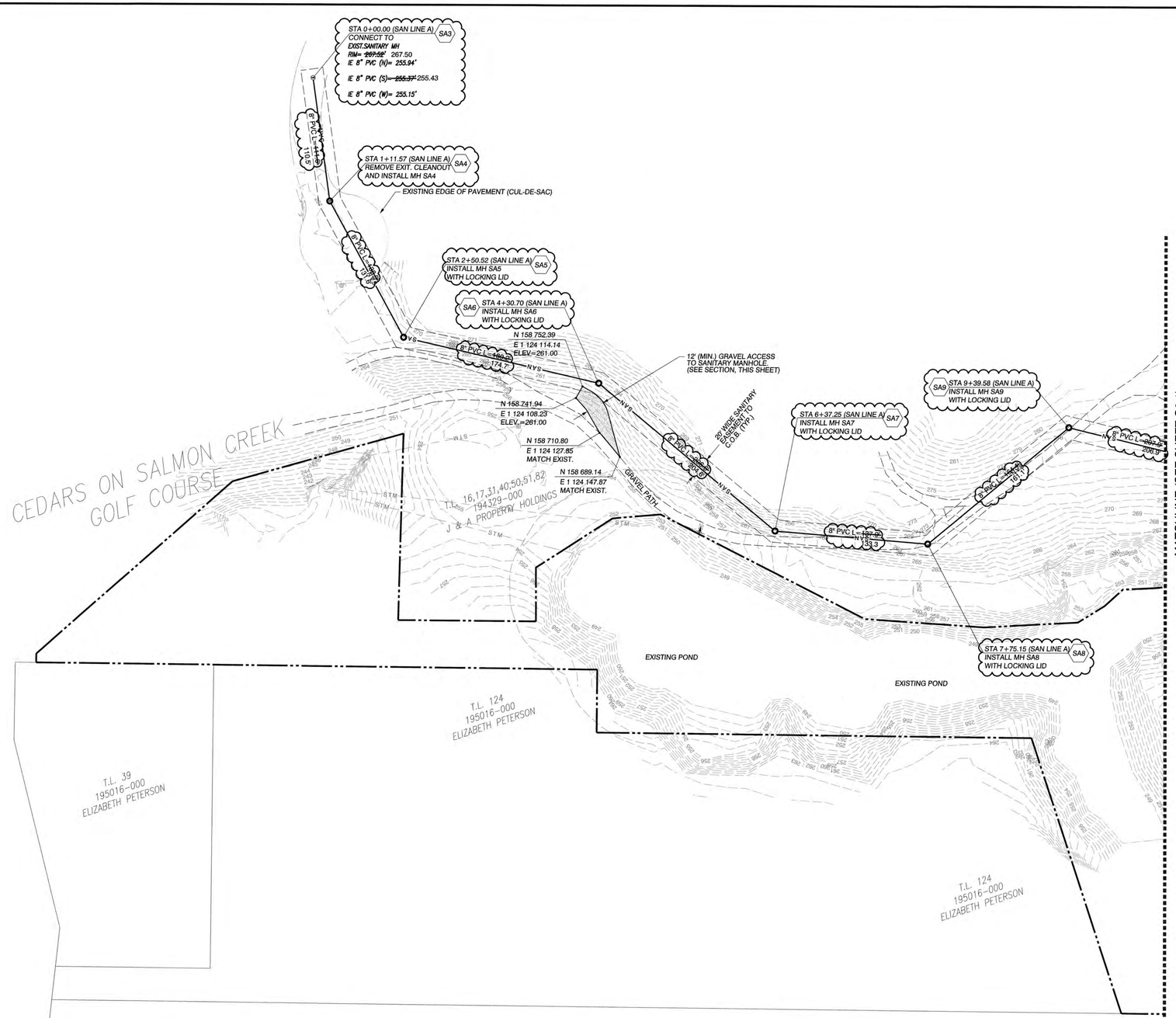

GRAVEL ACCESS

NOTE:
1) SEE C.O.B. STD. NOTES AND DETAILS FOR PIPE, LATERALS, MANHOLES AND CLEANOUT INSTALLATION ON SHEETS C9.8 AND C9.9.
2) ALL PVC SANITARY MAINS TO BE 3034 PVC.

CHRIS R. WONDERLY STATE OF WASHINGTON 32827 REGISTERED PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY. BY ( ) FOR:

A N/A
- ☐ ☒ GRADING
- ☐ ☒ STORM SEWER
- ☒ ☐ SANITARY SEWER
- ☐ ☒ WATER

☐ ☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

SCALE: 1"=50'

-50 0 50 100

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CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205
PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

SANITARY SEWER PLAN (WEST) FOR:

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.699.6606

CHRIS R. WONDERLY STATE OF WASHINGTON 32827 REGISTERED PROFESSIONAL ENGINEER
9/26/17

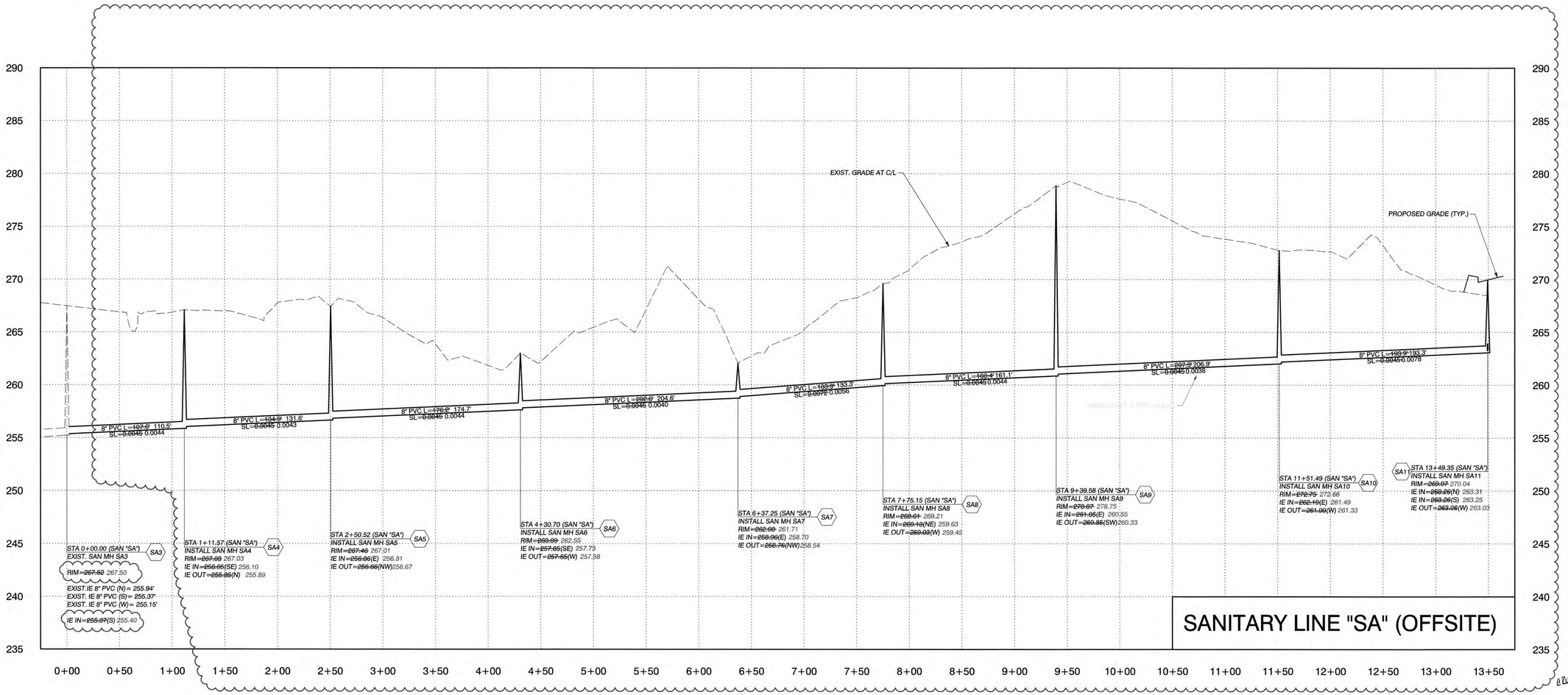
CHANGES / REVISIONS

DESCRIPTION:	DATE:
ADD EXIST. IE'S TO SA3	1/25/2018

DESIGNED: GCO
DRAWN: GCO
CHECKED: CRW
DATE: MAY 2017
SCALE: H: 1"=50' V:

CEDARS VILLAGE
JOB NO.: 8959.02.02

SHEET
C6.3



SANITARY LINE "SA" (OFFSITE)

NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

CHRIS R. WONDERLY — STATE OF WASHINGTON — 32827 — REGISTERED PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY FOR:

A N/A

- [ ] [X] GRADING
- [ ] [X] STORM SEWER
- [X] [ ] SANITARY SEWER
- [X] [X] WATER

- [ ] [X] LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

SCALE: 1"=50'

-50 0 50 100

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CLIENT:

TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

PROFILES OF OFFSITE SANITARY LINE "SA" SHEET FOR:

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9696

CHRIS R. WONDERLY — STATE OF WASHINGTON — 32827 — REGISTERED PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:
REVISE IE'S FOR SA5 - SA9	1/25/2018

DESIGNED: GCO

DRAWN: GCO

CHECKED: CRW

DATE: MAY 2017

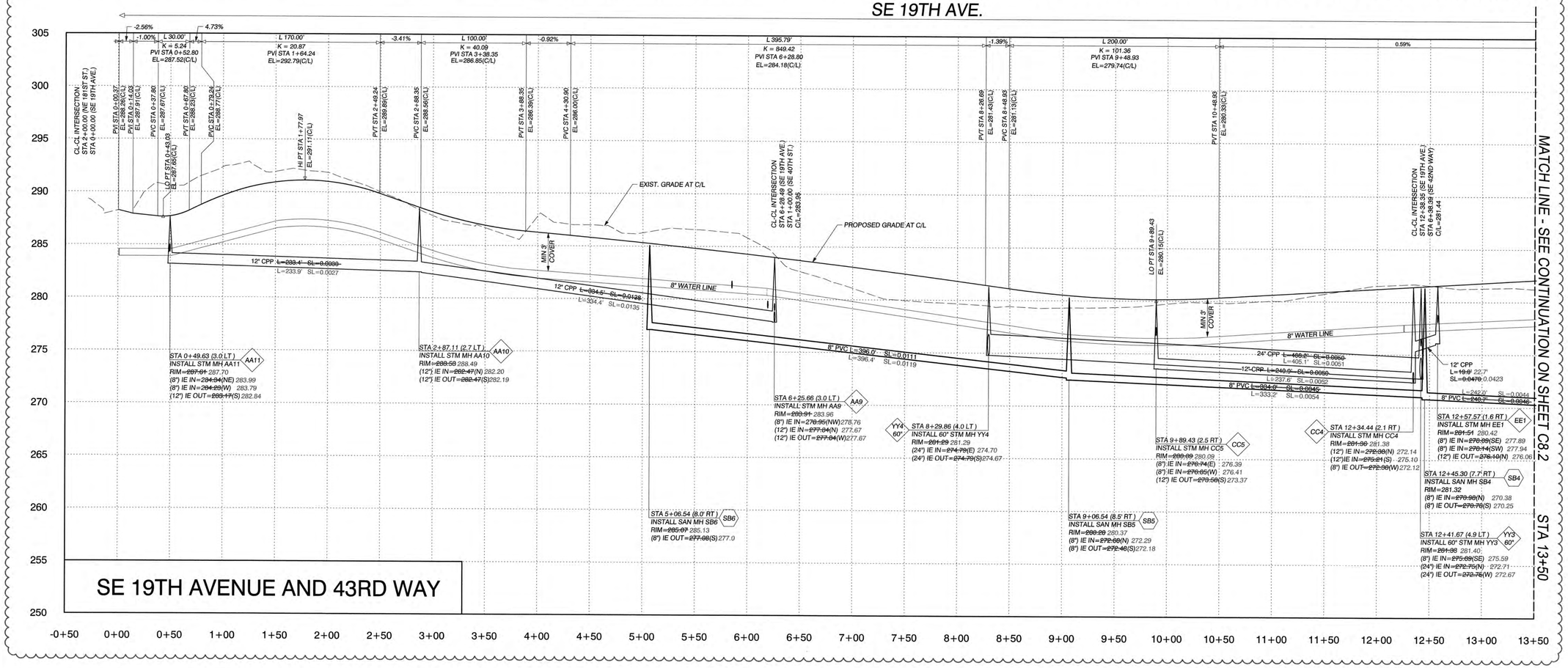
SCALE: H: 1"=50'
V: 1"=5'

CEDARS VILLAGE

JOB NO.: 8959.02.02

SHEET

C8.0



MATCHLINE - SEE CONTINUATION ON SHEET C8.2

NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

SCALE: 1"=50'

-50 0 50 100

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CHRIS R. WONDRA
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY _____ FOR:

- A N/A
- [X] [X] GRADING
- [X] [ ] STORM SEWER
- [X] [ ] SANITARY SEWER
- [ ] [X] WATER

[X] [ ] LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

PROFILE FOR SE 19TH AVE AND 43RD WAY(SHEET 1) FOR:

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9939

CHRIS R. WONDRA
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO

DRAWN: GCO

CHECKED: CRW

DATE: MAY 2017

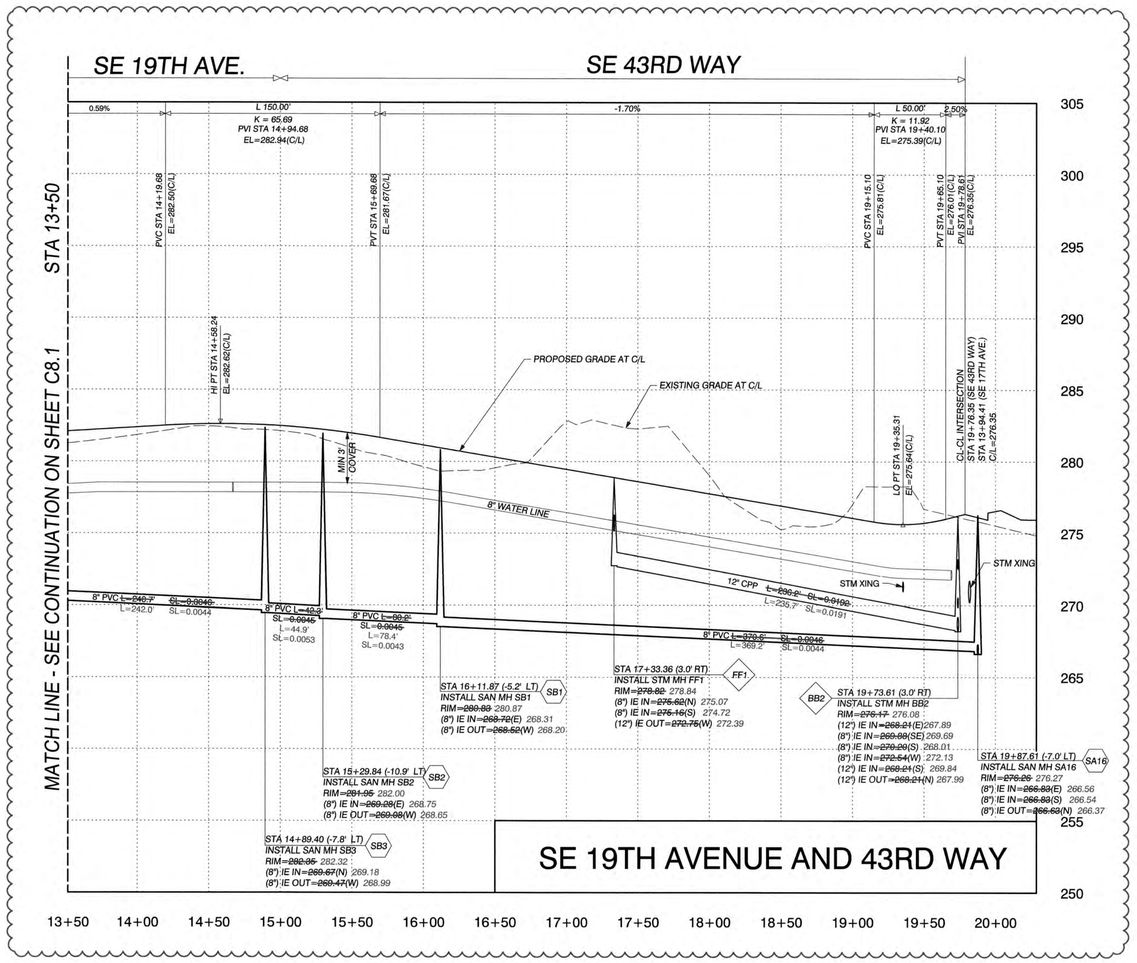
SCALE: H: 1"=50'
V: 1"=5'

CEDARS VILLAGE

JOB NO.: 8959.02.02

SHEET

C8.1



NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

SCALE: 1"=50'

-50 0 50 100

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CHRIS R. WONDERS
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY _____ FOR:

A N/A
☒ ☒ GRADING
☒ ☐ STORM SEWER
☐ ☐ SANITARY SEWER
☒ ☒ WATER

☒ ☐ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CLIENT:

TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

PROFILE FOR SE 19TH AVE AND 43RD WAY(SHEET 2) FOR: AS-BUILT

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9836

CHRIS R. WONDERS
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
9/26/17

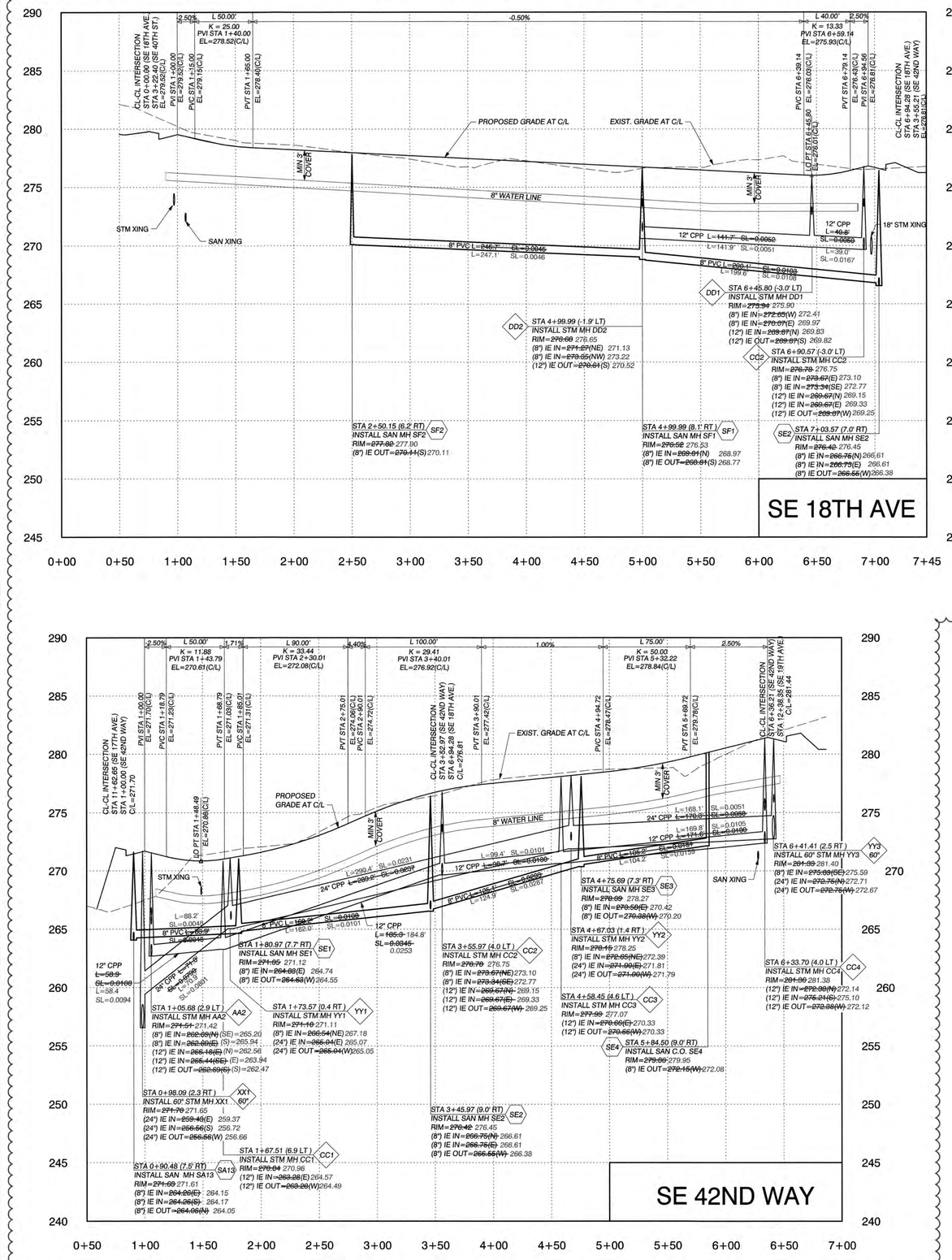
CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO
DRAWN: GCO
CHECKED: CRW
DATE: MAY 2017
SCALE: H: 1"=50'
V: 1"=5'

CEDARS VILLAGE
JOB NO.: 8959.02.02

SHEET
C8.2



NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

CHRIS R. WONDERLY STATE OF WASHINGTON 32827 REGISTERED PROFESSIONAL ENGINEER

11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY: FOR:

A N/A

- GRADING
- STORM SEWER
- SANITARY SEWER
- WATER

LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

SCALE: 1"=50'

-50 0 50 100

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CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205
PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

AS-BUILT

PROFILES FOR SE 18TH AVE. AND SE 42ND WAY FOR:

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9498

CHRIS R. WONDERLY STATE OF WASHINGTON 32827 REGISTERED PROFESSIONAL ENGINEER

9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO

DRAWN: GCO

CHECKED: CRW

DATE: MAY 2017

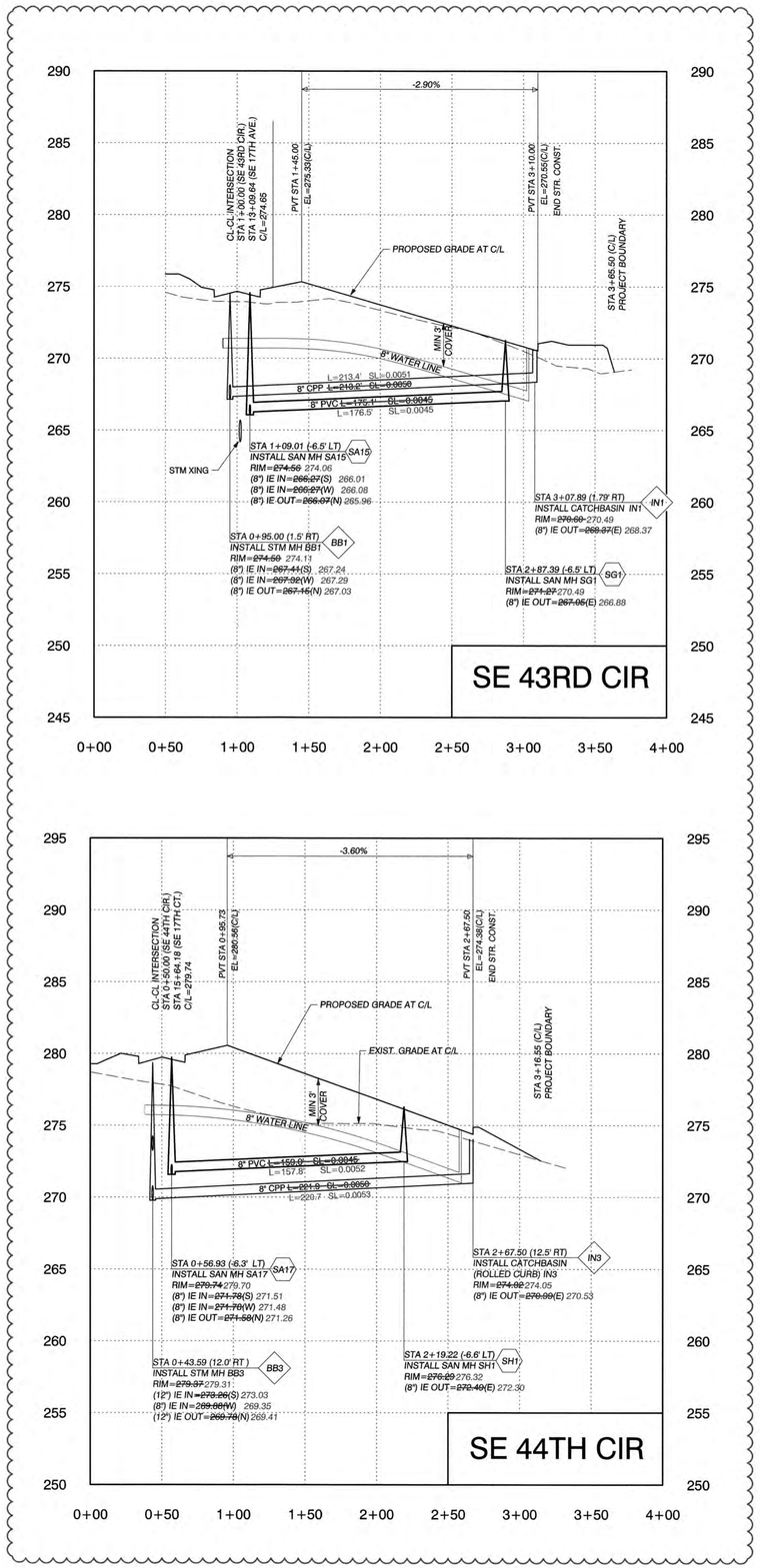
SCALE: H: 1"=50' V: 1"=5'

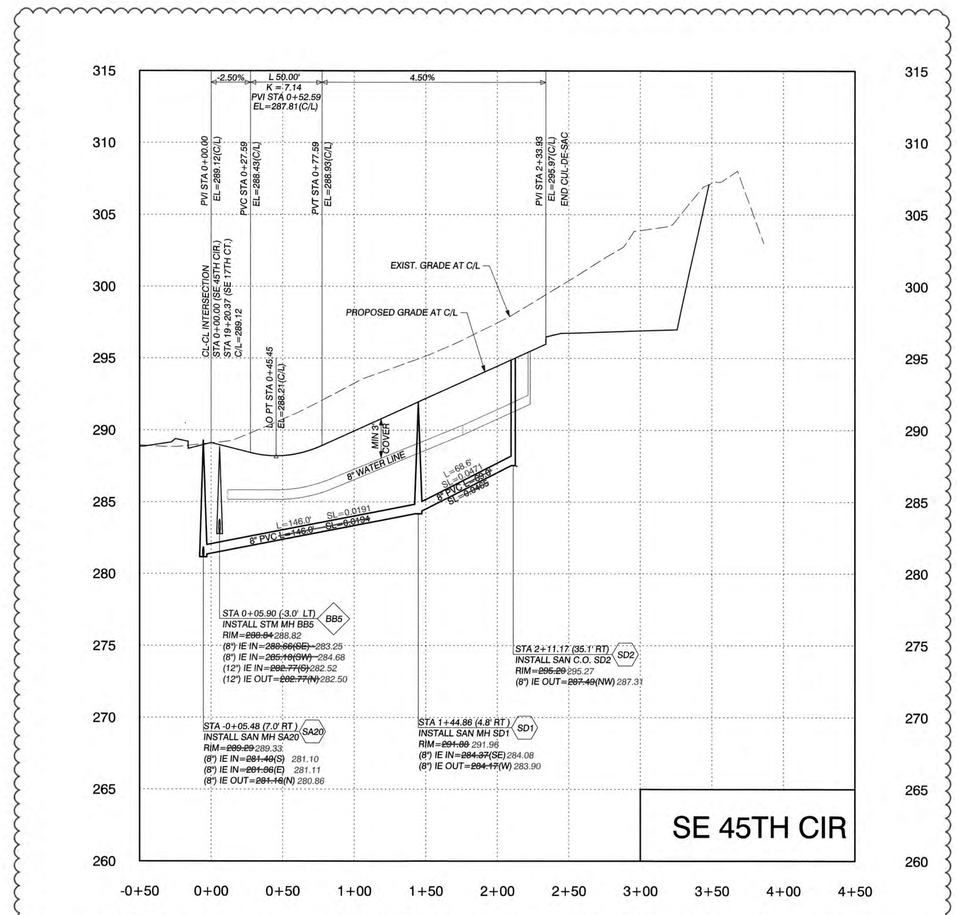
CEDARS VILLAGE

JOB NO.: 8959.02.02

SHEET

C8.3





NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

SCALE: 1"=50'

-50 0 50 100

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CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205
PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

PROFILES FOR SE 43RD CIR., SE 44TH CIR., AND SE 45TH CIR. FOR: AS-BUILT

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.399.4936

CHRIS R. WONDERLY
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY: FOR:

A N/A

- ☐ ☒ GRADING
- ☒ ☐ STORM SEWER
- ☒ ☐ SANITARY SEWER
- ☐ ☒ WATER
- ☒ ☐ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CHRIS R. WONDERLY
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
9/26/17

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO

DRAWN: GCO

CHECKED: CRW

DATE: MAY 2017

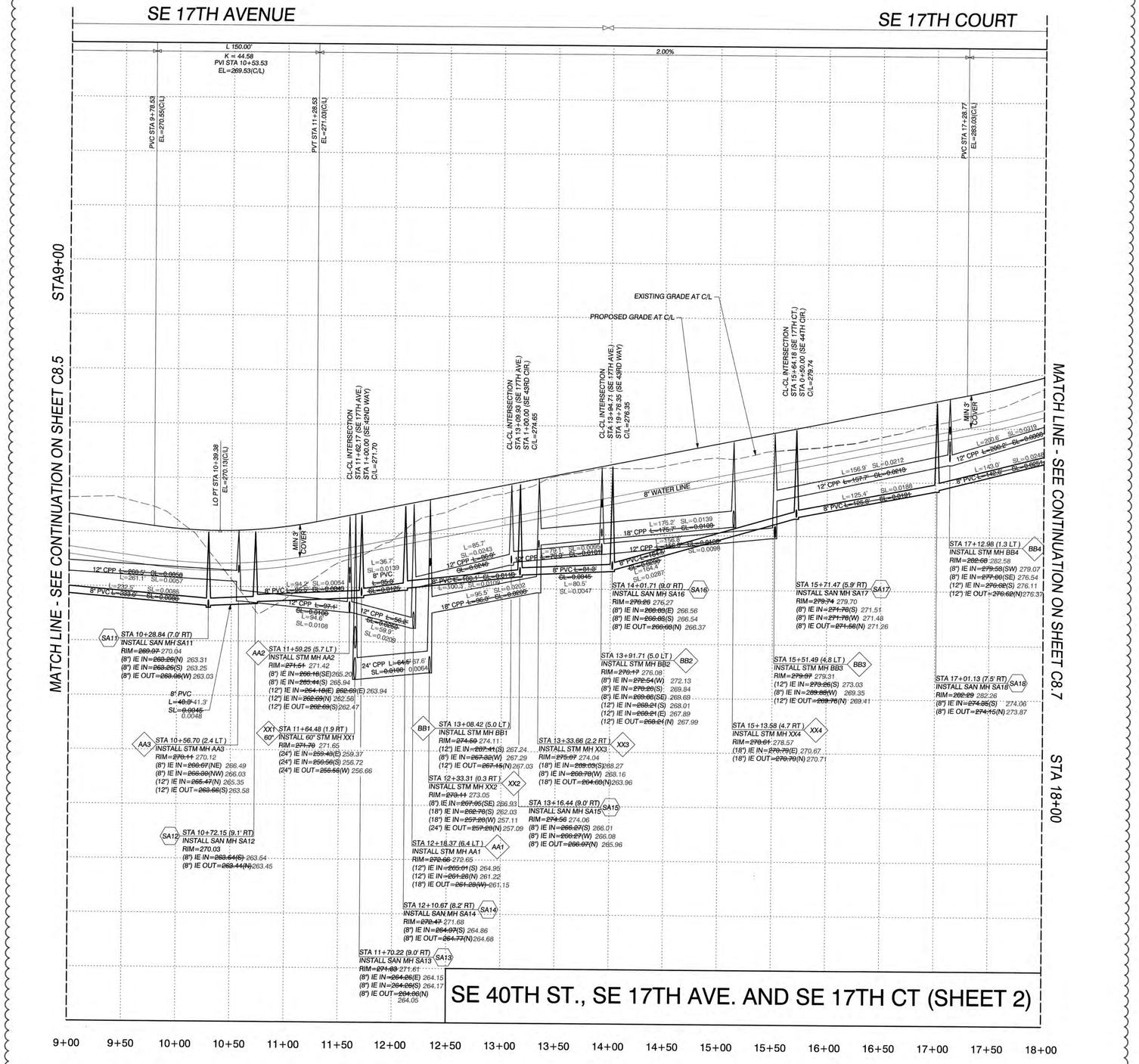
SCALE: H: 1"=50'
V: 1"=5'

CEDARS VILLAGE

JOB NO.: 8959.02.02

SHEET

C8.4



NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

SCALE: 1"=50'

-50 0 50 100

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CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tietonbuilt.com

PROFILE FOR SE 40TH ST., SE 17TH AVE. AND SE 17TH CT (SHEET 2) FOR: AS-BUILT

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9689

CHRIS R. WONDRA
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY: FOR:

A N/A

- [X] GRADING
- [X] STORM SEWER
- [ ] SANITARY SEWER
- [X] WATER

[X] [ ] LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CHRIS R. WONDRA
STATE OF WASHINGTON
32827
REGISTERED
PROFESSIONAL ENGINEER
9/26/17

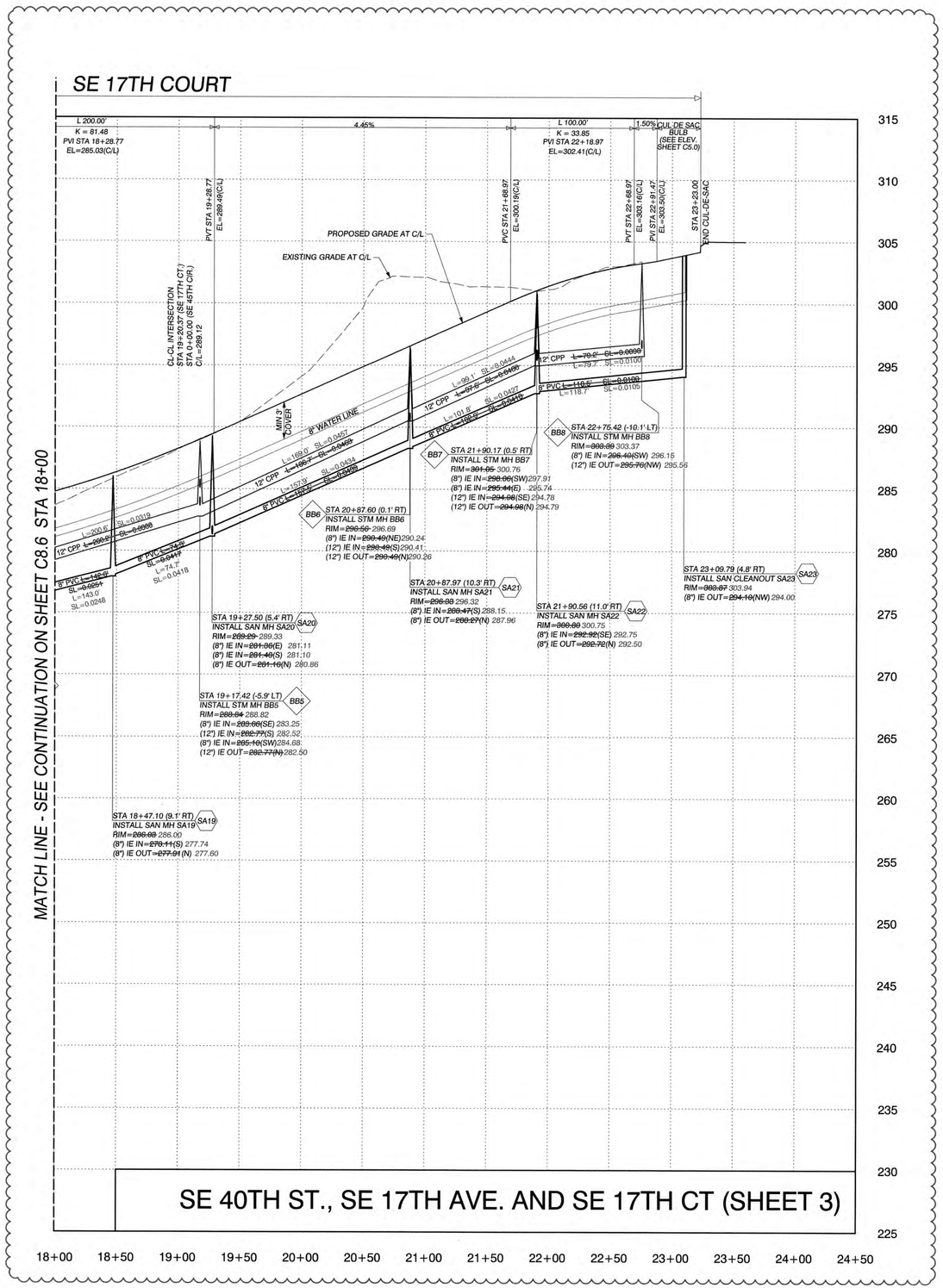
CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: GCO
DRAWN: GCO
CHECKED: CRW
DATE: MAY 2017
SCALE: H: 1"=50' V: 1"=5'

CEDARS VILLAGE
JOB NO.: 8959.02.02

SHEET
C8.6



NOTE: ACTUAL PIPE PLAN LENGTH REPORTED ON PROFILE. SLOPE IS BASED ON THIS LENGTH AND NOT PLAN LENGTH FROM MH CENTER TO CENTER

SCALE: 1"=50'

-50 0 50 100

CHRIS R. WONDERLY STATE OF WASHINGTON 32827 REGISTERED PROFESSIONAL ENGINEER
11/09/18

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY FOR:

A N/A

- [ ] [X] GRADING
- [X] [ ] STORM SEWER
- [X] [ ] SANITARY SEWER
- [ ] [X] WATER

[X] [ ] LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CHRIS R. WONDERLY STATE OF WASHINGTON 32827 REGISTERED PROFESSIONAL ENGINEER
9/26/17

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CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205
PHONE: (360) 798-4838
EMAIL: ryan@tetonbuilt.com

PROFILE FOR SE 40TH ST., SE 17TH AVE. AND SE 17TH CT (SHEET 3) FOR: AS-BUILT

CEDARS VILLAGE

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.399.6936

CHANGES / REVISIONS

DESCRIPTION:	DATE:

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SCALE: H: 1"=50' V: 1"=5'

CEDARS VILLAGE
JOB NO.: 8959.02.02

SHEET
C8.7

STANDARD NOTES FOR EROSION CONTROL PLAN

1. THE CONTRACTOR SHALL INSTALL AND MAINTAIN BMP'S AS SHOWN AND PERFORM ALL ACTIONS NECESSARY TO PREVENT EROSION, AND CONTROL SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. CONTRACTOR SHALL COMPLY WITH THE CITY OF BATTLE GROUND MUNICIPAL CODE 18.255.
2. ALL EROSION CONTROL MEASURES SHALL BE IN-PLACE AND IN WORKING CONDITION PRIOR TO DISTURBING AND EXPOSING ANY SOIL SURFACES.
3. ALL EROSION PREVENTION AND CONTROL BMP'S SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO INSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. NEEDED REPAIRS SHALL BE MADE AS SOON AS POSSIBLE. THEY ARE TO REMAIN IN PLACE AND OPERATIONAL DURING ALL PHASES OF CONSTRUCTION. CONSTRUCTION ACTIVITIES SHALL NOT CONTINUE OR RESUME UNTIL REPAIRS TO EROSION CONTROL FACILITIES ARE MADE AND THE FACILITIES ARE FUNCTIONAL. ANY SEDIMENT LEAVING THE SITE OR DISCHARGING TO A SENSITIVE AREA SHALL BE STOPPED AND CONTROLLED IMMEDIATELY. CONTAMINATED AREAS SHALL BE CLEANED AND RESTORED.
4. CLEARING LIMITS AND WORK AREA LIMITS SHALL BE DELINEATED AND MARKED. DO NOT DISTURB MORE AREA THAN NEEDED FOR CONSTRUCTION REQUIREMENTS.
5. ALL SENSITIVE OR CRITICAL AREAS (WETLANDS, STEEP SLOPES, NATURAL WATERWAYS) AND BUFFERS SHALL BE CLEARLY DELINEATED AND MARKED AND PROTECTED FROM SEDIMENT DEPOSITION.
6. SEDIMENT LADEN RUNOFF SHALL BE PREVENTED FROM ENTERING ALL EXISTING STORM WATER CATCH BASINS AND INLETS.
7. NO DENUDED SOILS SHALL REMAIN UNSTABILIZED FOR MORE THAN TWO DAYS DURING THE PERIOD OCTOBER 1 THRU APRIL 30 OR FOR MORE THAN SEVEN DAYS DURING THE PERIOD OF MAY 1 THROUGH SEPTEMBER 30. ALL DISTURBED SOIL SURFACES SHALL BE STABILIZED BY A SUITABLE BMP.
8. WHERE FEASIBLE, NO MORE THAN 500 FEET OF TRENCH SHALL BE OPEN AT ONE TIME. EXCAVATED MATERIAL SHALL BE PLACED ON THE UP-HILL SIDE OF TRENCHES PROVIDED IT DOES NOT CONFLICT WITH SAFETY REQUIREMENTS.
9. DEWATERING DEVICES SHALL DISCHARGE INTO A SEDIMENT TRAP OR SEDIMENT POND. NO DISCHARGE SHALL BE MADE TO A PAVED STREET OR STORMWATER COLLECTION SYSTEM WITHOUT FIRST REMOVING SEDIMENT.
10. SLOPES SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION. RUNOFF SHALL BE PREVENTED FROM UNDERCUTTING THE BASE OF SLOPES.
11. ANY SOIL OR DEBRIS TRANSPORTED ONTO ROADWAYS AND SIDEWALKS SHALL BE REMOVED. DEPOSITS SHALL BE COMPLETELY REMOVED BY SHOVELING AND/OR SWEEPING. WASHING SHALL NOT BE UTILIZED UNLESS SPECIFICALLY APPROVED IN WRITING BY THE CITY. SHOULD THERE BE ANY EVIDENCE OF SEDIMENT, MUD, OR DEBRIS BE TRANSPORTED ONTO A ROAD SURFACE, IT WILL BE CLEANED IMMEDIATELY AND A WHEEL WASH SHALL BE INSTALLED.
12. ALL CONVEYANCE CHANNELS, BOTH TEMPORARY AND PERMANENT SHALL BE STABILIZED TO PREVENT EROSION OF THE CHANNEL. STABILIZATION SHALL EXTEND TO AREAS AT OUTLETS AND DOWNSTREAM REACHES VULNERABLE TO EROSION.
13. IF SPECIFIED BMP'S ARE UTILIZED BUT ARE INSUFFICIENT TO PREVENT SEDIMENT FROM REACHING WATER BODIES, ADJACENT PROPERTIES, OR PUBLIC RIGHTS-OF-WAY THEN ADDITIONAL BMP'S SHALL BE IMPLEMENTED IMMEDIATELY.
14. STABILIZED AREAS SHALL BE PROVIDED FOR EMPLOYEE PARKING AND STORAGE OF CONSTRUCTION MATERIALS. EROSION CONTROL BMP'S SHALL BE UTILIZED AS NECESSARY TO PREVENT SEDIMENT LADEN RUNOFF FROM LEAVING OR SEDIMENT BEING TRANSPORTED FROM THESE AREAS FROM VEHICLE ACTIVITY.
15. INLET PROTECTION MUST ALLOW FOR OVERFLOW IN A SEVERE STORM EVENT.
16. REPAIR OR REPLACE MATERIALS AS NEEDED TO ENSURE PROPER FUNCTION.

EROSION CONTROL GENERAL NOTES

STANDARD DETAIL: EC-1.0A

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/98	BSG	GGH
2	8/30/05	ALL	ALL
3	9/15/10	RMJ	RMJ

STANDARD NOTES FOR EROSION CONTROL PLAN (CONTINUED)

17. ALL POLLUTANTS THAT OCCUR DURING CONSTRUCTION SHALL BE HANDLED AND DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF STORM WATER.
18. ALL EROSION AND SEDIMENT CONTROL BMPS SHALL BE REGULARLY INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED BY THE PROPERTY OWNER OR PERMIT HOLDER TO ENSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. A MAINTENANCE LOG SHALL BE PROVIDED AND KEPT AS PERMANENT RECORD. THE MAINTENANCE LOG SHALL BE IN A DESIGNATED ON-SITE LOCATION. INSPECT ONCE DAILY ON ACTIVE SITES, ONCE EVERY TWO WEEKS ON INACTIVE SITES, AND WITHIN 24 HOURS FOLLOWING A 0.5 INCH RAIN EVENT.
19. ALL CONSTRUCTION ACTIVITIES SHALL BE SUPERVISED BY AN INDIVIDUAL WHO SHALL HAVE SUCCESSFULLY COMPLETED FORMAL TRAINING IN EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION BY A RECOGNIZED ORGANIZATION ACCEPTABLE TO THE CITY. A CERTIFICATION OR SUFFICIENT EVIDENCE OF SUCCESSFUL COMPLETION OF SUCH TRAINING SHALL BE SUBMITTED PRIOR TO CONSTRUCTION.
20. ALL TEMPORARY BMP'S SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED.
21. CONSTRUCTION SHALL NOT BE CONSIDERED COMPLETE AND ACCEPTABLE UNTIL ALL DISTURBED SOIL SURFACES HAVE BEEN PROTECTED FROM EROSION.
22. VEGETATED STABILIZATION AND LANDSCAPING SHALL BE FERTILIZED, WATERED AND MAINTAINED TO ENSURE THAT GROWTH OF VEGETATION IS ESTABLISHED AND SUSTAINED.
23. DURING DRY WEATHER CONSTRUCTION PERIODS THE CONTRACTOR SHALL PROVIDE PROJECT-SPECIFIC DUST CONTROL MEASURES. THE CONTRACTOR SHALL MAINTAIN THE DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS HAVE BEEN STABILIZED. IMMEDIATELY RE-STABILIZE AREAS DISTURBED BY CONTRACTOR'S OPERATIONS OR OTHER ACTIVITIES (WIND, WATER, VANDALISM, ETC.).
24. ENTRY ONTO THE CONSTRUCTION SITE SHALL BE RESTRICTED TO A SINGLE APPROVED ENTRANCE AS SHOWN ON THE PLAN.
25. MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES WHICH INVOLVE POTENTIAL CONTAMINANTS (OIL,SOLVENTS,HYDRAULIC FLUID, ETC.) MUST BE CONDUCTED IN A MANNER WHICH PREVENTS CONTAMINATION OF SOILS, SURFACE WATER AND GROUND WATER. TARPS, DRIP PANS, OR OTHER APPROPRIATE MEASURES SHALL BE USED AS NECESSARY.
26. STRIPPING, TOPSOIL, AND UNSUITABLE MATERIAL STOCKPILES SHALL BE HYDROSEEDED. MAINTENANCE OF STOCKPILE AREAS AND REAPPLICATION OF HYDROSEED COVERING SHALL BE REQUIRED IF BARE SOIL IS PRESENT.

TEMPORARY EROSION CONTROL SEED MIX

	% WEIGHT	% PURITY	% GERMINATION
CHEWINGS OR ANNUAL BLUE GRASS FESTRUCA RUBRA VAR. COMMUTATA OR POA ANNA	40	98	90
PERENNIAL RYE LOLIUM PERENNE	50	98	90
REDTOP OR COLONIAL BENTGRASS AGROSTIS ALBA OR AGROSTIS TENUIS	5	92	85
WHITE DUTCH CLOVER TRIFOLIUM REPENS	5	98	90

EROSION CONTROL GENERAL NOTES

STANDARD DETAIL: EC-1.0B

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

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2	8/30/05	ALL	ALL
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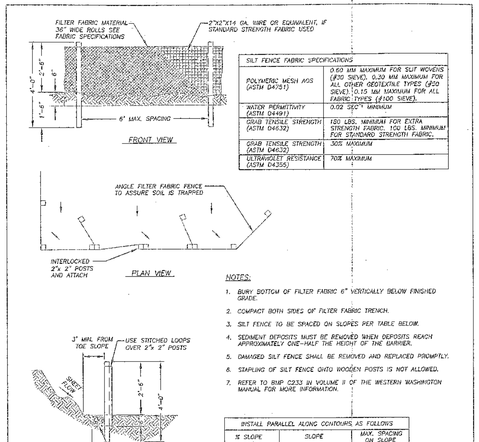

SILT FENCE FABRIC SPECIFICATIONS	
POLYMERIC MESH AOS (ASTM D4751)	0.60 MM MAXIMUM FOR SILT MOVERS (#30 SIEVE). 0.30 MM MAXIMUM FOR ALL OTHER VERTICALLY TYPES (#50 SIEVE). 0.15 MM MAXIMUM FOR ALL FABRIC TYPES (#100 SIEVE).
WATER PERMITTIVITY (ASTM D4491)	0.02 SEC^{-1} MINIMUM
GRAB TENSILE STRENGTH (ASTM D4632)	180 LBS. MINIMUM FOR EXTRA STRENGTH FABRIC. 100 LBS. MINIMUM FOR STANDARD STRENGTH FABRIC.
GRAB TENSILE STRENGTH (ASTM D4632)	30% MAXIMUM
ULTRAVIOLET RESISTANCE (ASTM D4355)	70% MINIMUM

NOTES:

1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. COMPACT BOTH SIDES OF FILTER FABRIC TRENCH.
3. SILT FENCE TO BE SPACED ON SLOPES PER TABLE BELOW.
4. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
5. DAMAGED SILT FENCE SHALL BE REMOVED AND REPLACED PROMPTLY.
6. STAPLING OF SILT FENCE ONTO WOODEN POSTS IS NOT ALLOWED.
7. REFER TO BMP C233 IN VOLUME II OF THE WESTERN WASHINGTON MANUAL FOR MORE INFORMATION.

INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS		
% SLOPE	SLOPE	MAX. SPACING ON SLOPE
NOT EASTER	NOT 40 EASTER	250 FT.
10:1-5:1	10:1-5:1	100 FT.
5:1-2:1	2.5:1-2:1	50 FT.
40:1-5:1	3.5:1-2:1	25 FT.
30:1-5:1	3.5:1-2:1	20 FT.

N.T.S.

SILT FENCE

STANDARD DETAIL: EC-2.0

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

REVISIONS:	DATE:	DRAWN:	DESIGNED:
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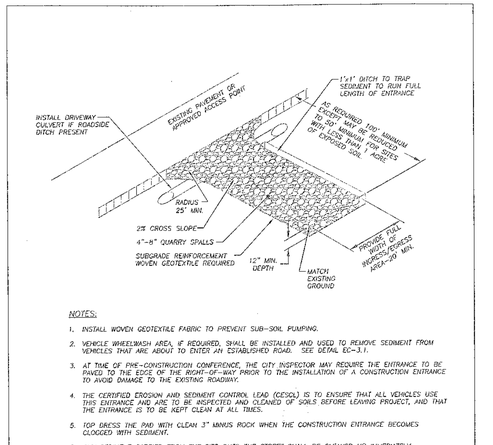
2	8/30/05	ALL	MCH
3	9/15/10	RMJ	RMJ



NOTES:

1. INSTALL WOVEN GEOTEXTILE FABRIC TO PREVENT SUB-SOIL PUMPING.
2. VEHICLE WHEELWASH AREA, IF REQUIRED, SHALL BE INSTALLED AND USED TO REMOVE SEDIMENT FROM VEHICLES THAT ARE ABOUT TO ENTER AN ESTABLISHED ROAD. SEE DETAIL EC-3.1.
3. AT TIME OF PRE-CONSTRUCTION CONFERENCE, THE CITY INSPECTOR MAY REQUIRE THE ENTRANCE TO BE PAVED TO THE EDGE OF THE RIGHT-OF-WAY PRIOR TO THE INSTALLATION OF A CONSTRUCTION ENTRANCE TO AVOID DAMAGE TO THE EXISTING ROADWAY.
4. THE CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL) IS TO ENSURE THAT ALL VEHICLES USE THIS ENTRANCE AND ARE TO BE INSPECTED AND CLEANED OF SOILS BEFORE LEAVING PROJECT, AND THAT THE ENTRANCE IS TO BE KEPT CLEAN AT ALL TIMES.
5. TOP DRESS THE PAD WITH CLEAN 3" MINUS ROCK WHEN THE CONSTRUCTION ENTRANCE BECOMES CLOGGED WITH SEDIMENT.
6. ANY SEDIMENT CARRIED FROM THE SITE ONTO THE STREET SHALL BE CLEANED UP IMMEDIATELY. PRESSURE WASHING NOT ALLOWED. SWEEPING IS THE PREFERRED METHOD.
7. REFER TO BMP C105 IN VOLUME II OF THE WESTERN WASHINGTON MANUAL FOR MORE INFORMATION.

N.T.S.

CONSTRUCTION ENTRANCE

STANDARD DETAIL: EC-3.0

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

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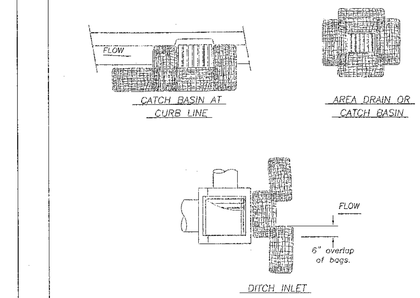
2	8/30/05	ALL	MCH
3	9/15/10	RMJ	RMJ



NOTES:

1. BIO-FILTER BAGS NOT TO BE USED WITHIN CITY OF BATTLE GROUND ROW UNLESS APPROVED BY CITY ENGINEER. IF APPROVED, BIO-FILTER BAGS SHALL BE USED IN CONJUNCTION WITH CATCH BASIN INSERT (EC-4.1), OR SEDIMENT DAM (EC-4.2).
2. ADDITIONAL MEASURES MUST BE CONSIDERED DEPENDING ON SOIL TYPE.
3. BIO-FILTER BAGS SHOULD BE STAKED WHERE APPLICABLE USING (2) 1"x2" WOODEN STAKES OR APPROVED EQUAL PER BAG.

N.T.S.

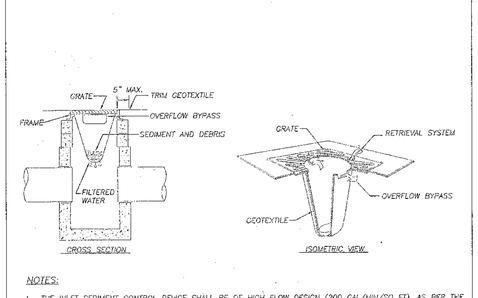
INLET PROTECTION (BIO-FILTER BAG)

STANDARD DETAIL: EC-4.0

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	01/08	CMS	MCH
2	9/15/10	RMJ	RMJ



NOTES:

1. THE INLET SEDIMENT CONTROL DEVICE SHALL BE OF HIGH FLOW DESIGN (200 GAL/MIN/SQ FT), AS PER THE MANUFACTURER'S SPECS.
2. SUBSTITUTION OF A SHEET OF FILTER FABRIC PLACED OVER THE OPENING OF THE INLET IS NOT APPROVED.
3. THE FILTER SHALL BE REPLACED OR CLEANED WHEN THE INSERT BECOMES HALF FULL.
4. FOR SEDIMENT DAM REFER TO STANDARD DETAIL EC-4.2.
5. REFER TO BMP C220 IN VOLUME II OF THE WESTERN WASHINGTON MANUAL FOR MORE INFORMATION.

N.T.S.

INLET PROTECTION (CATCH BASIN INSERT)

STANDARD DETAIL: EC-4.1

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

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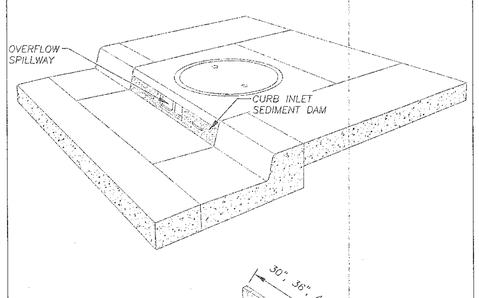

NOTES:

1. SEDIMENT DAM SHALL BE MADE FROM 100% NON-WOVEN POLYFIBER

N.T.S.

INLET PROTECTION (SEDIMENT DAM)

STANDARD DETAIL: EC-4.2

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

REVISIONS:	DATE:	DRAWN:	DESIGNED:
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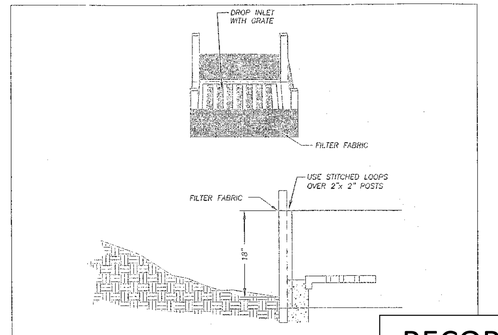

NOTES:

1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. COMPACT BOTH SIDES OF FILTER FABRIC TRENCH.
3. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
4. DAMAGED SILT FENCE SHALL BE REMOVED AND REPLACED PROMPTLY.
5. STAPLING OF SILT FENCE ONTO WOODEN POSTS IS NOT ALLOWED.
6. REFER TO BMP C220 IN VOLUME II OF THE WESTERN WASHINGTON MANUAL FOR MORE INFORMATION.

N.T.S.

INLET PROTECTION (SILT FENCE)

STANDARD DETAIL: EC-4.3

CITY OF BATTLE GROUND APPROVED

Scott P. Sawyer 9-16-10
CITY ENGINEER DATE

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2	8/30/05	ALL	MCH
3	9/15/10	RMJ	RMJ

CITY OF BATTLE GROUND STD. EROSION CONTROL DETAILS FOR:

CEDARS VILLAGE

CLIENT:
TIETON HOMES, LLC
931 SW KING AVENUE
PORTLAND, OR 97205

PHONE: (360) 798-4838
EMAIL: ryan@tetonbuilt.com

OLSON ENGINEERING, INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9693

CHANGES / REVISIONS

DESCRIPTION:	DATE:

RECORD DRAWING

DESIGNED: GCO
DRAWN: GCO
CHECKED: CRW
DATE: MAY 2017
SCALE:

CEDARS VILLAGE
JOB NO.: 8959.02.02

SHEET
C9.0

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CEDARS SEWER REPAIR

CITY OF BATTLE GROUND — PROJECT # SS1508

VICINITY MAP
SCALE: 1"=4000'

SHEET INDEX

NOTES

1. THIS SURVEY IS BASED UPON THE CLARK COUNTY VERTICAL DATUM. REFERENCED BENCHMARK PRAIRIE–68 (POINT ID NO. 320), BRASS DISC IN CONCRETE SET ON THE EAST SIDE OF RAILROAD CROSSING ON THE NORTH SIDE OF NE 181ST ST, SET VERTICALLY. ELEVATION = 291.14'

2. THIS SURVEY WAS PERFORMED JUNE 1, 2009 UTILIZING TRIGONOMETRIC METHODS TO ESTABLISH HORIZONTAL LOCATIONS AND ELEVATIONS. FEATURES CRITICAL TO DEVELOPMENT SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

3. THERE MAY BE EASEMENTS AFFECTING THE SUBJECT PROPERTY WHICH HAVE NOT BEEN IDENTIFIED AT THIS TIME AS A TITLE REPORT FOR THE PROPERTY HAS NOT BEEN PROVIDED.

UTILITY NOTE

WARNING! – THERE IS NO ASSURANCE THAT THE LOCATION OF SUBSTRUCTURES SHOWN ON THIS DRAWING ARE ACCURATE, OR THAT ALL EXISTING SUBSTRUCTURES ARE SHOWN ON THIS DRAWING. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL SUBSTRUCTURES WHETHER SHOWN OR NOT. ANY DAMAGE TO THE EXISTING SUBSTRUCTURES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. PRIOR TO EXCAVATIONS THE PROPER UTILITY LOCATION AGENCY MUST BE CONTACTED FOR FIELD LOCATION MARKINGS OF SUBSTRUCTURES.

GENERAL NOTES

1. MATERIALS AND CONSTRUCTION METHODS SHALL BE IN CONFORMANCE WITH THE CITY OF BATTLE GROUND CONSTRUCTION REQUIREMENTS, BATTLE GROUND STANDARD DETAILS, AND THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION AS PREPARED BY WSDOT.

2. THE CONTRACTOR SHALL NOTIFY THE CITY OF BATTLE GROUND ENGINEERING DIVISION AT (360) 342–5070 TWO WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. CONSTRUCTION SHALL NOT BEGIN UNTIL APPROVAL HAS BEEN ISSUED BY THE ENGINEERING DIVISION.

3. PRE–CONSTRUCTION PHOTOS ARE RECOMMENDED. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE DUE TO CONSTRUCTION.

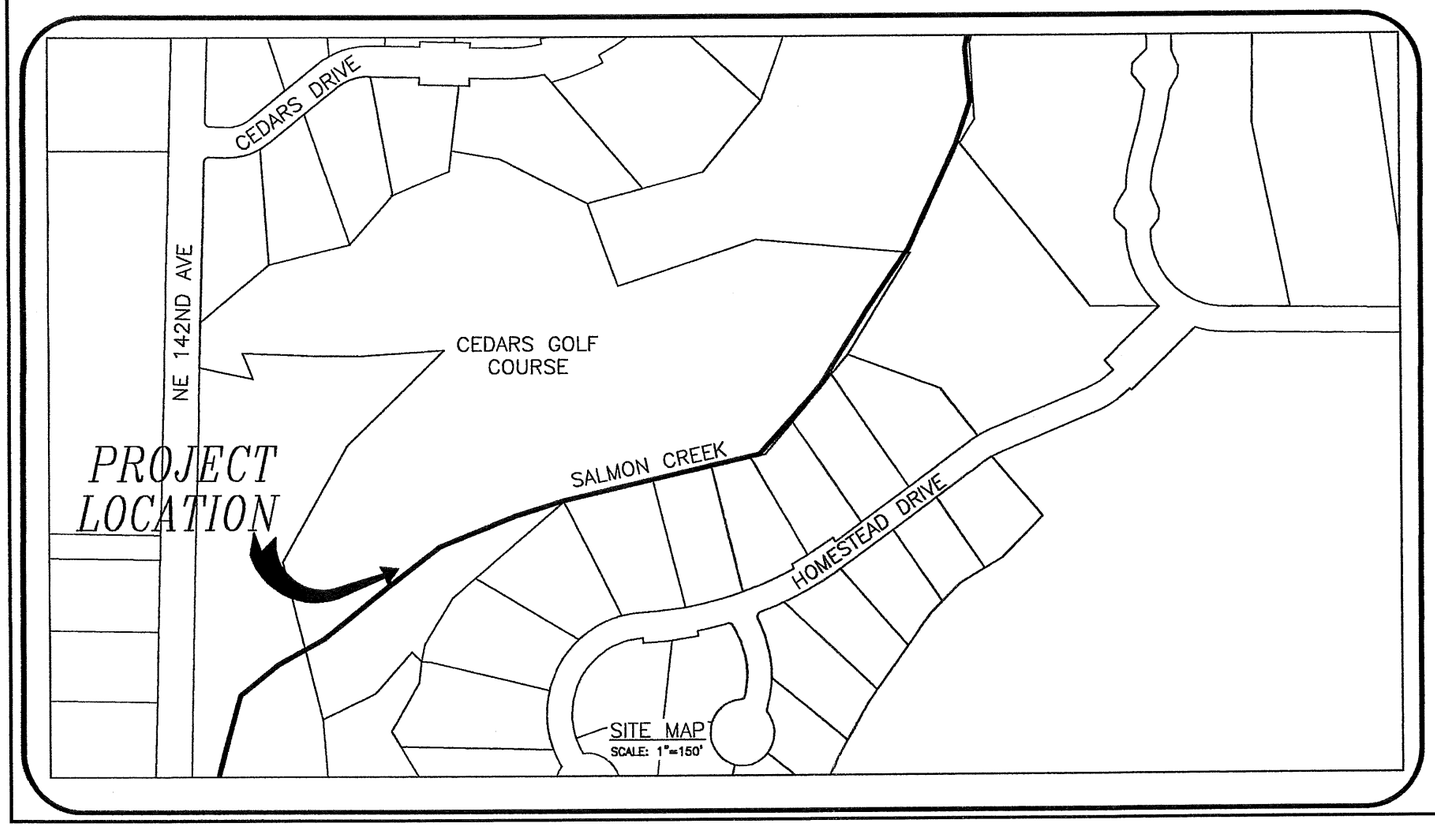
4. PRIOR TO COMMENCING ANY EXCAVATION THE CONTRACTOR SHALL PROVIDE NOTICE OF THE SCHEDULED EXCAVATION TO ALL OWNERS OF UNDERGROUND FACILITIES BY CALLING CLARK COUNTY UTILITY COORDINATING COUNCIL'S ONE–CALL NUMBER AT (360) 696–4848 OR THE STATE'S ONE–CALL NUMBER AT (800) 424–5555. THE CONTRACTOR SHALL MAKE THE CALL NOT LESS THAN 48 HOURS BEFORE STARTING THE WORK.

5. ALL EXISTING UTILITY LOCATIONS AND DEPTHS ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR POTHOLING TO CONFIRM LOCATIONS.

6. PRIVATE AND PUBLIC UTILITY COMPANIES CAN BE REACHED AT THE FOLLOWING NUMBERS:

CLARK PUBLIC UTILITIES (ELECTRIC, WATER)	(360) 992–3000
COMCAST (CABLE)	(360) 859–3295
NW NATURAL GAS (GAS)	(360) 571–5465
QWEST (PHONE)	(360) 694–8050
WASTE CONNECTIONS (GARBAGE)	(360) 892–5370
BATTLE GROUND (SEWER)	(360) 342–5350
CEDARS GOLF COURSE CONTACT:	
CRAIG LIDDLE (COURSE SUPERINTENDENT)	(360) 518–7399
CEDARS GOLF PRO SHOP	(360) 387–4233

7. A PRE–CONSTRUCTION MEETING SHALL BE SCHEDULED WITH THE CITY PRIOR TO THE START OF CONSTRUCTION.



SITE MAP
SCALE: 1"=150'

LEGEND

EXISTING

- GRAVEL PATH
- EDGE OF STREAM
- WETLAND BOUNDARY
- ORDINARY HIGH WATER MARK
- SAND TRAP
- TEE #9
- SANITARY PIPE
- SANITARY SEWER EASEMENT
- IRRIGATION HEAD
- IRRIGATION CONTROL
- BOLLARD
- GOLF BALL CLEANER
- SANITARY MANHOLE
- SHRUB
- CONIFEROUS TREE
- DECIDUOUS TREE
- BRIDGE DECK
- 1' CONTOUR
- 5' CONTOUR
- DEAD STUMP
- BRIDGE RAILING

PROPOSED

- SANITARY PIPE
- TREE PROTECTION FENCING
- EROSION SILT FENCING
- SANITARY MANHOLE
- EXCAVATION / FILL AREA
- CONSTRUCTION STAGING
- TOP SOIL
- GRANULATED BACKFILL

DESIGNED ME
DRAWN CMS
HOR. AS SHOWN
VERT. NA
DATE 09/18/2009
DWG: G01
SHEET 1 OF 9

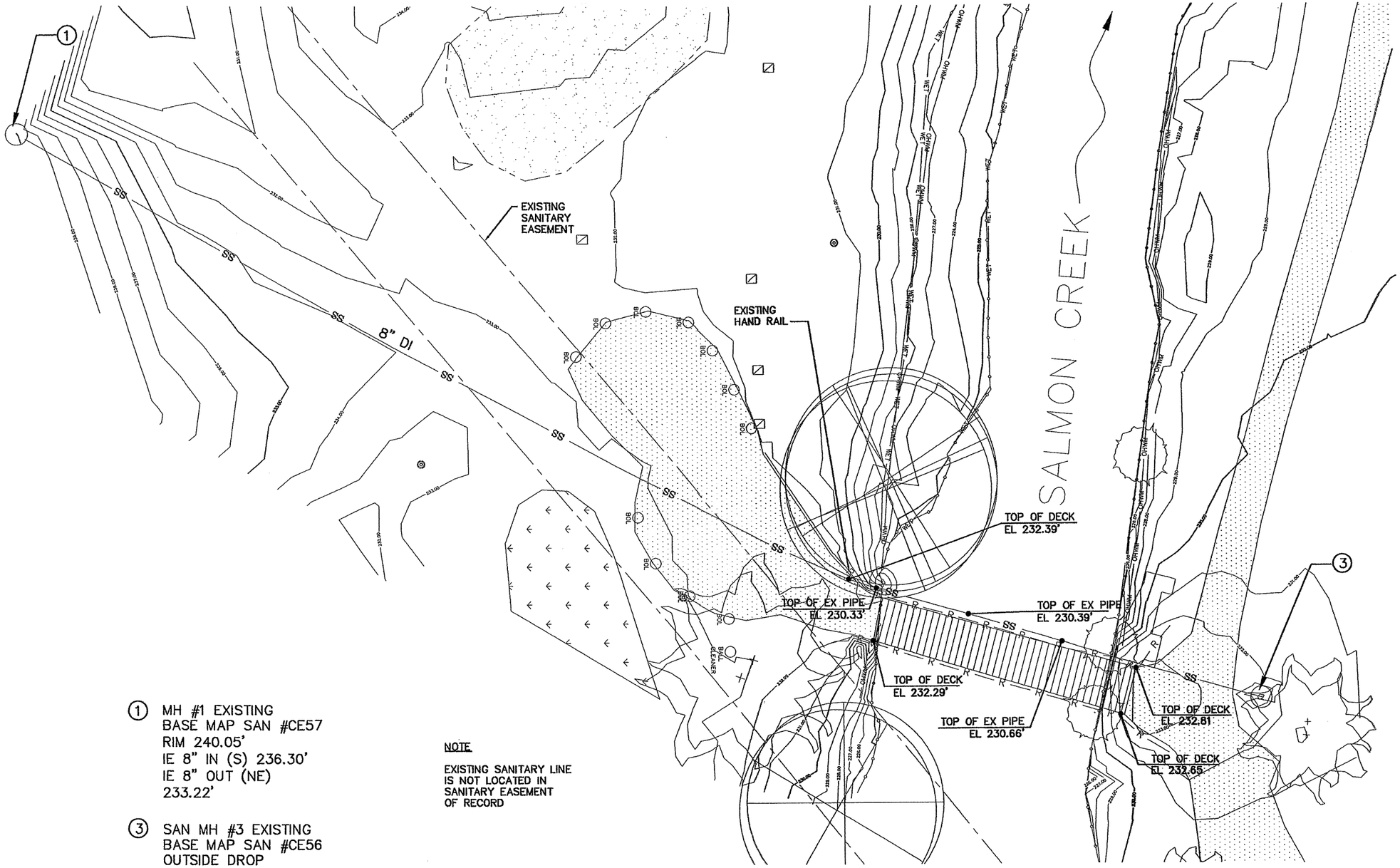
CALL 48 HOURS BEFORE YOU DIG 1–800–553–4344 "It's the Law" CLARK COUNTY UTILITY COORDINATING COUNCIL

CITY OF BATTLE GROUND
CEDARS SEWER REPAIR

COVER SHEET

No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT–PROJECT MANAGER
ENGINEERING 360–342–5070



(1) MH #1 EXISTING
BASE MAP SAN #CE57
RIM 240.05'
IE 8" IN (S) 236.30'
IE 8" OUT (NE)
233.22'

(3) SAN MH #3 EXISTING
BASE MAP SAN #CE56
OUTSIDE DROP
RIM 234.27'
IE 8" IN (SE) 231.98' (OVERFLOW)
IE 8" IN (SE) 227.34'
IE 8" OUT (NE) 227.14'

NOTE

EXISTING SANITARY LINE IS NOT LOCATED IN SANITARY EASEMENT OF RECORD

DESIGNED ME
DRAWN CMS
HOR. 1" = 10'
VERT. NA
DATE 07/21/09
DWG: V01
SHEET 2 OF 9

CALL 48 HOURS BEFORE YOU DIG 1-800-553-4344 "It's the Law"
CLARK COUNTY UTILITIES COORDINATING COUNCIL

CITY OF BATTLE GROUND CEDARS SEWER REPAIR

EXISTING CONDITIONS

No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070

EROSION CONTROL GENERAL NOTES ER-1.0

1. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO ANY DISTURBANCE CAUSED BY CLEARING OR GRADING AND SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE PUGET SOUND MANUAL - EROSION AND SEDIMENT CONTROL AND TO THE STANDARD DETAILS ATTACHED TO THIS SET OF PLANS. NEWLY CONSTRUCTED OR MODIFIED INLETS AND CATCH BASINS ARE TO BE PROTECTED IMMEDIATELY UPON INSTALLATION. TEMPORARY SEEDING AND MULCHING OF FILL SLOPES AND DIVERSION DIKES SHALL BE COMPLETED WITHIN ONE WEEK AFTER ROUGH GRADING. ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY THE APPROPRIATE BMP, DURING THE PERIOD FROM OCTOBER 1 TO APRIL 30 NO SOIL SHALL BE EXPOSED FOR MORE THAN TWO (2) DAYS. FROM MAY 1 TO SEPTEMBER 30 NO SOIL SHALL BE EXPOSED FOR MORE THAN SEVEN (7) DAYS.

2. PROTECTION

A. PRIOR TO ANY SITE EXCAVATION, ALL STORM DRAINAGE INLETS SHALL BE PROTECTED AS SHOWN ON THIS DETAIL SHEET TO PREVENT SEDIMENT FROM ENTERING THE STORM DRAINAGE SYSTEM PRIOR TO PERMANENT STABILIZATION OF THE DISTURBED AREA. CLEAN THE FILTER AS NECESSARY TO MAINTAIN DRAINAGE. PROVIDE APPROVED TRAFFIC CONTROL DEVICES AS NECESSARY. REMOVE FILTER AND CLEAN CATCH BASINS FOLLOWING COMPLETION OF SITEWORK.

B. INSTALL SILT FENCE PRIOR TO EXCAVATION AS SHOWN ON THIS SHEET TO PREVENT SILT INTRUSION UPON ADJACENT LAN FOR MAINTENANCE AND REMOVAL OF SILT FENCE. SEE DETAIL STANDARD ON THIS SHEET.

C. PRIOR TO HOUSE CONSTRUCTION, INSTALL SILT FENCE, PRIOR TO EXCAVATION, ALONG THE DOWNHILL LOT LINE, IN ACCORDANCE WITH THIS SHEET TO PREVENT SILT INTRUSION UPON ADJACENT LOTS. IF FENCE CONSTRUCTION OCCURS SIMULTANEOUSLY ON ADJACENT LOTS INTO THE LOTS WHERE THE SAME OWNER DURING CONSTRUCTION, THEN THE SILT FENCE ALONG THE COMMON LOT LINE CAN BE ELIMINATED.

3. PROTECTION OF ADJACENT ROADS AND STREETS:

A. AT ALL ACCESS POINTS ONTO THE SITE THAT ARE UTILIZED BY CONSTRUCTION EQUIPMENT AND TRUCKS, PROVIDE A 12 INCH DEEP PAD OF CRUSHED ROCK FOR A DISTANCE OF 100 FEET INTO THE SITE. WIDTH OF THE PAD SHALL BE 20 FEET MINIMUM. ALL TRUCKS LEAVING THE PAD SHALL EXERCISE ACROSS THE PAD. ACCUMULATED SOIL SHALL BE PERIODICALLY REMOVED, OR ADDITIONAL ROCK SHALL BE PLACED UPON THE PAD SURFACE. ROCK SHALL BE CLEAN 4" TO 8" QUARRY SPALLS. ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

B. AT SITES WITH LESS THAN 1 ACRE OF EXPOSED SOIL, PAD LENGTH MAY BE REDUCED TO 50 FEET. SINGLE FAMILY LOT ENTRANCES MAY REDUCE THE PAD LENGTH TO 20 FEET. IF HOUSE CONSTRUCTION OCCURS SIMULTANEOUSLY ON ADJACENT LOTS AND THE SAME OWNER DURING CONSTRUCTION, THEN, ONE LOT ENTRANCE CAN BE USED FOR ADJACENT LOTS.

4. MAINTENANCE OF EROSION CONTROL FACILITIES:

A. MAINTAIN AND REMOVE ALL EROSION CONTROLS AS SPECIFIED ON THIS SHEET. THE CONTRACTOR SHALL REMOVE ALL ACCUMULATED SEDIMENT FROM THE CATCH BASINS, DRYWELLS, UTILITY TRENCHES AND STORM PIPES PRIOR TO ACCEPTANCE BY THE OWNER.

B. INSPECTION OF EROSION CONTROL MEASURES SHALL BE AFTER EACH RAINFALL EVENT THAT PRODUCES RUNOFF AND AT LEAST ONE TIME PER MONTH. A MAINTENANCE LOG SHALL BE KEPT AND SHALL BE MADE AVAILABLE TO WATER QUALITY STAFF. SHOULD SPECIFIED EROSION AND SEDIMENT CONTROL BMPS FAIL OR PROVE TO BE INADEQUATE, THE WATER QUALITY MANAGER SHALL REQUIRE ADDITIONAL BMPS BE INSTALLED.

C. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER SITE STABILIZATION IS ACHIEVED OR AFTER TEMPORARY BMPS ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.

5. MANAGE SUBJECT TO SURFACE AND AIR MOVEMENT OF DUST, WHERE ON-SITE OR OFF-SITE DAMAGE IS LIKELY TO OCCUR, ONE OR MORE OF THE FOLLOWING PREVENTATIVE MEASURES SHALL BE TAKEN FOR DUST CONTROL:

A. MINIMIZE THE PERIOD OF SOIL EXPOSURE THROUGH THE USE OF TEMPORARY GROUND COVER AND OTHER TEMPORARY STABILIZATION PROCESSES.

B. THE SITE IS SPRINKLED WITH WATER UNTIL SURFACE IS WET. REPEAT AS NEEDED TO PREVENT THE CARRY OUT OF MUD ONTO STREET, REFER TO STABILIZED CONSTRUCTION ENTRANCE DETAILS.

C. SPRAY EXPOSED SOIL AREAS WITH A DUST PALLIATIVE. NOTE, USED OIL IS PROHIBITED AS A PALLIATIVE.

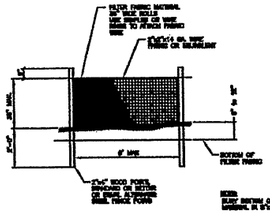
6. TEMPORARY SEEDING SHALL BE PLACED ON EXPOSED SURFACES THAT WILL NOT BE BROUGHT TO FINAL GRADING OR PERMANENT COVER TREATMENT OR VEGETATION WITHIN 30 DAYS OF THE EXPOSURE TO REDUCE EROSION AND DEGRADATION BY STABILIZING EXPOSED SOILS. SEEDED AREAS SHALL BE CHECKED REGULARLY TO ASSURE A GOOD STAND OF GRASS IS BEING MAINTAINED. AREAS THAT FAIL TO ESTABLISH VEGETATIVE COVER ADEQUATE TO PREVENT EROSION SHALL BE RESEEDED AS SOON AS SUCH AREAS ARE IDENTIFIED.

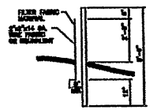
7. APPLY THE FOLLOWING TEMPORARY SEEDING MIXTURE TO THE PREPARED SEED BED AT A RATE OF 130 LBS/ACRE:

NAME	PROPORTION BY WEIGHT	PERCENT PURITY	PERCENT GERMINATION
REDTOP	10%	92	90
ANNUAL RYE	45%	98	90
CHEWINGS FESCUE	45%	97	90
WHITE DUTCH CLOVER	10%	98	90

* NOTE: "HYDROSEEDING" APPLICATIONS WITH APPROVED SEED-MULCH-FERTILIZER MIXTURES MAY ALSO BE USED

N.T.S.

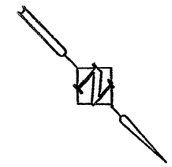




NOTES:

MAINTENANCE:

1. SILT FENCES AND FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
2. SHOULD THE FABRIC ON A SILT FENCE OF FILTER BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE, AND THE BARRIER STILL BE NECESSARY, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
4. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND SEEDED.



NOTE:

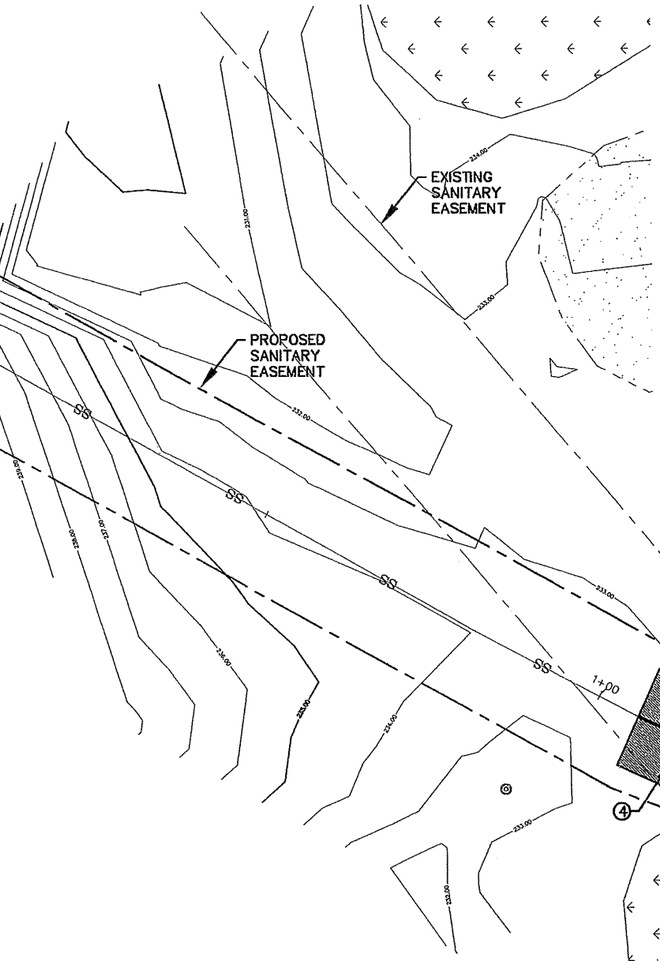
1. NO CONSTRUCTION EQUIPMENT ALLOWED ON BRIDGE. REFER TO PAGE 4.
2. FOR SEWER ABANDONMENT, REFER TO PAGE 5.
3. REVEGETATE EXISTING PERVIOUS (NON-TURF) AREAS BY PLACING 6" OF TOPSOIL ON TOP OF THE GRANULAR BACK FILL AND SEEDING WITH *STREAMBANK PLUS* (OR EQUIVALENT)
   50% NATIVE RED FESCUE
   20% CALIFORNIA BROME
   20% BLUE WILDRYE
   10% SICKLE KEELED LUPINE
   SEEDING RATE = 2LBS/1000 SQ.FT.
4. DISTURBED TURF AREA TO BE REVEGETATED WITH PERENNIAL RYE.

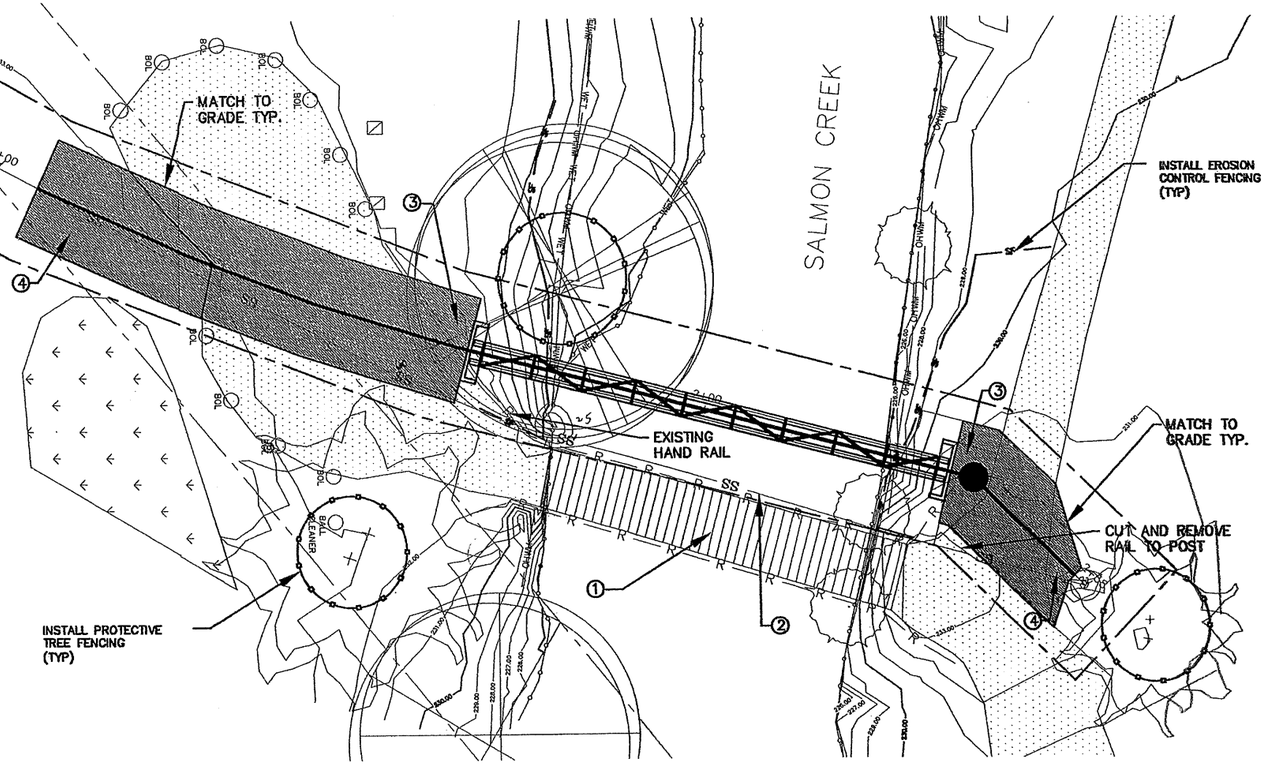
EROSION CONTROL GENERAL NOTES	PLAN #
CITY OF BATTLE GROUND APPROVED — CITY ENGINEER — DATE	ER-1.0

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/08	BSG	CGH
2	8/30/05	ALL	MCH

FILTER FABRIC FENCE	PLAN #
CITY OF BATTLE GROUND APPROVED — CITY ENGINEER — DATE	ER-1.3

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/08	BSG	CGH
2	8/30/05	ALL	MCH





No.	Revision/Issue	Date

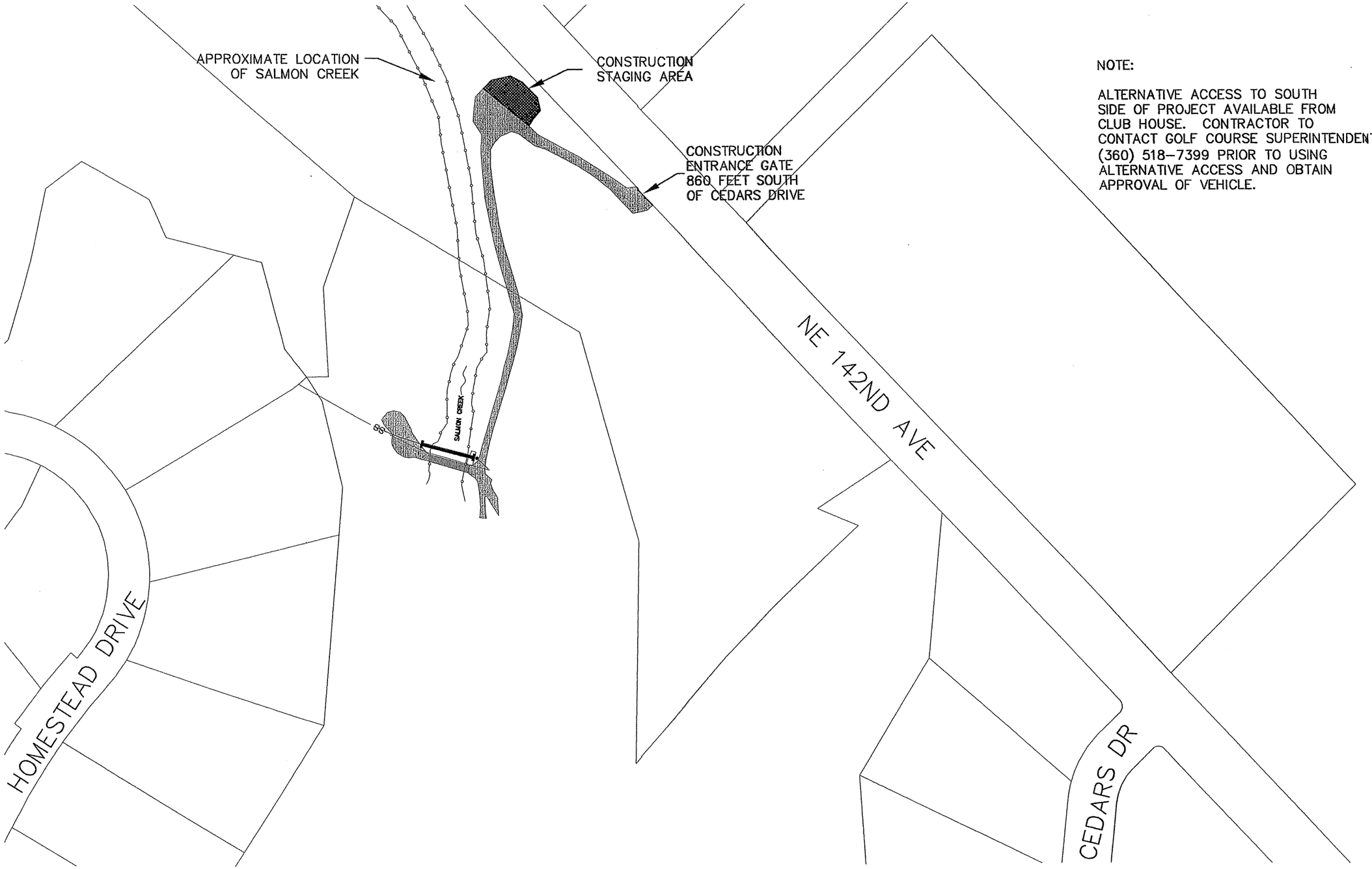
CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070

CITY OF BATTLE GROUND
CEDARS SEWER REPAIR

GRADING
EROSION CONTROL

DESIGNED	ME
DRAWN	CMS
HOR.	1" = 10'
VERT.	NA
DATE	07/21/09
DWG:	EC1
SHEET	3 OF 9

CALL 48 HOURS BEFORE YOU DIG 1-800-553-4344 "It's the Law"
CLARK COUNTY UTILITIES COORDINATED COUNCIL



NOTE:

ALTERNATIVE ACCESS TO SOUTH SIDE OF PROJECT AVAILABLE FROM CLUB HOUSE. CONTRACTOR TO CONTACT GOLF COURSE SUPERINTENDENT (360) 518-7399 PRIOR TO USING ALTERNATIVE ACCESS AND OBTAIN APPROVAL OF VEHICLE.

DESIGNED ME
DRAWN CMS
HOR. 1" = 60'
VERT. NA
DATE 07/21/09
DWG: EC2
SHEET 4 OF 9

CALL 48 HOURS BEFORE YOU DIG 1-800-553-4344 "It's the Law" CLARK COUNTY UTILITIES COORDINATING COUNCIL

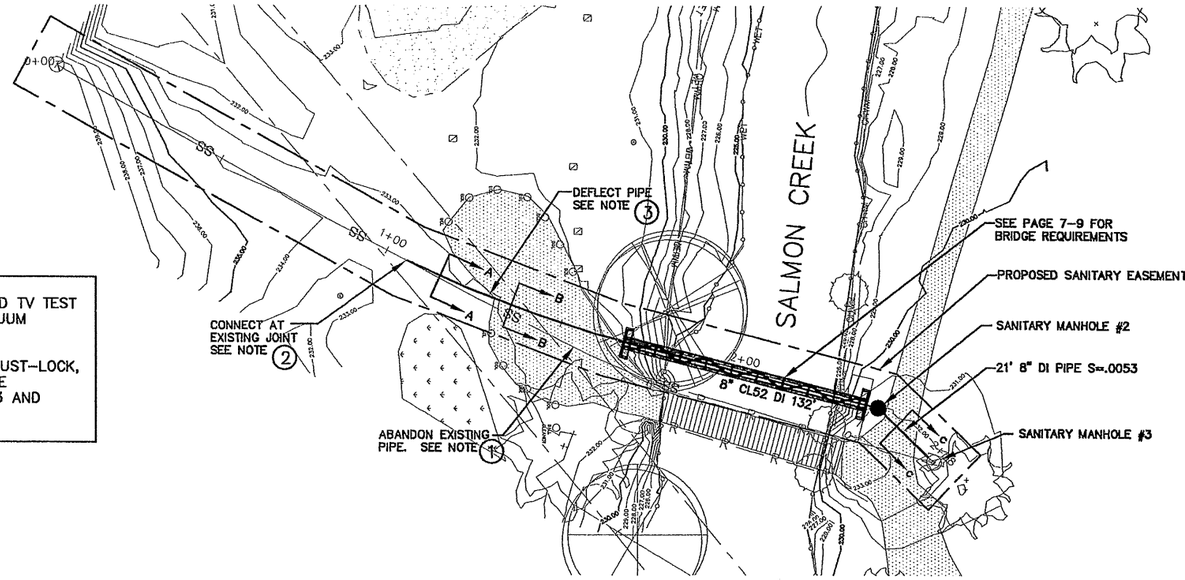
CITY OF BATTLE GROUND
CEDARS SEWER REPAIR

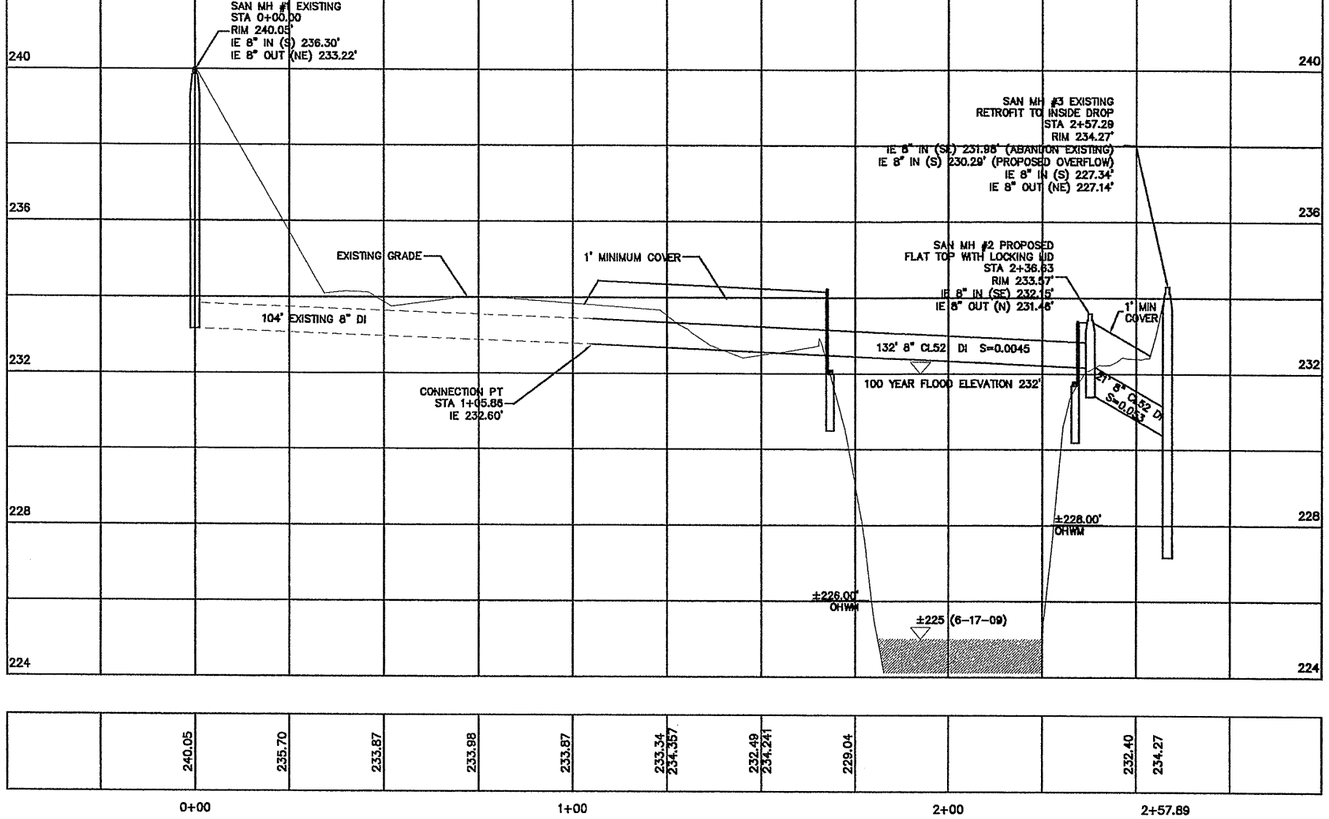
CONSTRUCTION ENTRANCE AND STAGING

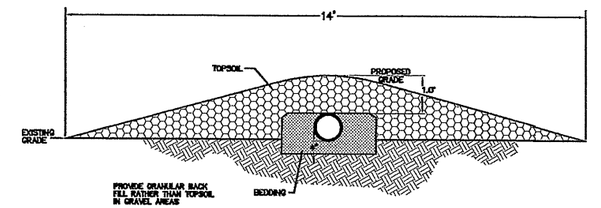
No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070

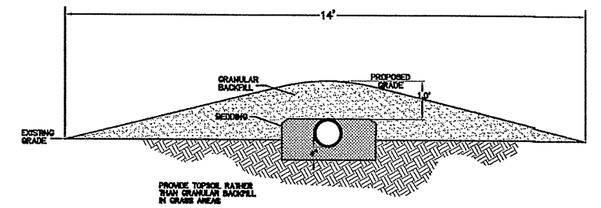
- CONTRACTOR TO AIR TEST AND TV TEST NEW SANITARY LINE AND VACUUM TEST MANHOLE #2.
- SANITARY PIPE SHALL BE THRUST-LOCK, OR APPROVED EQUAL. PROVIDE POLYPROPYLENE WEDGES AT 3 AND 9 O'CLOCK POSTIONS.



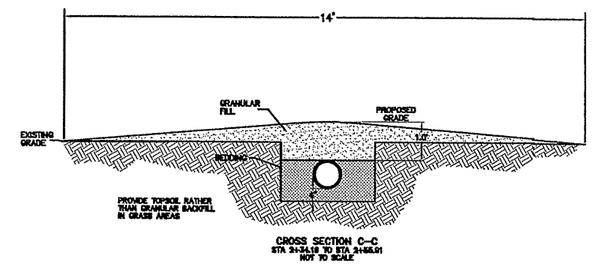




CROSS SECTION A-A
STA 1+40.18 TO STA 1+39.16
NOT TO SCALE



CROSS SECTION B-B
STA 1+34.18 TO STA 1+67.18
NOT TO SCALE



CROSS SECTION C-C
STA 2+34.18 TO STA 2+66.91
NOT TO SCALE

(1) ABANDON EXISTING DI PIPE BETWEEN STA 1+05.86 AND STA 2+57.29. CONTRACTOR TO CLEAN AND TV EXISTING PIPE AND SUBMIT TV RESULTS TO COBG INSPECTOR FOR APPROVAL PRIOR TO ABANDONMENT. PIPE MAY BE REMOVED OR ABANDONED IN PLACE. CONTRACTOR RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH SEWER SPILLAGE DUE TO CONTRACTOR NEGLIGENCE.

(2) CONNECT AT EXISTING JOINT STA 1+05.86 W/ 8"X8" MJ SLEEVE W/ MEGALUG (OR APPROVED EQUAL) RESTRAINT ON BOTH ENDS. CONTRACTOR TO POTHOLE TO VERIFY I.E. AND EVALUATE CONNECTION POINT.

(3) CONTRACTOR TO DEFLECT PIPE SOUTH OF ABUTMENT LOCATED AT STA 1+66.51 TO POINT OF CONNECTION PER MANUFACTURER'S SPECIFICATIONS.

DESIGNED	ME
DRAWN	CMS
HOR.	1" = 20'
VERT.	1" = 2'
DATE	09/28/2009
DWG:	C01
SHEET	5 OF 9

CALL 48 HOURS BEFORE YOU DIG 1-800-553-4344 "It's the Law" CLARK COUNTY UTILITIES COORDINATING COUNCIL

CITY OF BATTLE GROUND CEDARS SEWER REPAIR

SANITARY PLAN PROFILE AND CROSS SECTION

No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070

SANITARY SEWER GENERAL NOTES:

1. ALL MATERIALS AND INSTALLATION OF SANITARY SEWERS SHALL BE IN CONFORMANCE WITH THE LATEST EDITION OF THE "CITY OF BATTLE GROUND CONSTRUCTION STANDARDS" AND THE LATEST EDITION OF THE "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION", HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS", PREPARED BY THE WASHINGTON STATE CHAPTER OF THE AMERICAN PUBLIC WORKS ASSOCIATION (APWA) AND THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, EXCEPT AS NOTED HEREIN OR ON THE STANDARD PLANS.

2. ALL SANITARY SEWER CONSTRUCTION IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY OF BATTLE GROUND, PRIOR TO COVER. THE CONTRACTOR SHALL NOTIFY THE ENGINEERING OFFICE AT LEAST 48 HOURS PRIOR TO THE START OF CONSTRUCTION. A PRE-CONSTRUCTION MEETING IS REQUIRED PRIOR TO THE BEGINNING OF CONSTRUCTION.

3. THE CONTRACTOR IS REQUIRED TO NOTIFY ALL UTILITIES 48 HOURS PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR MAY CONTACT THE UTILITY COORDINATING COUNCIL OF CLARK COUNTY (360-696-4848) IN LIEU OF CONTACTING INDIVIDUAL UTILITIES.

4. LOCAL VARIATIONS IN SLOPE (ie "BELLIES") MUST BE NO MORE THAN ½" IN 8-INCH PIPE, ¾" IN A 10" PIPE, AND 1" IN PIPES 12 INCHES OR GREATER IN DIAMETER. VARIATIONS IN EXCESS OF THESE TOLERANCES MUST BE REPAIRED AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE CITY.

5. ALL PIPE AND FITTINGS SHALL CONFORM TO THE FOLLOWING:

A. CONCRETE PIPE, REINFORCED, SHALL CONFORM TO ASTM C 76, AND SHALL BE OF THE CLASS NOTED ON THE PLANS OR IN THE SPECIAL PROVISIONS.

B. POLYVINYLCHLORIDE (PVC) SEWER PIPE 15" DIAMETER OR LESS SHALL CONFORM TO ASTM D3034, SDR 35 OR ASTM F 789. IT SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PSI. PVC PIPE 16" DIAMETER AND LARGER SHALL CONFORM TO ASTM F 679. ALL PVC PIPE SHALL HAVE AN ELASTOMERIC GASKET AND SHALL BE FURNISHED IN 12-1/2 FOOT LAYING LENGTHS.

C. DUCTILE IRON (DI) PIPE SHALL CONFORM TO ANSI A21.51 OR AWWA C-151, WITH PUSH-ON JOINTS, CLASS-52, UNLESS OTHERWISE NOTED.

6. MANHOLES, CLEANOUTS, SERVICE LATERAL CONNECTIONS, TRENCH EXCAVATION, PIPE BEDDING AND STREET RESTORATION, AND APPURTENANCES SHALL CONFORM TO THE DETAILS SHOWN ON THE STANDARD PLANS. ALL OTHER CONSTRUCTION SHALL CONFORM TO THE LATEST STANDARD DETAILS CONTAINED IN THE "STANDARD PLANS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION".

7. ALL SANITARY MANHOLES INSTALLED WITHIN AN EASEMENT OR OUTSIDE THE CITY RIGHT-OF-WAY SHALL HAVE LOCKING LID COVERS.

8. THE CONTRACTOR SHALL OBTAIN A RIGHT-OF-WAY PERMIT OR APPROVED ENGINEERING PLANS FOR WORK WITHIN THE PUBLIC RIGHT-OF-WAY. THE CONTRACTOR SHALL SUBMIT AN APPROVED TRAFFIC CONTROL PLAN. INSIDE THE CITY THIS PLAN SHALL BE APPROVED BY THE CITY ENGINEER (360-342-5070) AND OUTSIDE THE CITY IT SHALL BE APPROVED BY THE CLARK COUNTY TRAFFIC ENGINEER (397-2446 X 4944). APPROVAL SHALL BE OBTAINED PRIOR TO BEGINNING CONSTRUCTION.

9. ALL PIPES SHALL BE PLUGGED AT THE END OF EACH WORKING DAY.

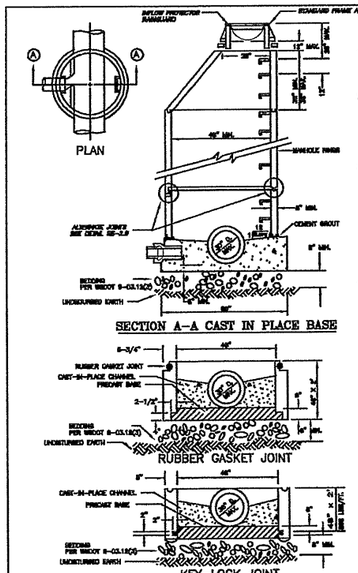
10. ALL TRENCHES SHALL BE FILLED AND COMPACTED UP TIGHT AT THE END OF EACH WORKING DAY.

11. CLEAN OUT REQUIRED @ THE END OF MAIN LINES I.E. FUTURE STUB & CAP

12. PRE-PAVEMENT AS-BUILTS REQUIRED.

SANITARY SEWER GENERAL NOTES		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-1.0
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	CMS	MCH

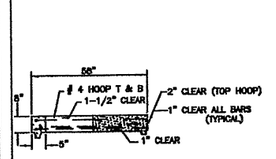


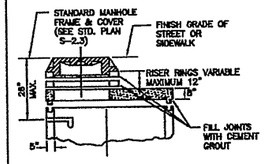
NOTES:

1. ALL PRECAST MANHOLE RINGS AND CONES SHALL CONFORM TO ASTM C-478 WITH CAST IN STEPS.
2. IN OVER EXCAVATED AREAS PROVIDE SUPPORT FOR THE PIPE AS FOLLOWS: PLACE 3/4" MINUS CRUSHED ROCK OVER UNDISTURBED GROUND IN 6" LAYERS AND COMPACT USING HAND TAMPER.
3. BASE CONCRETE SHALL BE 3000 P.S.I., 2-4 IN. SLUMP. FLOW LINES AND INSIDE SURFACES SHALL BE TROWELED SMOOTH & UNIFORM AT TIME OF POUR. MANHOLE BASE MAY BE MONOLITHICALLY CAST TO 6" ABOVE BARREL OF MAIN SEWER. CHANNELS SHALL CONFORM ACCURATELY TO SEWER GRADE. INSTALL BENCHES TO ELEVATION OF SPRINGLINE OF PIPE.
4. CAST-IN-PLACE, NON-CUTTING MANHOLE MAY BE SUBSTITUTED WITH SPECIFIC APPROVAL OF THE ENGINEER.
5. JOINTS SHALL BE CONSTRUCTED SO AS TO BE WATERTIGHT. KENT-SEAL NO. 2 OR APPROVED EQUAL SHALL BE USED ON TONGUE & GROOVE SECTIONS, AND ON RISER RINGS. PREMOLDED "O-RING" MAY BE SUBSTITUTED ON BELL & SPIGOT SECTIONS. ALL JOINTS SHALL BE GROUTED WITH PORTLAND CEMENT CONCRETE GROUT & STRUCK EVEN WITH THE WALL.
6. MANHOLES UNDER 6'-0" IN DEPTH FROM RIM TO SHELF SHALL HAVE A TOP SLAB IN LIEU OF CONE. SEE DETAIL SS-2.1
7. ALL SEWER MANHOLES SHALL BE WRAPPED WITH A HEAT SHRINKABLE SLEEVE SYSTEM, WRAPID SEAL OR APPROVED EQUAL.
8. A WATERTIGHT RAINGUARD IS REQUIRED FOR ALL MANHOLE FRAME/COVERS.
9. WHIRLY GIG © MANHOLE RISER COLLAR SYSTEM MAY BE USED IN PLACE OF RISER RING.

STANDARD PRECAST MANHOLE		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-2.0
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH



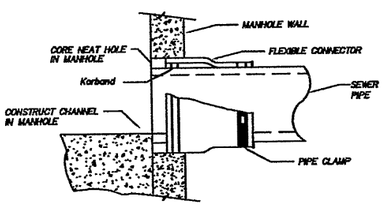


NOTES:

1. ALL PRECAST SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478. ALL POURED IN PLACE CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 3000 P.S.I. & 2" TO 4" SLUMP.
2. ALL REINFORCING SHALL BE GRADE 40 STEEL.
3. MANHOLES UNDER 6'-0" IN DEPTH FROM RIM TO SHELF SHALL HAVE UNIT "MH" TOP SLAB IN LIEU OF CONE.
4. RAINGUARD REQUIRED. SEE DETAIL SS-2.0
5. REFER TO STANDARD DETAIL PLAN SS-2.0 FOR JOINT SEALING REQUIREMENTS.
6. WHIRLY GIG© MANHOLE RISER COLLAR SYSTEM MAY BE USED IN PLACE OF RISER RING.

TOP SLAB FOR STD. PRECAST MANHOLE		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-2.1
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH

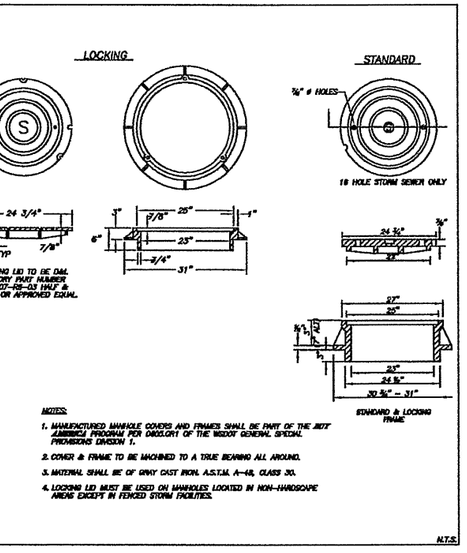


NOTES:

1. CONNECTIONS TO MANHOLE SHALL BE MADE WITH AN APPROVED EXPANSION TYPE RUBBER BOOT; KOR-N-SEAL ® OR SEALTITE ®, (NO FLEX JOINT REQUIRED), FOR ALL PIPES UP TO 15". LARGER PIPES WILL BE HANDLED ON A CASE-BY-CASE BASIS.
2. CORE NEAT HOLE IN MANHOLE AND INSTALL BOOT AS REQUIRED PER MANUFACTURER'S SPECIFICATIONS.
3. STUB-OUTS INSTALLED FOR FUTURE EXTENSIONS ARE TO BE PLUGGED.

STANDARD MANHOLE CONNECTION DETAILS		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-2.2
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH



LOCKING LID TO BE DAL FOUNDRY PART NUMBER A-2107-R8-03 HALF & HALF OR APPROVED EQUAL.

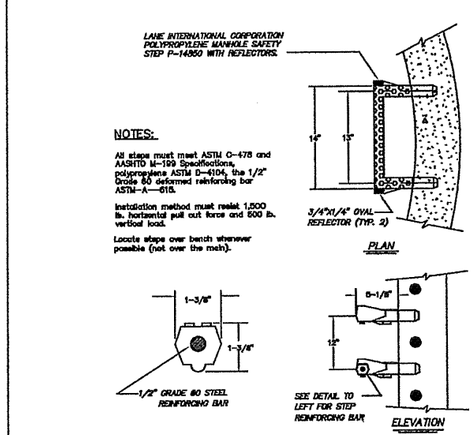
NOTES:

1. MANUFACTURED MANHOLE COVERS AND FRAMES SHALL BE PART OF THE BEST LAMBRICK PROGRAM PER DISCOUNT OF THE WSDOT GENERAL SPECIAL PROVISIONS DIVISION 1.
2. COVER & FRAME TO BE MACHINED TO A TRUE BEARING ALL AROUND.
3. MATERIAL SHALL BE OF GRAY CAST IRON, A.S.T.M. A-48, CLASS 30.
4. LOCKING LID MUST BE USED ON MANHOLES LOCATED IN NON-HARDSCAPE AREAS EXCEPT IN FENCED STORM FACILITIES.

N.T.S.

MANHOLE FRAMES & COVERS		STANDARD DETAIL
CITY OF BATTLE GROUND APPROVED		SS-2.3
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH
4	2/11/08	RMJ	RMJ



NOTES:

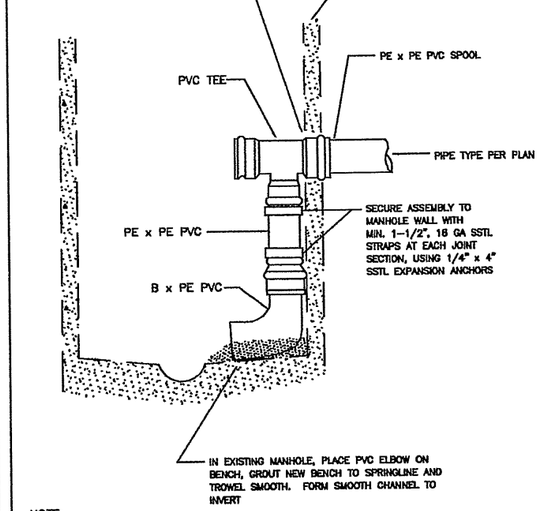
All steps must meet ASTM C-478 and AASHTO M-199 Specifications, polypropylene ASTM D-4104, the 1/2" Grade 60 deformed reinforcing bar ASTM-A-615.

Installation method must resist 1,000 lb. horizontal pull out force and 600 lb. vertical load.

Locate steps over bench wherever possible (not over the main).

STEP DETAIL		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-2.4
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH



NOTE:
1. MAXIMUM ONE ASSEMBLY PER 48" MANHOLE.
2. MUST BE APPROVED BY CITY ENGINEER.

INSIDE DROP MANHOLE CONNECTION		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-2.5
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH

NOTES

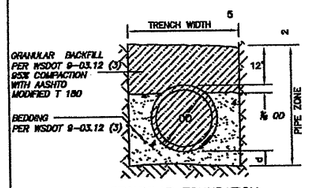
1. WHERE DIRECTED BY THE ENGINEER GRANULAR TRENCH FOUNDATION STABILIZATION SHALL BE PLACED PRIOR TO PLACEMENT OF THE BEDDING, SIZE AND DEPTH ARE DEPENDENT ON SOIL CONDITIONS.
2. BEDDING AND BACKFILL MATERIALS IN THE PIPE ZONE SHALL BE COMPARTED AS SPECIFIED PRIOR TO BACKFILLING THE REMAINDER OF THE TRENCH.

LEGEND:

OD = OUTSIDE DIAMETER
ID = INSIDE DIAMETER
d = DEPTH OF BEDDING MATERIAL BELOW PIPE

DEPTH OF BEDDING MATERIAL BELOW PIPE	
ID	d (min) [3]
27" & SMALLER	4"
LARGER THAN 27"	6"

3. FOR ROCK AND OTHER INCOMPRESSIBLE MATERIALS, THE TRENCH SHALL BE OVER-EXCAVATED A MINIMUM OF 6" AND RE-FILLED WITH GRANULAR MATERIAL AS DIRECTED BY THE ENGINEER.
4. IMPORTED GRANULAR MATERIAL SHALL BE USED FOR UTILITY TRENCH BACKFILL. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST 72 HOURS PRIOR TO USE. THE ENGINEER MAY APPROVE, REJECT, OR REQUIRE LABORATORY TESTING OF THE MATERIAL.
5. TRENCH WIDTH SHALL NOT EXCEED ONE AND ONE-HALF THE INSIDE DIAMETER OF THE PIPE PLUS 18" AT THE TOP OF THE PIPE ZONE.



PIPE BEDDING (RIGID PIPE)		PLAN #
CITY OF BATTLE GROUND APPROVED		SS-4.0
CITY ENGINEER DATE		

REVISIONS:	DATE:	DRAWN:	DESIGNED:
1	8/12/96	BSG	CGH
2	8/30/05	ALL	MCH
3	3/28/07	JMH	MCH

DESIGNED	ME
DRAWN	CMS
HOR.	NA
VERT.	NA
DATE	07/21/2009
DWG:	D01
SHEET	6 OF 9

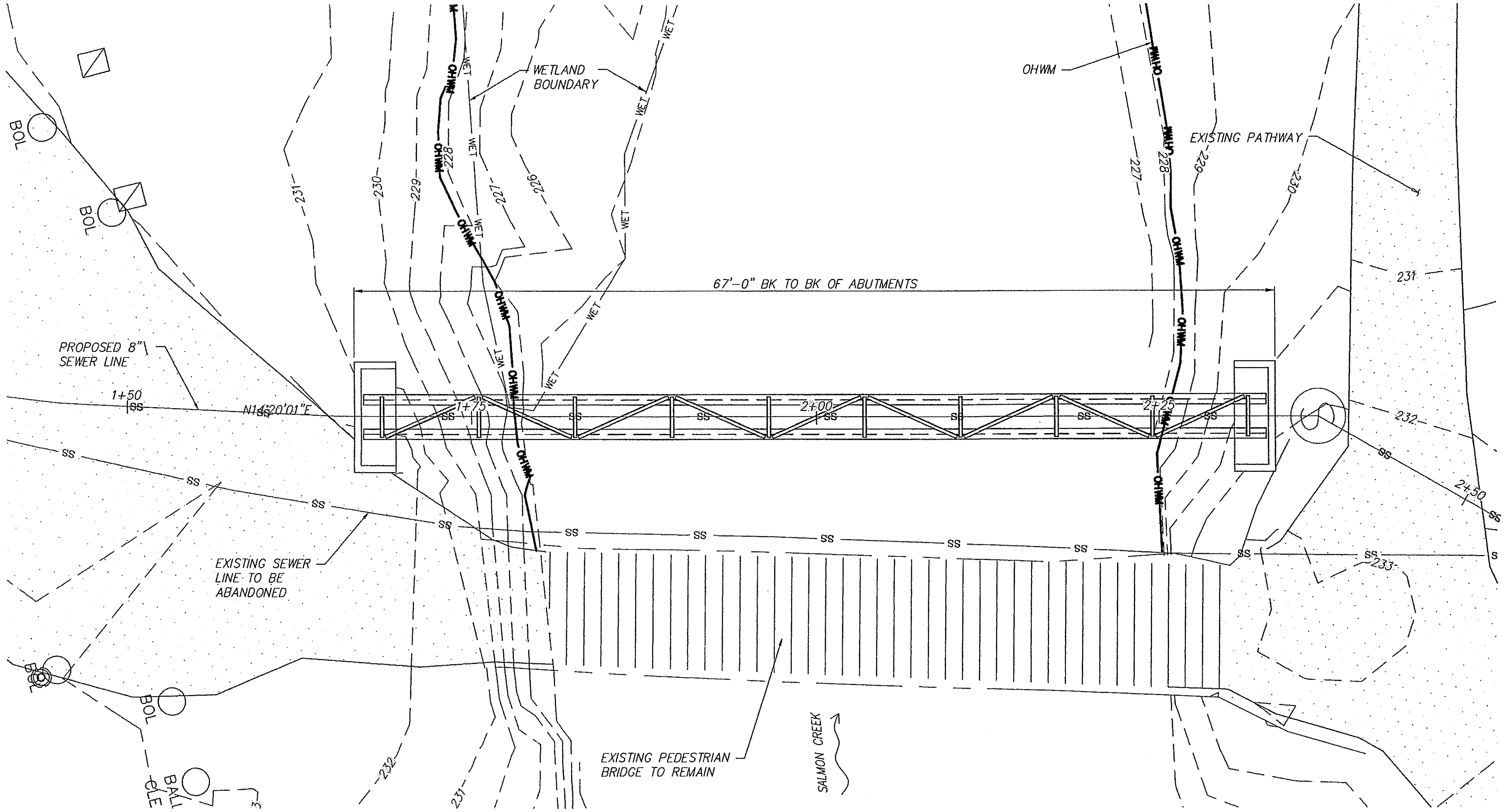
CALL 48 HOURS BEFORE YOU DIG 1-800-553-4344 "It's the Law" CLARK COUNTY UTILITIES COORDINATING COUNCIL

CITY OF BATTLE GROUND
CEDARS SEWER REPAIR

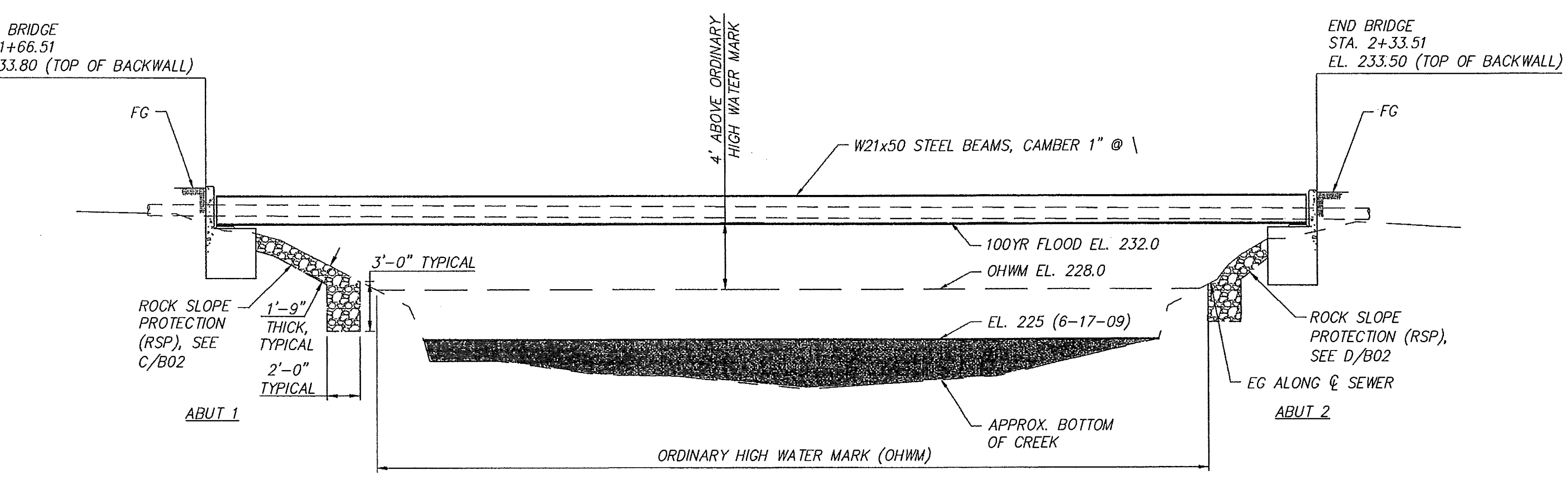
DETAILS

No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070



A/B01 **BRIDGE PLAN**
1"=5'-0"



B/B01 **BRIDGE ELEVATION**
1"=5'-0"

SALMON CREEK CROSSING

GENERAL NOTES

1. ALL MATERIAL AND WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION" 2008 EDITION.
2. BRIDGE HAS BEEN DESIGNED IN ACCORDANCE WITH THE REQUIREMENT FOR LOAD & RESISTANCE FACTOR DESIGN, "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS" 2007, FOURTH EDITION, WITH 2008 INTERIMS.
3. SEISMIC DESIGN CRITERIA:
   ACCELERATION, pga = 0.25g
   SITE FACTOR, Fpga = 1.3
4. MATERIAL SPECIFICATIONS:
   STRUCTURAL STEEL: ANGLES, AASHTO M 270 GR 36
   WIDE FLANGE BEAMS AASHTO M270 GR50.
   ALL STEEL MEMBERS TO BE GALVANIZED PER AASHTO M111
   PIPE ASTM A53 GRADE B.
   BOLTS, NUTS, AND WASHERS: AASHTO M 164 (ASTM A 325) ALL CONNECTION HARDWARE TO BE GALVANIZED PER AASHTO M232
   CONCRETE: CLASS 4000
   REINFORCING BAR: GRADE 60
   ROCK SLOPE PROTECTION: (9-13.1(2) LIGHT LOOSE RIPRAP)
   GEOTEXTILE FILTER FABRIC: US 160NW OR APPROVED EQUAL
5. ALL DIMENSIONS SHOWN ARE MEASURED HORIZONTALLY OR VERTICALLY UNLESS NOTED OTHERWISE.
6. CONTRACTOR TO FIELD VERIFY ALL CONTROLLING DIMENSIONS AND NOTIFY ENGINEER IF ACTUAL CONDITIONS VARY SIGNIFICANTLY FROM THAT SHOWN IN THESE PLANS.
7. ENGINEER TO REVIEW REINFORCING STEEL PRIOR TO PLACEMENT OF CONCRETE.
8. SEE CIVIL PLANS FOR STATION LINE INFORMATION AND BENCHMARK INFORMATION.
9. SEE SHEET G01 FOR LEGEND INFORMATION.

DESIGNED	GD
DRAWN	MS
HOR.	1"=20'
VERT.	1"=5'
DATE	8/03/09
DWG:	B01
SHEET 7	OF 9

CALL 48 HOURS BEFORE YOU DIG
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"It's the Law"
CLARK COUNTY UTILITIES COORDINATING COUNCIL

CITY OF BATTLEGROUND
CEDARS SEWER REPAIR

BRIDGE LAYOUT PLAN

DOUGLAS L. SARKKINEN
STATE OF WASHINGTON
24138
REGISTERED PROFESSIONAL ENGINEER
10-21-09

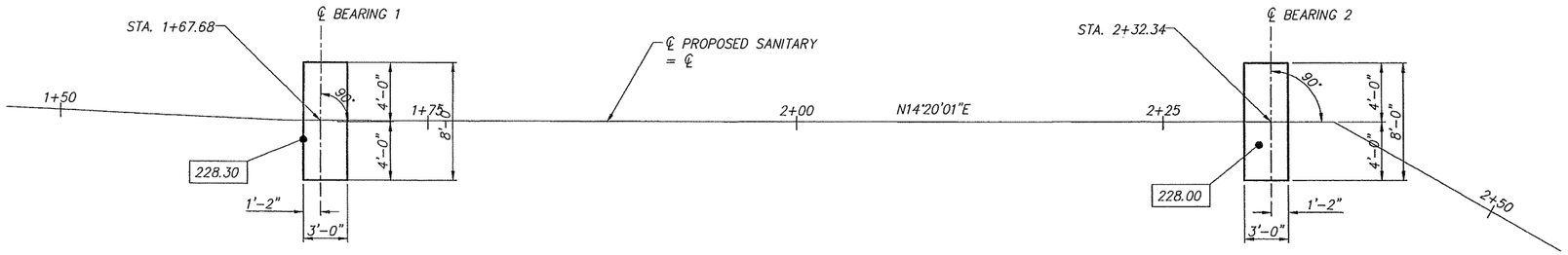
No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070

THE CITY OF BATTLE GROUND

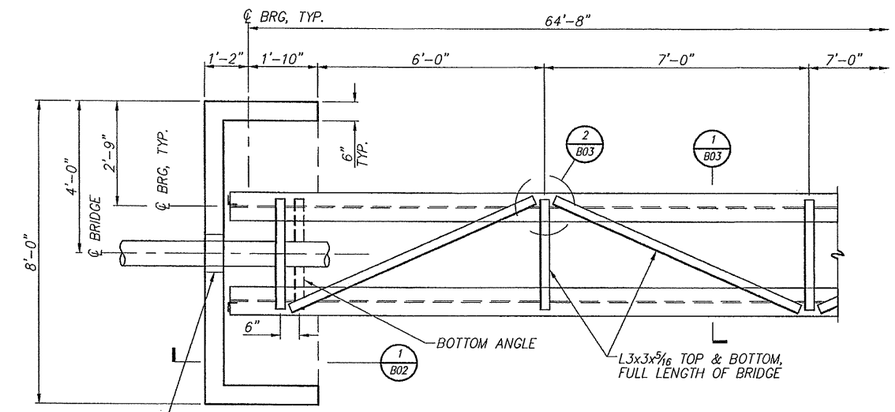
KGA
KRAMER GEHLEN ASSOCIATES
Consulting Engineers Structural/Civil
400 COLUMBIA ST.
SUITE 240
VANC. WA.
98660-3117
360-693-1621
503-289-2661

H: \PROJECT-FILES\2006\06449 - SALMON CREEK SEWER LINE CROSSING\06449A09 - SEWER LINE CROSSING DESIGN AND PERMITTING\AUTOCAD FILES\B1



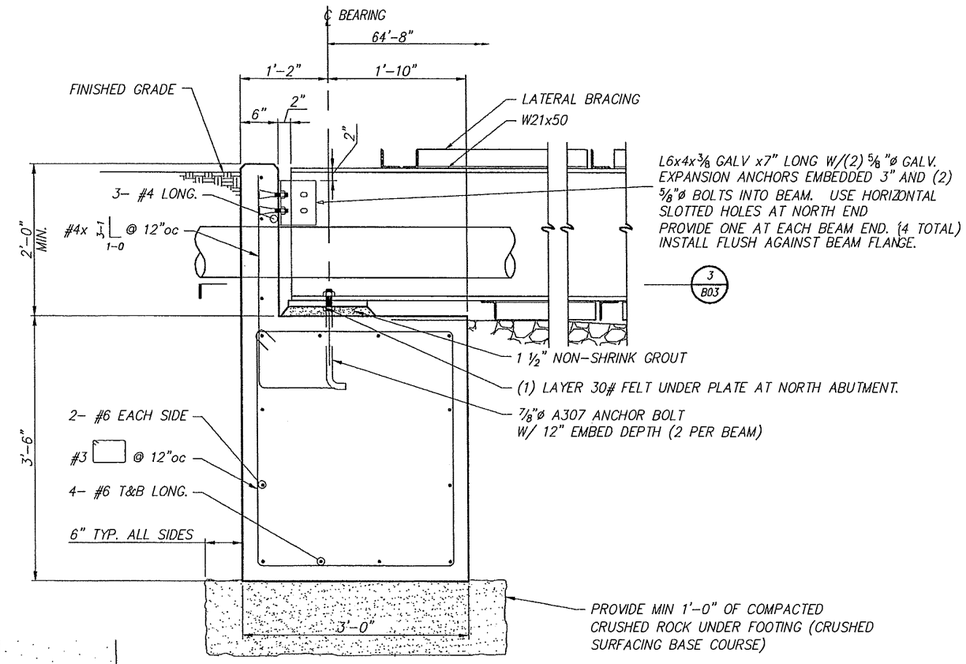
A / B02 FOOTING LAYOUT

1"=5'-0"



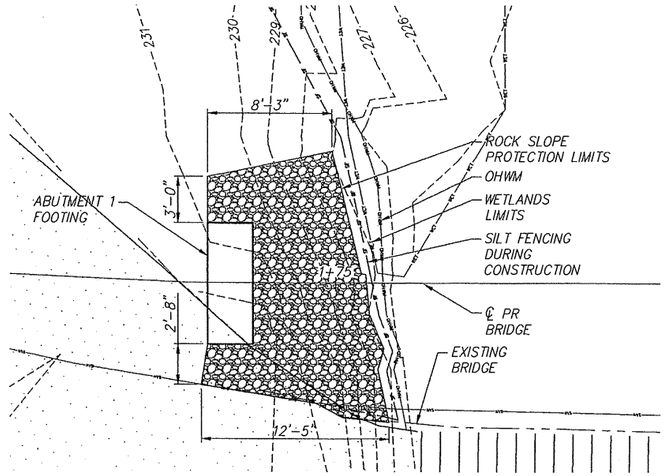
B / B02 ABUTMENT PLAN

1/2"=1'-0"



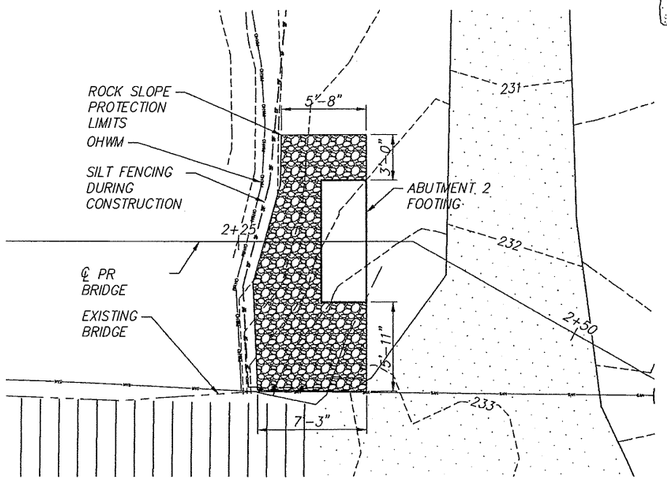
1 / B02 ABUTMENT SECTION

1"=1'-0"



C / B02 ABUT 1 RSP LIMITS

1"=5'-0"



D / B02 ABUT 2 RSP LIMITS

1"=5'-0"

NOTES:

RSP = ROCK SLOPE PROTECTION

RSP TO BE UNDERLAIN BY NON-WOVEN GEOTEXTILE FABRIC

XXX.XX =DENOTES BOTTOM OF FOOTING ELEVATION

KRAMER GEHLEN ASSOCIATES
Consulting Engineers Structural/Civil
100 COLUMBIA ST. SUITE 240 VANC. WA. 98660-3117
360-693-1621
503-289-2661

DESIGNED GD
DRAWN MS
HOR. 1"=20'
VERT. 1"=5'
DATE 8/03/09
DWG: B02
SHEET 8 OF 9

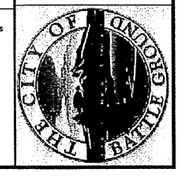
CALL 48 HOURS BEFORE YOU DIG 1-800-553-4344 "It's the Law" CLARK COUNTY UTILITIES COORDINATING COUNCIL

CITY OF BATTLEGROUND
CEDARS SEWER REPAIR

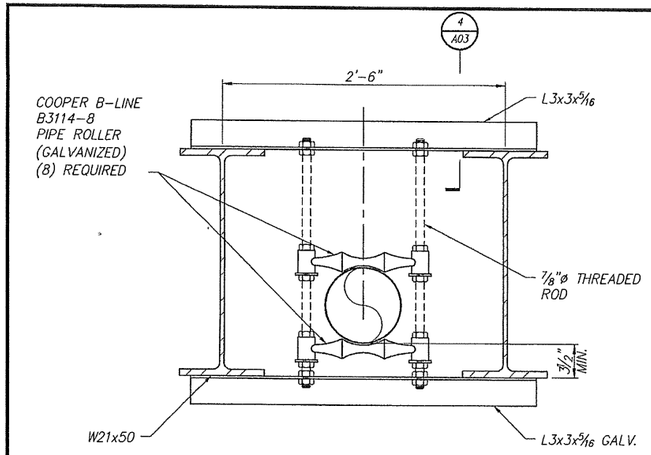
BRIDGE FOUNDATION DETAILS

No.	Revision/Issue	Date

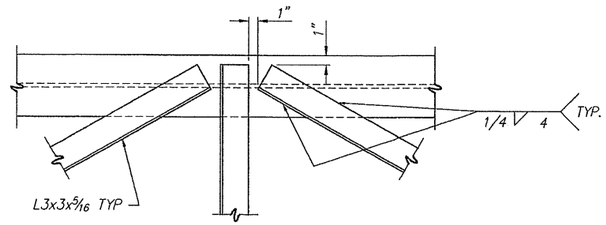
CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070



H:\PROJECT-FILES\2009\06449 - SALMON CREEK SEWER LINE CROSSING\06449A09 - SEWER LINE CROSSING DESIGN AND PERMITTING\AUTOCAD FILES\B2

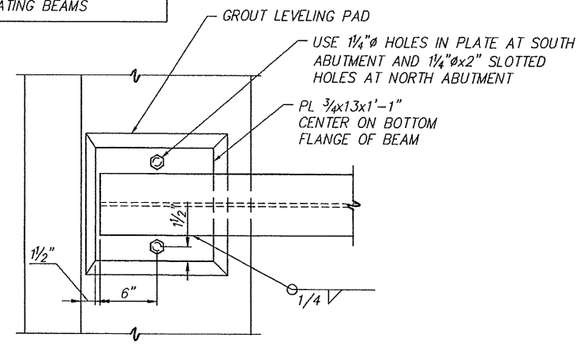


1 / B03 **BRIDGE SECTION**
1-1/2"=1'-0"

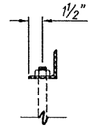


2 / B03 **CONNECTION DETAIL**
1-1/2"=1'-0"

NOTE: FIELD MEASURE ANCHOR BOLT LOCATIONS BEFORE DRILLING AND FABRICATING BEAMS



3 / B03 **CONNECTION DETAIL**
1-1/2"=1'-0"



4 / B03 **ANGLE SECTION**
1-1/2"=1'-0"

DESIGNED	GD
DRAWN	MS
HOR.	AS SHOWN
VERT.	AS SHOWN
DATE	8/03/09
DWG:	B03
SHEET	9 OF 9

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CITY OF BATTLEGROUND CEDARS SEWER REPAIR

BRIDGE DETAILS

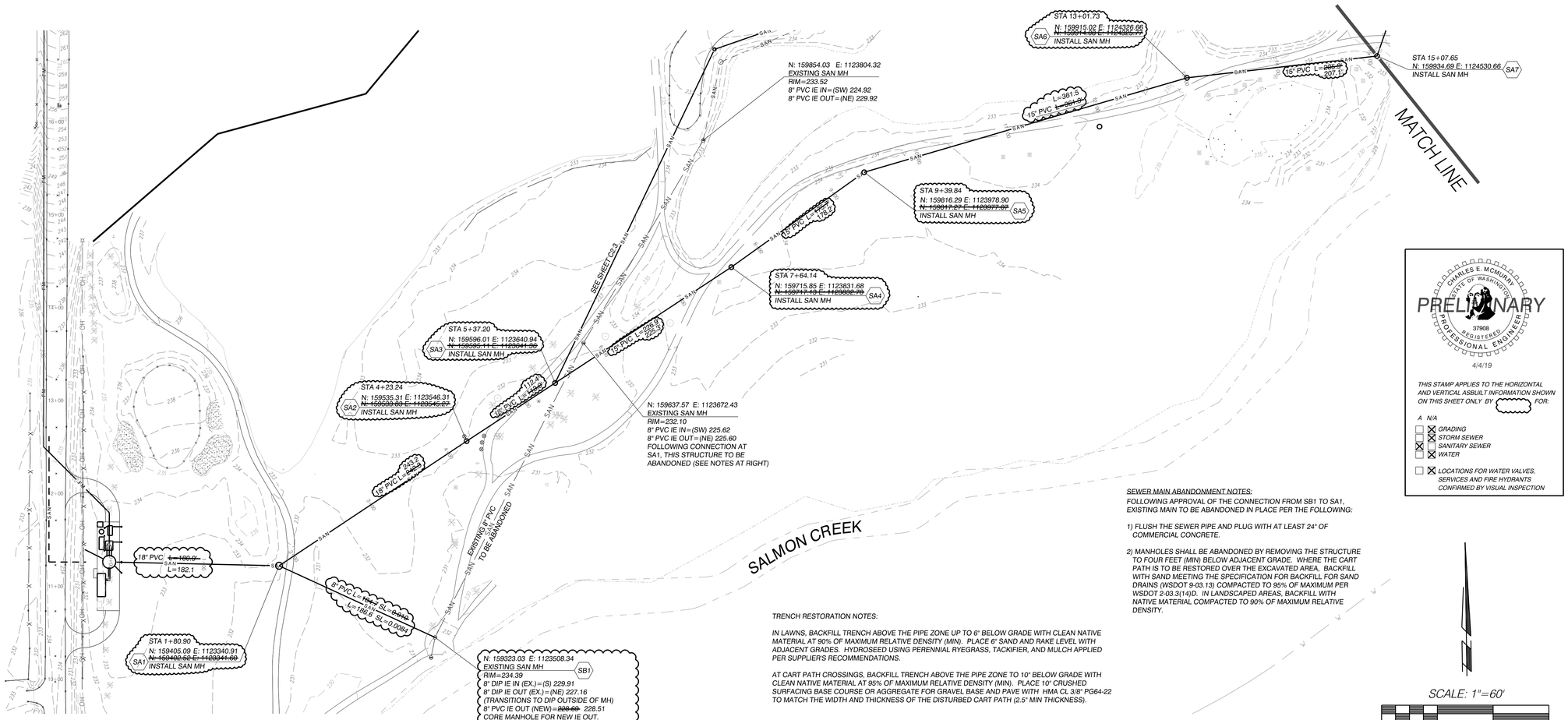
DOUGLAS L. SARKINEN — STATE OF WASHINGTON — EXPIRATION DATE — REGISTERED PROFESSIONAL ENGINEER — 10-14-09

No.	Revision/Issue	Date

CITY OF BATTLE GROUND
109 S.W. 1ST. STREET
SUITE 122
BATTLE GROUND, WA. 98604
MARIT ERNST, EIT-PROJECT MANAGER
ENGINEERING 360-342-5070

THE CITY OF BATTLE GROUND

KGA KRAMER GEHLEN ASSOCIATES
Consulting Engineers
Structural/Civil
400 COLUMBIA ST.
SUITE 240
VANC. WA.
98660-3117
360-693-1621
503-289-2661



SEWER MAIN ABANDONMENT NOTES:

FOLLOWING APPROVAL OF THE CONNECTION FROM SB1 TO SA1, EXISTING MAIN TO BE ABANDONED IN PLACE PER THE FOLLOWING:

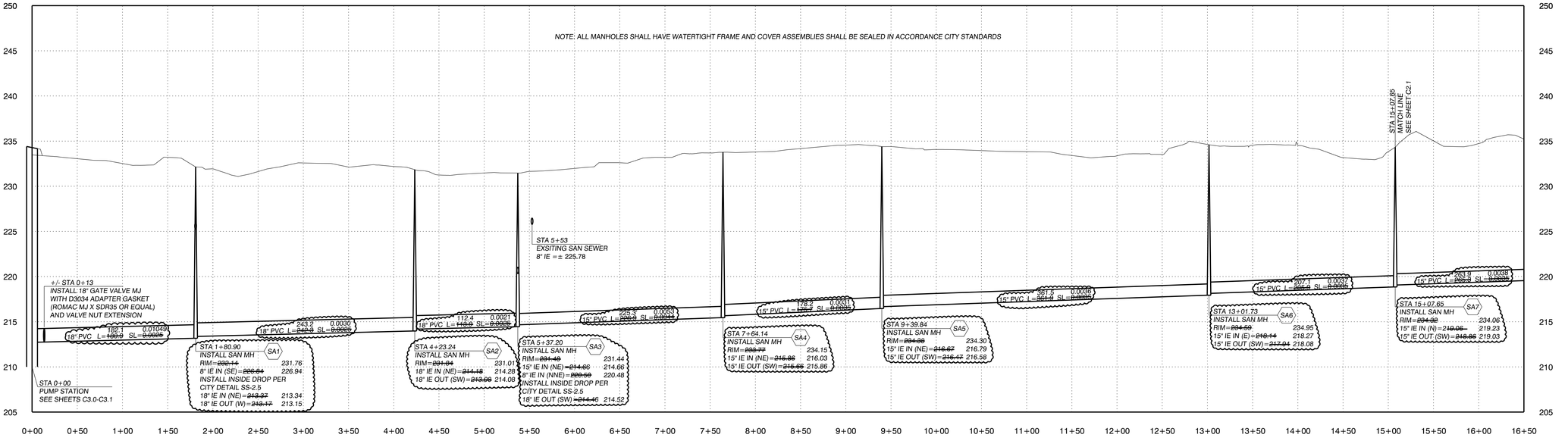
1) FLUSH THE SEWER PIPE AND PLUG WITH AT LEAST 24" OF COMMERCIAL CONCRETE.

2) MANHOLES SHALL BE ABANDONED BY REMOVING THE STRUCTURE TO FOUR FEET (MIN) BELOW ADJACENT GRADE. WHERE THE CART PATH IS TO BE RESTORED OVER THE EXCAVATED AREA, BACKFILL WITH SAND MEETING THE SPECIFICATION FOR BACKFILL FOR SAND DRAINS (WSDOT 9-03.13) COMPACTED TO 95% OF MAXIMUM PER WSDOT 2-03.3(14)D. IN LANDSCAPED AREAS, BACKFILL WITH NATIVE MATERIAL COMPACTED TO 90% OF MAXIMUM RELATIVE DENSITY.

TRENCH RESTORATION NOTES:

IN LAWNS, BACKFILL TRENCH ABOVE THE PIPE ZONE UP TO 6" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 90% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 6" SAND AND RAKE LEVEL WITH ADJACENT GRADES. HYDROSEED USING PERENNIAL RYEGRASS, TACKIFIER, AND MULCH APPLIED PER SUPPLIER'S RECOMMENDATIONS.

AT CART PATH CROSSINGS, BACKFILL TRENCH ABOVE THE PIPE ZONE TO 10" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 95% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 10" CRUSHED SURFACING BASE COURSE OR AGGREGATE FOR GRAVEL BASE AND PAVE WITH HMA CL 3/8" PG64-22 TO MATCH THE WIDTH AND THICKNESS OF THE DISTURBED CART PATH (2.5" MIN THICKNESS).



CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
EMAIL: tim@ralstoninvestments.com

AS-BUILT

PLAN AND PROFILE FOR:

CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9606

CHARLES E. MCMURRY
STATE OF WASHINGTON
37908
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
4/4/19

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY ( ) FOR:

A	N/A	
☐	☒	*GRADING*
☐	☒	*STORM SEWER*
☒	☐	*SANITARY SEWER*
☐	☒	*WATER*
☐	☒	*LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION*

CHARLES E. MCMURRY
STATE OF WASHINGTON
37908
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
4/15/19

CHANGES / REVISIONS

DESCRIPTION:	DATE:
SA4 IEs, GRADE SA4-SA3	10/02/17

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

SCALE: H: 1"=60'
V:

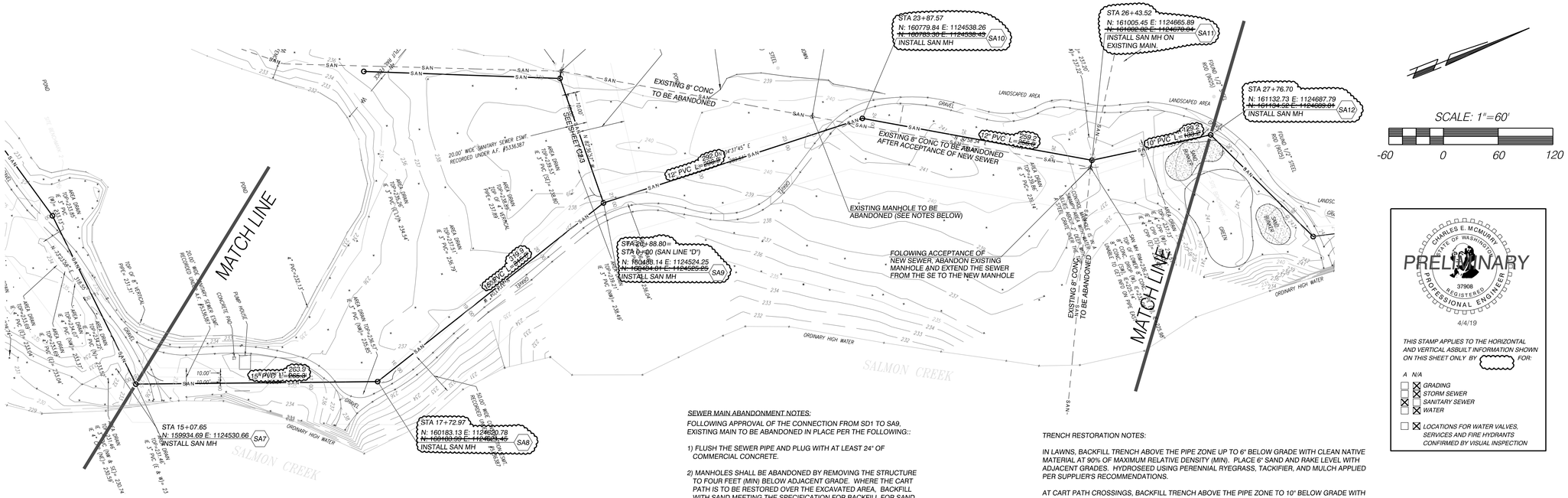
CEDARS LANDING
OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C2.0

J:\data\8000\8900\8950\8959\Engineering\Final\PS\As-Built\8959.e.C2.0.AB.dgn
M:\MicroStation V8\pen tables\OCE table setup\OCE sanitary.tbl



SEWER MAIN ABANDONMENT NOTES:

FOLLOWING APPROVAL OF THE CONNECTION FROM SD1 TO SA9, EXISTING MAIN TO BE ABANDONED IN PLACE PER THE FOLLOWING::

1) FLUSH THE SEWER PIPE AND PLUG WITH AT LEAST 24" OF COMMERCIAL CONCRETE.

2) MANHOLES SHALL BE ABANDONED BY REMOVING THE STRUCTURE TO FOUR FEET (MIN) BELOW ADJACENT GRADE. WHERE THE CART PATH IS TO BE RESTORED OVER THE EXCAVATED AREA, BACKFILL WITH SAND MEETING THE SPECIFICATION FOR BACKFILL FOR SAND DRAINS (WSDOT 9-03.13) COMPACTED TO 95% OF MAXIMUM PER WSDOT 2-03.3(14)D. IN LANDSCAPED AREAS, BACKFILL WITH NATIVE MATERIAL COMPACTED TO 90% OF MAXIMUM RELATIVE DENSITY.

TRENCH RESTORATION NOTES:

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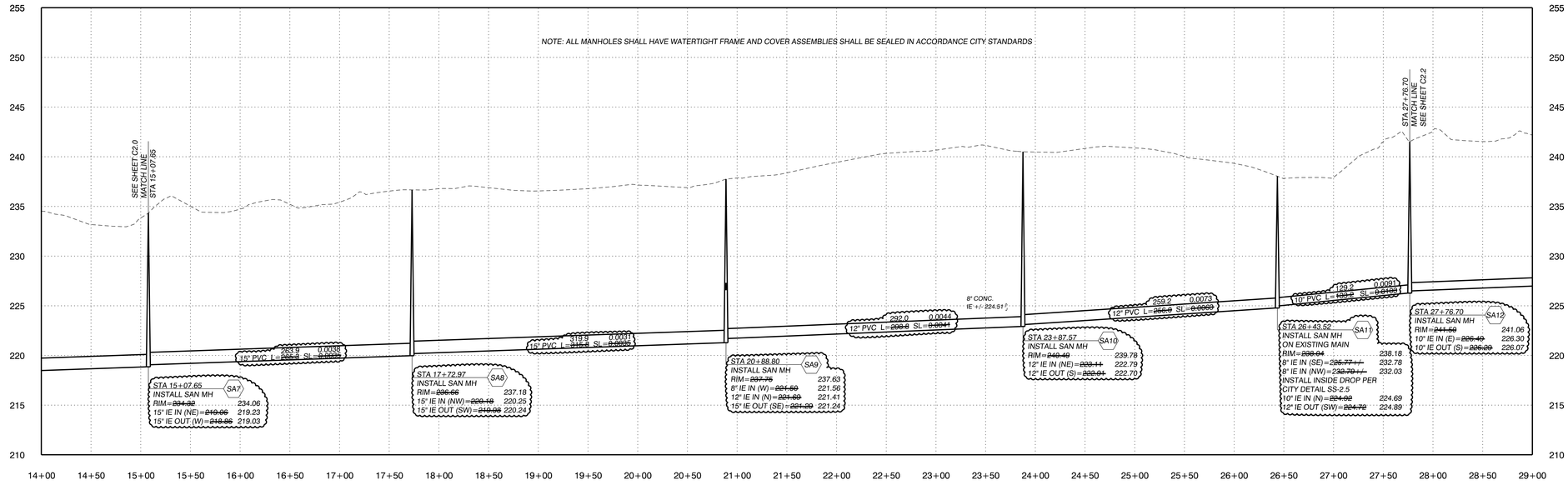
AT CART PATH CROSSINGS, BACKFILL TRENCH ABOVE THE PIPE ZONE TO 10" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 95% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 10" CRUSHED SURFACING BASE COURSE OR AGGREGATE FOR GRAVEL BASE AND PAVE WITH HMA CL 3/8" PG64-22 TO MATCH THE WIDTH AND THICKNESS OF THE DISTURBED CART PATH (2.5" MIN THICKNESS).



CHARLES E. MCMURRY
STATE OF WASHINGTON
37906
REGISTERED
PROFESSIONAL ENGINEER
PRELIMINARY
4/4/19

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY. BY FOR:

A	N/A
☐	☒ GRADING
☐	☒ STORM SEWER
☒	☐ SANITARY SEWER
☐	☒ WATER
☐	☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
EMAIL: tim@ralstoninvestments.com

AS-BUILT

PLAN AND PROFILE FOR:

CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9696

CHARLES E. MCMURRY
STATE OF WASHINGTON
37906
REGISTERED
PROFESSIONAL ENGINEER
PRELIMINARY
4/4/19

CHANGES / REVISIONS	
DESCRIPTION:	DATE:
GRADES SD1 TO SA9	12/13/17

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

SCALE: H: 1"=60'
V: 1"=6'

CEDARS LANDING
OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C2.1

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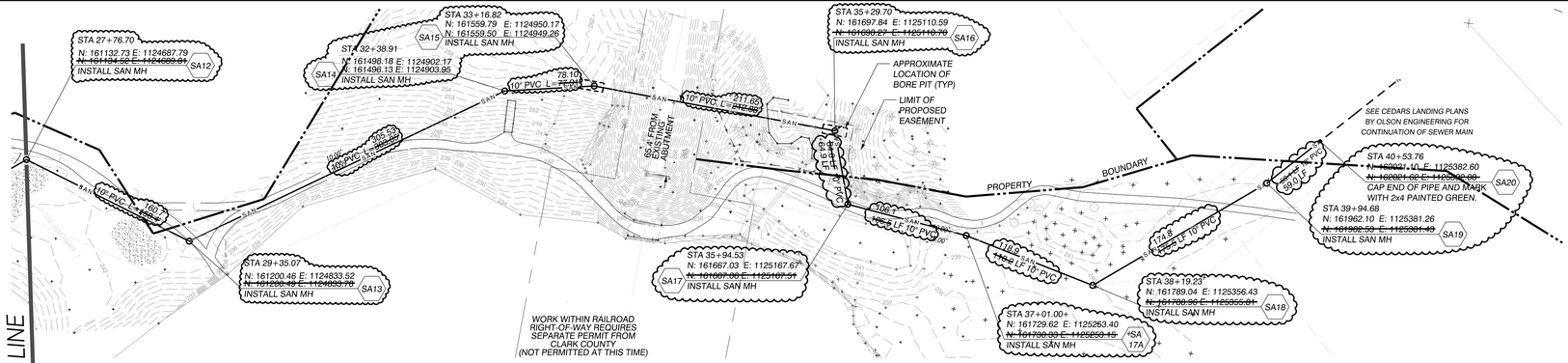
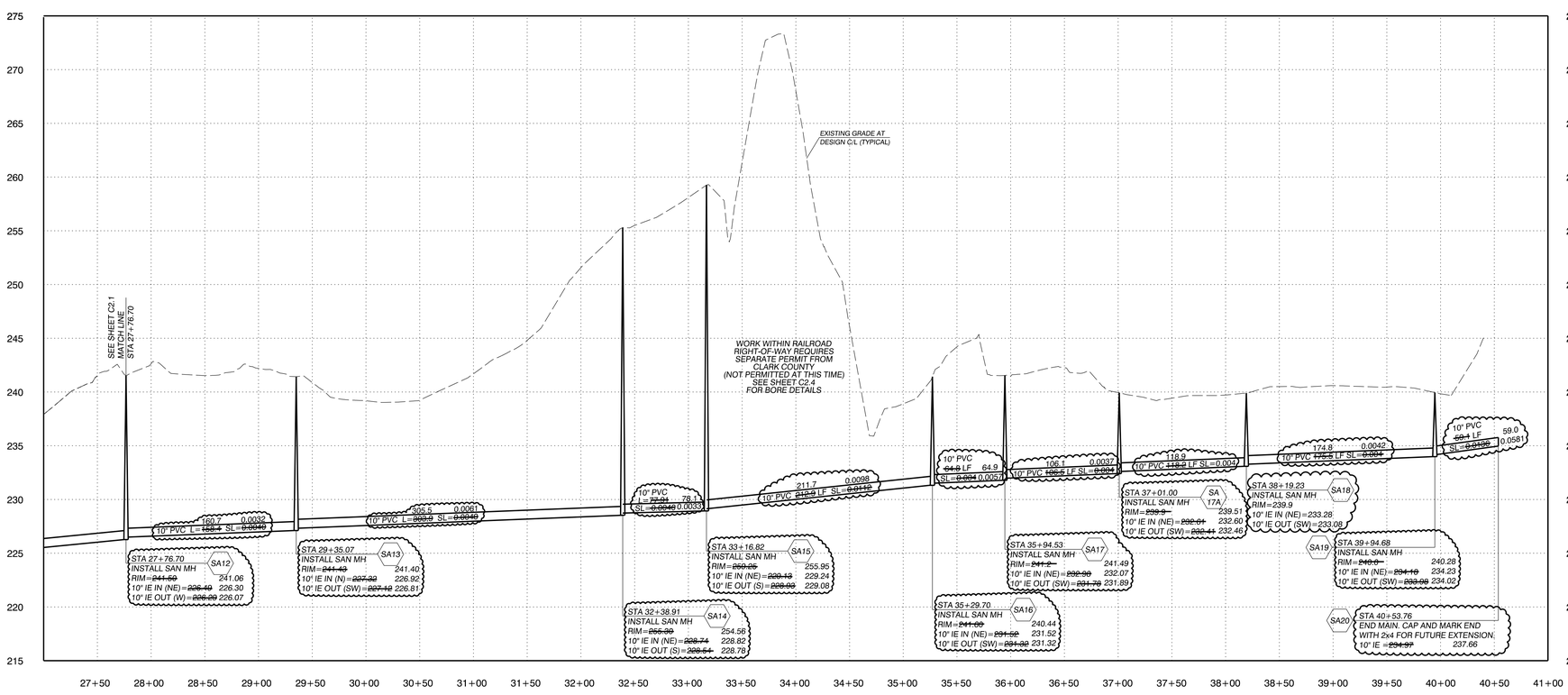


TRENCH RESTORATION NOTES:

IN LAWNS, BACKFILL TRENCH ABOVE THE PIPE ZONE UP TO 6" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 90% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 6" SAND AND RAKE LEVEL WITH ADJACENT GRADES. HYDROSEED USING PERENNIAL RYEGRASS, TACKIFIER, AND MULCH APPLIED PER SUPPLIER'S RECOMMENDATIONS.

AT CART PATH CROSSINGS, BACKFILL TRENCH ABOVE THE PIPE ZONE TO 10" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 95% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 10" CRUSHED SURFACING BASE COURSE OR AGGREGATE FOR GRAVEL BASE AND PAVE WITH HMA CL 3/8" PG64-22 TO MATCH THE WIDTH AND THICKNESS OF THE DISTURBED CART PATH (2.5" MIN THICKNESS).



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CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
EMAIL: tim@ralstoninvestments.com

AS-BUILT

PLAN AND PROFILE FOR:

CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9936

CHARLES E. MCMURRY — STATE OF WASHINGTON — 37908 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY

4/4/19

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY ( ) FOR:

A N/A

- ☐ ☒ *GRADING*
- ☐ ☒ *STORM SEWER*
- ☒ ☒ *SANITARY SEWER*
- ☐ ☒ *WATER*
- ☐ ☒ *LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION*

CHARLES E. MCMURRY — STATE OF WASHINGTON — 37908 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY

4/4/19

CHANGES / REVISIONS

DESCRIPTION:	DATE:
REALIGN RAILROAD BORE	12/4/17
REALIGN RAILROAD BORE	5/21/18

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

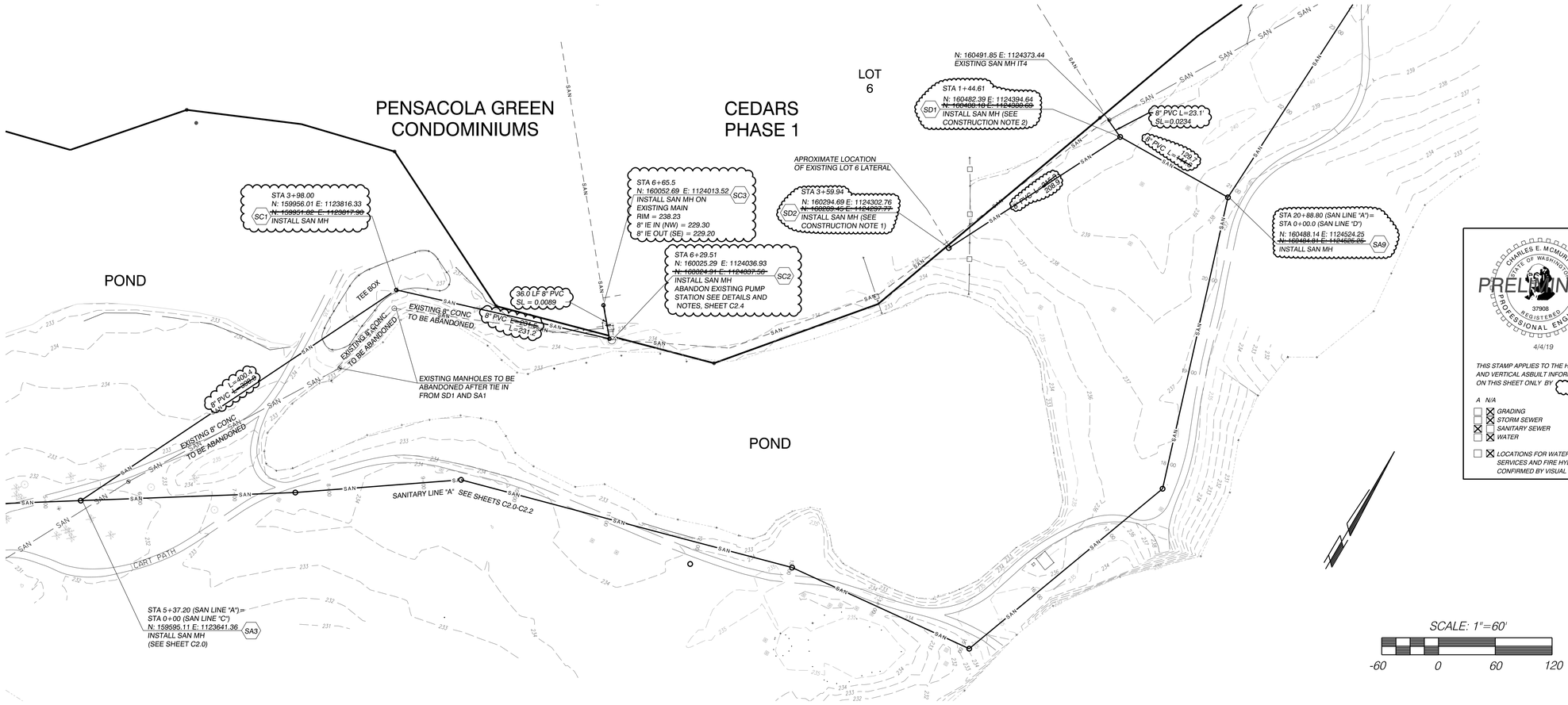
SCALE: H: 1"=60'
V: 1"=6'

CEDARS LANDING
OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C2.2



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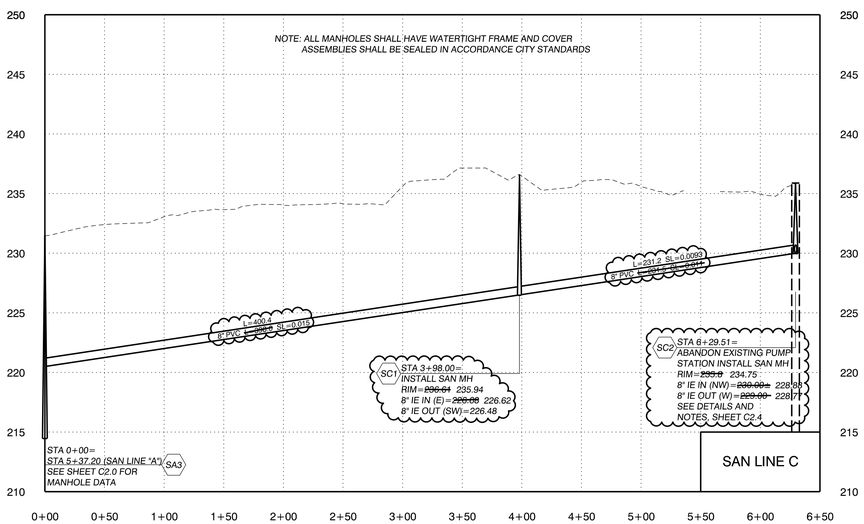

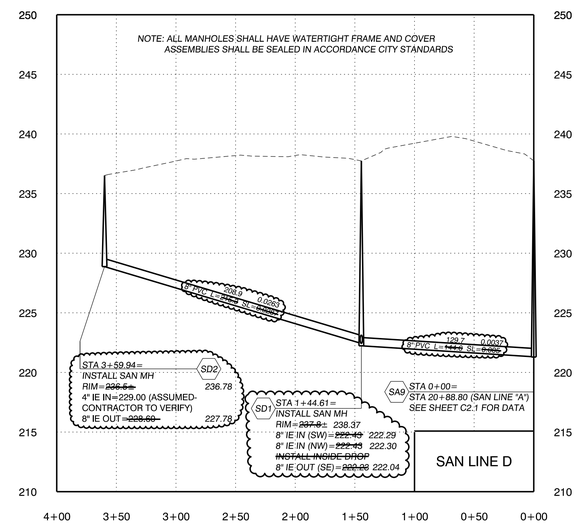

CHARLES E. MCMURRY STATE OF WASHINGTON 37908 REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
4/4/19

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A N/A
- ☐ ☒ GRADING
- ☐ ☒ STORM SEWER
- ☒ ☐ SANITARY SEWER
- ☐ ☒ WATER

☐ ☒ LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION

CONSTRUCTION NOTES:

1) CONTRACTOR TO LOCATE EXSITING LATERAL TO LOT 6 NEAR SD2 AND CONFIRM LOCATION AND DEPTH, THEN ADJUST MANHOLE LOCATION AND INVERT ELEVATION TO MATCH . INSTALL SANITARY MANHOLE AND CONNECT EXISTING LATERAL AFTER ACCEPTANCE OF MAIN FROM SD2 TO PUMP STATION.

2) FOLLOWING ACCEPTANCE OF MAIN FROM SA9 TO PUMP STATION, EXTEND NEW 8" MAIN TO IT4 AND RECHANNEL TO DIRECT SEWAGE TO NEW LINE. ABANDON EXISTING MAINS NORTH AND SOUTH AFTER ALL NEW MAIN IS CONSTRUCTED AND REROUTING OF EXISTING SEWAGE IS COMPLETE.

SEWER MAIN ABANDONMENT NOTES:

FOLLOWING APPROVAL OF THE CONNECTIONS FROM SC2 TO SA3 AND FROM SD2 TO SA9, EXISTING SEWERS TO BE ABANDONED IN PLACE BY:

1) FLUSH THE SEWER PIPE AND PLUG WITH AT LEAST 24" OF COMMERCIAL CONCRETE.

2) MANHOLES SHALL BE ABANDONED BY REMOVING THE STRUCTURE TO FOUR FEET (MIN) BELOW ADJACENT GRADE. WHERE THE CART PATH IS TO BE RESTORED OVER THE EXCAVATED AREA, BACKFILL WITH SAND MEETING THE SPECIFICATION FOR BACKFILL FOR SAND DRAINS (WSDOT 9-03.13) COMPACTED TO 95% OF MAXIMUM PER WSDOT 2-03.3(14)D. IN LANDSCAPED AREAS, BACKFILL WITH NATIVE MATERIAL COMPACTED TO 90% OF MAXIMUM RELATIVE DENSITY.

TRENCH RESTORATION NOTES:

IN LAWNS, BACKFILL TRENCH ABOVE THE PIPE ZONE UP TO 6" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 90% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 6" SAND AND RAKE LEVEL WITH ADJACENT GRADES. HYDROSEED USING PERENNIAL RYEGRASS, TACKIFIER, AND MULCH APPLIED PER SUPPLIER'S RECOMMENDATIONS.

AT CART PATH CROSSINGS, BACKFILL TRENCH ABOVE THE PIPE ZONE TO 10" BELOW GRADE WITH CLEAN NATIVE MATERIAL AT 95% OF MAXIMUM RELATIVE DENSITY (MIN). PLACE 10" CRUSHED SURFACING BASE COURSE OR AGGREGATE FOR GRAVEL BASE AND PAVE WITH HMA CL 3/8" PG64-22 TO MATCH THE WIDTH AND THICKNESS OF THE DISTURBED CART PATH (2.5" MIN THICKNESS).

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CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
EMAIL: tim@ralstoninvestments.com

AS-BUILT

PLAN AND PROFILE FOR:

CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360-695-1385
503-289-9696

CHARLES E. MCMURRY STATE OF WASHINGTON 37908 REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY
4/4/19

CHANGES / REVISIONS

DESCRIPTION:	DATE:
SC1 GRADES	10/02/17

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

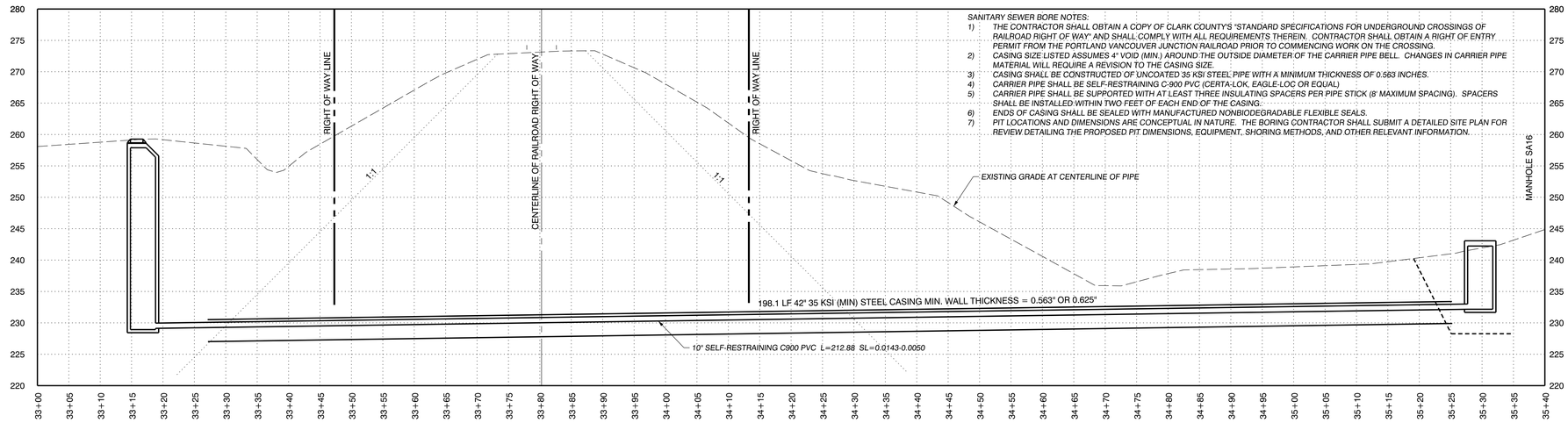
SCALE: H: 1"=60'

CEDARS LANDING OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C2.3



SANITARY SEWER BORE NOTES:

1) *THE CONTRACTOR SHALL OBTAIN A COPY OF CLARK COUNTY'S "STANDARD SPECIFICATIONS FOR UNDERGROUND CROSSINGS OF RAILROAD RIGHT OF WAY" AND SHALL COMPLY WITH ALL REQUIREMENTS THEREIN. CONTRACTOR SHALL OBTAIN A RIGHT OF ENTRY PERMIT FROM THE PORTLAND VANCOUVER JUNCTION RAILROAD PRIOR TO COMMENCING WORK ON THE CROSSING.*
2) *CASING SIZE LISTED ASSUMES 4" VOID (MIN.) AROUND THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL. CHANGES IN CARRIER PIPE MATERIAL WILL REQUIRE A REVISION TO THE CASING SIZE.*
3) *CASING SHALL BE CONSTRUCTED OF UNCOATED 35 KSI STEEL PIPE WITH A MINIMUM THICKNESS OF 0.563 INCHES.*
4) *CARRIER PIPE SHALL BE SELF-RESTRAINING C-900 PVC (CERTA-LOK, EAGLE-LOC OR EQUAL)*
5) *CARRIER PIPE SHALL BE SUPPORTED WITH AT LEAST THREE INSULATING SPACERS PER PIPE STICK (8' MAXIMUM SPACING). SPACERS SHALL BE INSTALLED WITHIN TWO FEET OF EACH END OF THE CASING.*
6) *ENDS OF CASING SHALL BE SEALED WITH MANUFACTURED NONBIODEGRADABLE FLEXIBLE SEALS.*
7) *PIT LOCATIONS AND DIMENSIONS ARE CONCEPTUAL IN NATURE. THE BORING CONTRACTOR SHALL SUBMIT A DETAILED SITE PLAN FOR REVIEW DETAILING THE PROPOSED PIT DIMENSIONS, EQUIPMENT, SHORING METHODS, AND OTHER RELEVANT INFORMATION.*

RAILROAD BORE DETAILS AND NOTES

CHARLES E. MCMURRY — STATE OF WASHINGTON — 37908 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY

4/4/19

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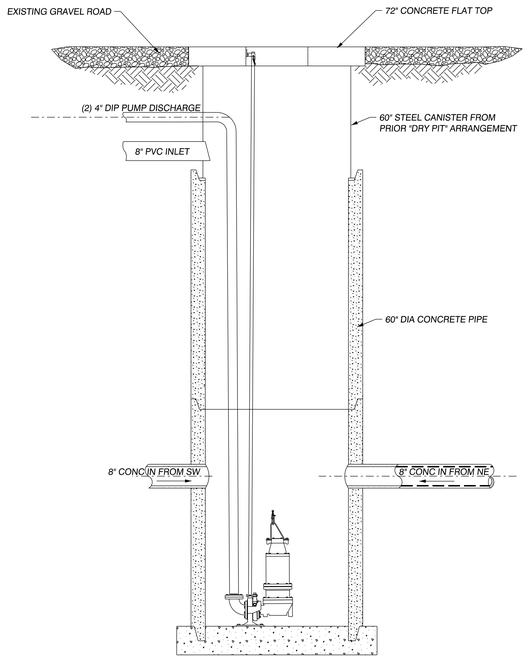
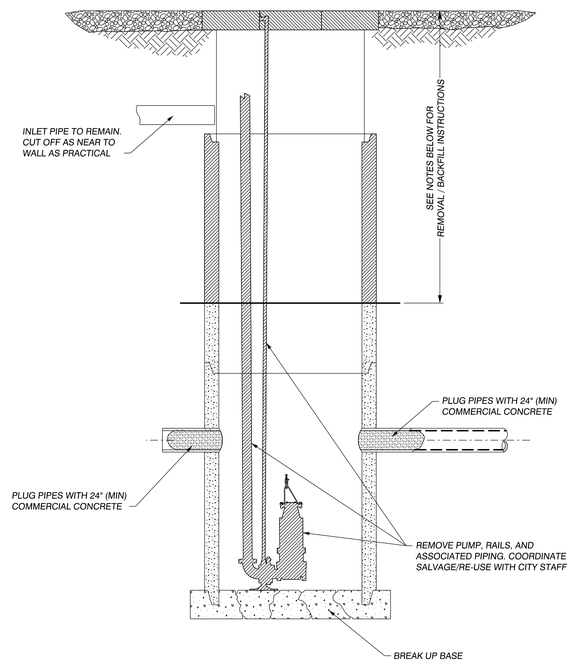
- ☐ ☒ *LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION*



EXISTING CONDITION

NTS

NOTE:
ELEMENTS SHOWN HAVE BEEN ROTATED FROM THEIR TRUE POSITION FOR CLARITY. SEE PLAN VIEW FOR CURRENT ORIENTATION



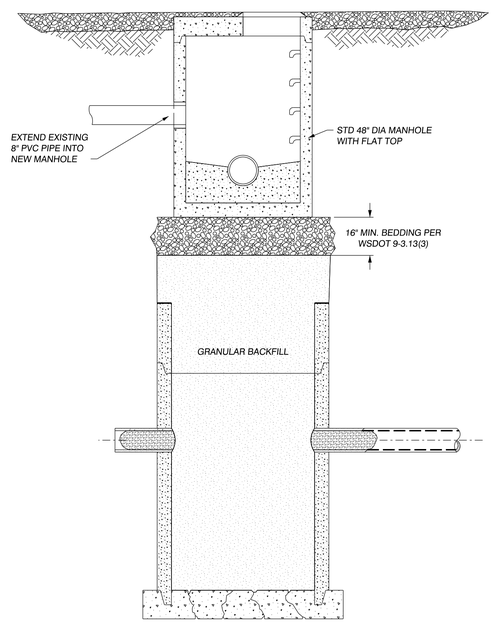
DEMOLITION PHASE

NTS

NOTES:
REMOVE / DEMOLISH WET WELL TO A POINT AT LEAST 3' BELOW THE PROPOSED MANHOLE BASE.

FILL WITH FREE DRAWING GRANULAR BACKFILL.

CONTRACTOR TO SUBMIT PREFERRED MATERIAL FOR ENGINEER'S APPROVAL PRIOR TO PLACEMENT.



MANHOLE CONSTRUCTION PHASE

NTS

PUMP STATION ABANDONMENT DETAILS

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CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
EMAIL: tim@ralstoninvestments.com

RAILROAD BORE AND PUMP STATION ABANDONMENT DETAILS FOR: AS-BUILT

CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9606

CHARLES E. MCMURRY — STATE OF WASHINGTON — 37908 — REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY

4/4/19

CHANGES / REVISIONS	
DESCRIPTION:	DATE:
BORE DETAILS	1/12/18
CASING SIZE	5/4/18
BORE ALIGNMENT	5/21/18

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

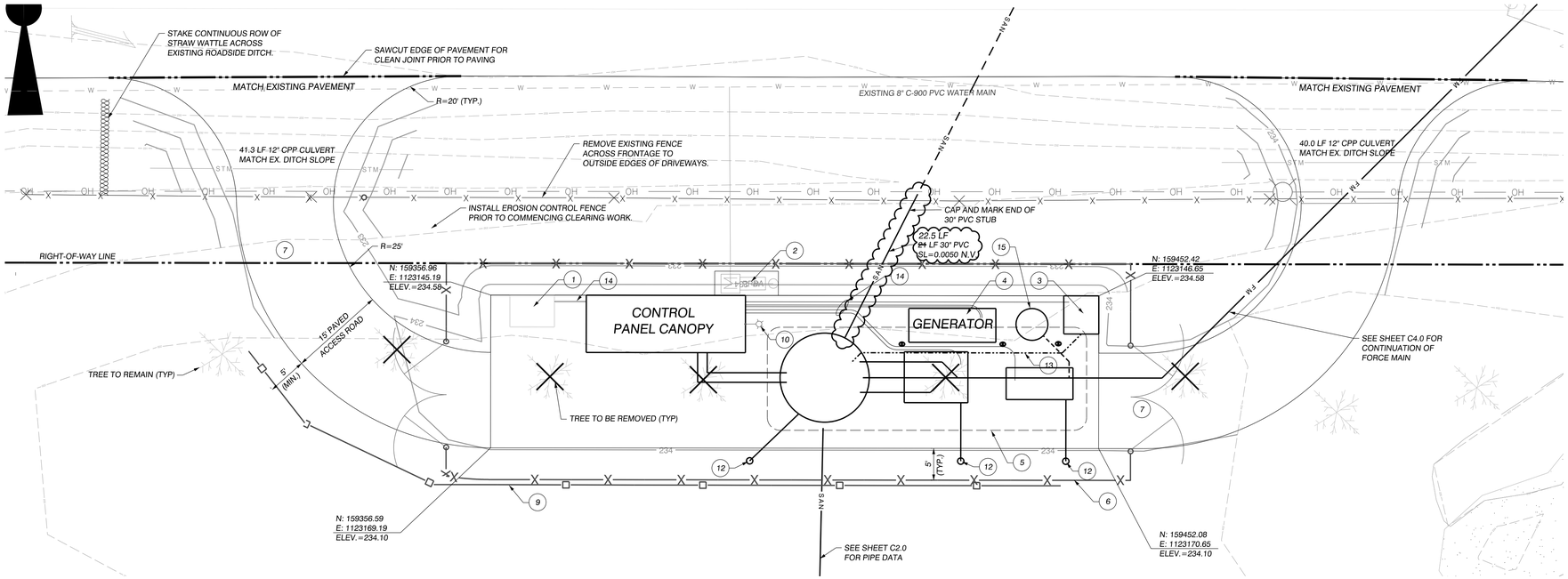
SCALE:

CEDARS LANDING OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C2.4



SCALE: 1"=10'

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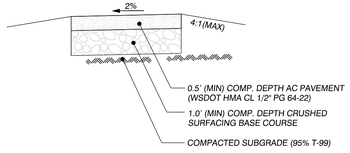

PAVEMENT SECTION

N.T.S.

THE FOLLOWING ITEMS SHALL BE PRESENTED AS DEFERRED SUBMITTALS

- CONTROL PANEL (BASED ON CITY OF BATTLE GROUND DETAILS SS-6.4, SS-6.5, SS-6.6 AND SS-6.7)
- CONTROL PANEL CANOPY STRUCTURE
- GENERATOR AND AUTOMATIC TRANSFER SWITCH
- SAFETY NETTING AND SUPPORT STRUCTURE
- ELECTRICAL & INSTRUMENTATION

SITE CONSTRUCTION NOTES

1. INSTALL TRANSFORMER. CONFIRM SIZE AND CLEARANCE REQUIREMENTS WITH CPU AND THE ELECTRICAL PANEL/CONTROL DESIGNER
2. 5/8" WATER METER, REDUCED PRESSURE BACKFLOW ASSEMBLY, YARD HYDRANT, AND HOSE REEL PER CITY OF BATTLE GROUND DETAIL SS-6.2
3. BIOXIDE TANK PAD - SIZE TO PROVIDE 6" CLEAR SLAB AREA ON ALL SIDES OF BIOXIDE SYSTEM. CONSTRUCT SLAB OF 4000 PSI CONCRETE 6" THICK WITH NO. 5 REBAR 12" O.C. SPACING BOTH WAYS CENTERED IN SLAB. CHAMFER ALL SLAB EDGES 3/4". SUPPLY AND CONNECT BIOXIDE INJECTION SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND CITY OF BATTLE GROUND REQUIREMENTS.
4. GENERATOR MEETING CITY OF BATTLE GROUND REQUIREMENTS:
   - DIESEL FUEL
   - SIZED TO OPERATE ALL FACILITIES
   - SEISMIC RESTRAINTS
   - ENCLOSURE RATED AT 60db
   - NO TURBOCHARGER
   - ADDITIONAL REQUIREMENTS LISTED IN BATTLE GROUND WASTEWATER PUMP STATION AND PRESSURE SEWER DESIGN AND CONSTRUCTION STANDARDS
     - ANCHOR TO CONCRETE SLAB PER MANUFACTURERS RECOMMENDATIONS FOR THIS SEISMIC HAZARD ZONE. SLAB TO BE CONSTRUCTED TO SAME SPECIFICATIONS DESCRIBED FOR BIOXIDE SYSTEM ABOVE.
5. SEE SHEET C3.1 FOR WET WELL, VALVE VAULT, AND METER VAULT DETAILS
6. 6' HIGH BLACK VINYL-COATED CHAIN LINK FENCING (CITY OF BATTLE GROUND DETAIL ST-8.0) WITH 6" X 10" LANDSCAPE CURB CENTERED BELOW FENCE.
7. 16' DOUBLE GATE (PER WSDOT STD. PLAN L-30.10-02)
8. NOT USED
9. INSTALL GOLF SAFETY NETTING. HEIGHT TO MATCH THAT PREVIOUSLY INSTALLED APPROXIMATELY 400 FEET NORTH OF THE PUMP STATION SITE.
10. INSTALL YARD LIGHT AS HIGH AS PRACTICAL ON END OF CONTROL PANEL COVER.
11. ALL UNPAVED AREAS WITHIN THE PROPOSED CHAIN LINK FENCE SHALL STRIPPED. FOLLOWING GRADING, APPLY PRE-EMERGENT HERBICIDE, INSTALL COMMERCIAL GRADE WEED BARRIER, AND TOP WITH 4" THICK LAYER OF RIVER ROCK.
12. VENT PIPE. EXTEND ABOVE GRADE AND INSTALL DOWNTURNED ELBOW WITH MESH INSECT AND RODENT SCREEN. DOWNTURNED OPENING SHALL BE AT LEAST TWELVE INCHES ABOVE ADJACENT GRADE.
13. 1/2" HIGH DENSITY POLYETHYLENE TUBING FOR CALCIUM NITRATE (BIOXIDE) ODOR CONTROL SYSTEM.
14. EXTEND CONDUIT FROM CONTROL PANEL TO VAULTS, TRANSFORMER, GENERATOR, AND ODOR CONTROL SYSTEM. NUMBER AND SIZE TO BE DETERMINED BY ELECTRICAL DESIGNER.
15. AIR RELEASE ASSEMBLY (SEE SHEET C3.1)

THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE CITY OF BATTLE GROUND EROSION AND SEDIMENT CONTROL STANDARDS AS FOLLOWS:

1) CREATE CONSTRUCTION ENTRANCE(S) AT PROPOSED DRIVEWAY(S).

2) COORDINATE WITH GOLF COURSE FOR EMPLOYEE PARKING AND MATERIAL STAGING AT NEARBY MAINTENANCE LOT.

3) MINIMIZE REMOVAL OF EXISTING TOPSOIL AND VEGETATION.

4) FOLLOWING CONSTRUCTION, RESTORE DISTURBED SURFACES IN ACCORDANCE WITH RESTORATION PLAN TO BE PUBLISHED BY OLSON ENGINEERING FOLLOWING CONSULTATION WITH GOLF COURSE OWNER AND DEVELOPER.

5) EROSION AND SEDIMENT CONTROL MEASURES SHOWN ARE BASED ON DRY WEATHER CONSTRUCTION. ADDITIONAL EFFORT AND BEST MANAGEMENT PRACTICE APPLICATION MAY BE REQUIRED DURING PERIODS OF WET WEATHER.

CHARLES E. MCMURRY STATE OF WASHINGTON 37908 REGISTERED PROFESSIONAL ENGINEER

THIS STAMP APPLIES TO THE HORIZONTAL AND VERTICAL ASBUILT INFORMATION SHOWN ON THIS SHEET ONLY BY _____ FOR:

A N/A

- ☐ ☒ GRADING
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- ☒ ☐ SANITARY SEWER
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CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
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PUMP STATION SITE PLAN FOR:
CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695-1385
503.289-9908

CHARLES E. MCMURRY STATE OF WASHINGTON 37908 REGISTERED PROFESSIONAL ENGINEER

CHANGES / REVISIONS

DESCRIPTION:	DATE:
DRIVEWAY REALIGNMENT	11/16/17

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

SCALE: AS NOTED

CEDARS LANDING
OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C3.0

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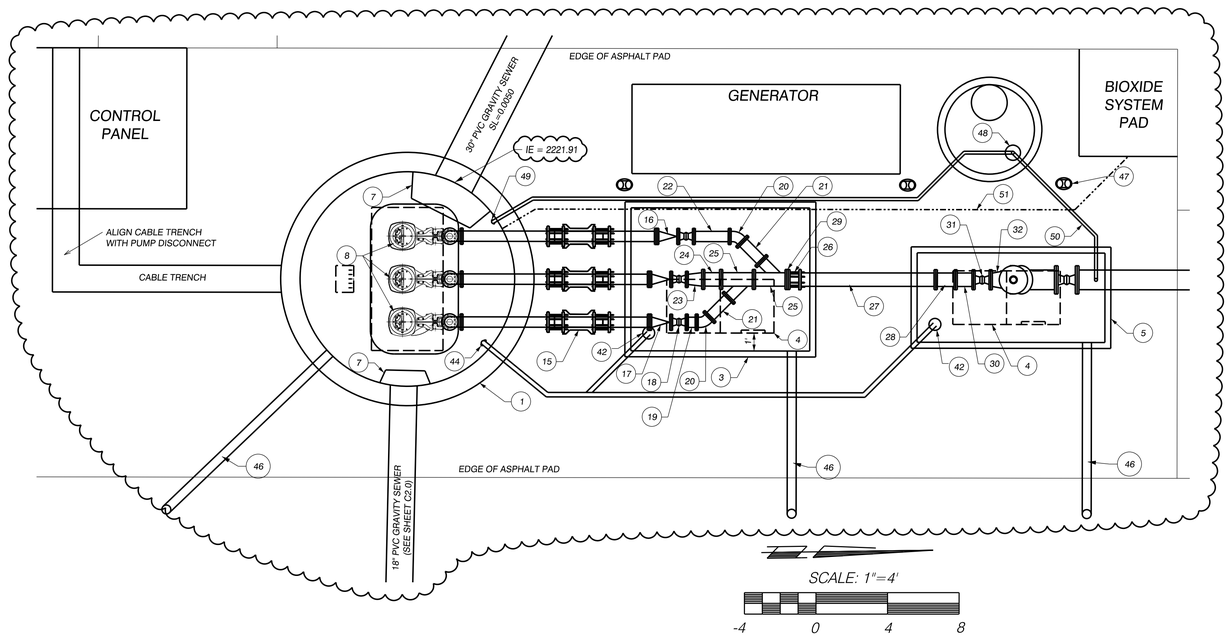

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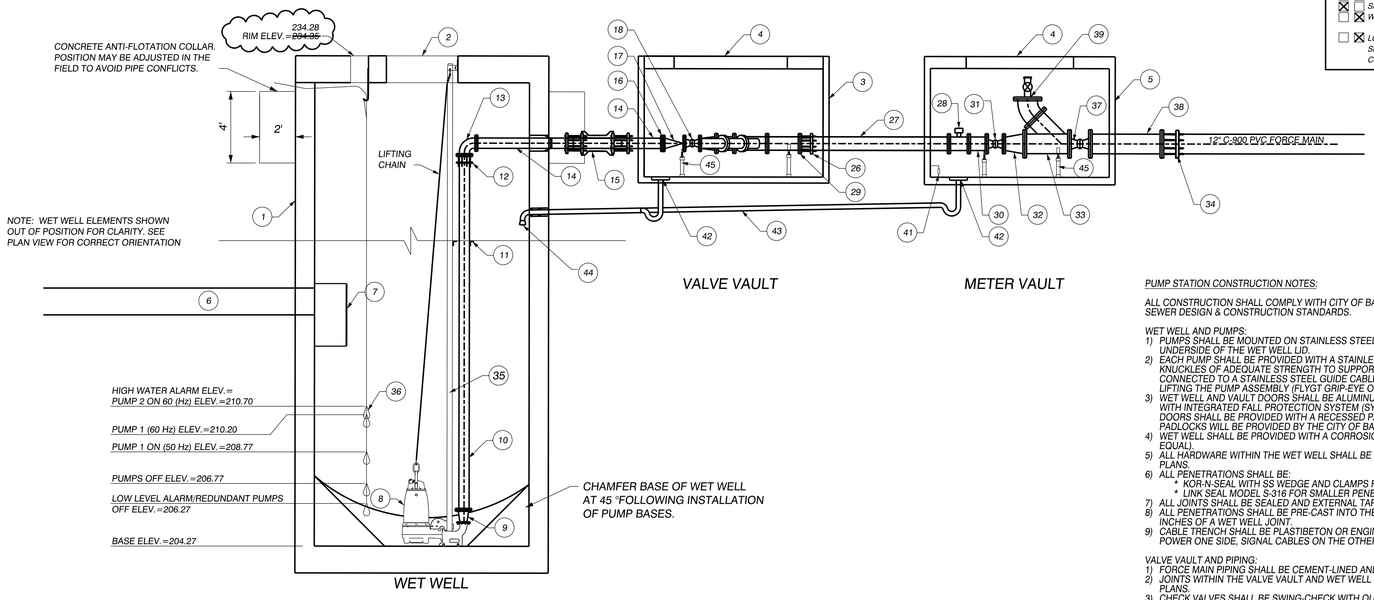

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PRELIMINARY

4/4/19

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A N/A

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- ☐ ☒ *WATER*
- ☐ ☒ *LOCATIONS FOR WATER VALVES, SERVICES AND FIRE HYDRANTS CONFIRMED BY VISUAL INSPECTION*

PUMP STATION CONSTRUCTION NOTES:

ALL CONSTRUCTION SHALL COMPLY WITH CITY OF BATTLE GROUND WASTEWATER PUMP STATION AND PRESSURE SEWER DESIGN & CONSTRUCTION STANDARDS.

WET WELL AND PUMPS:

1) *PUMPS SHALL BE MOUNTED ON STAINLESS STEEL GUIDE RAILS SECURED TO THE BASE OF THE WELL AND THE UNDERSIDE OF THE WET WELL LID.*
2) *EACH PUMP SHALL BE PROVIDED WITH A STAINLESS STEEL LIFTING CHAIN AND STAINLESS STEEL LIFTING KNUCKLES OF ADEQUATE STRENGTH TO SUPPORT 150% OF THE PUMP ASSEMBLY WEIGHT. CHAIN SHALL BE CONNECTED TO A STAINLESS STEEL GUIDE CABLE. A STAINLESS STEEL GRIP EYE SHALL BE PROVIDED FOR LIFTING THE PUMP ASSEMBLY (FLYGT GRIP-EYE OR EQUAL).*
3) *WET WELL AND VAULT DOORS SHALL BE ALUMINUM, DIAMOND PLATED, H20 RATED, AND SPRING ASSISTED WITH INTEGRATED FALL PROTECTION SYSTEM (SYRICUSE CASTINGS ALUMINUM SAFETY HATCH OR EQUAL). DOORS SHALL BE PROVIDED WITH A RECESSED PADLOCK HASP FOR LOCKING WITH A STANDARD PADLOCK. PADLOCKS WILL BE PROVIDED BY THE CITY OF BATTLE GROUND.*
4) *WET WELL SHALL BE PROVIDED WITH A CORROSION RESISTANT EPOXY COATING (RAVEN 404 OR APPROVED EQUAL).*
5) *ALL HARDWARE WITHIN THE WET WELL SHALL BE STAINLESS STEEL UNLESS OTHERWISE NOTED ON THESE PLANS.*
6) *ALL PENETRATIONS SHALL BE:*
   - ** KOR-N-SEAL WITH SS WEDGE AND CLAMPS FOR PIPES 4" AND LARGER*
   - ** LINK SEAL MODEL S-316 FOR SMALLER PENETRATIONS*
7) *ALL JOINTS SHALL BE SEALED AND EXTERNAL TAPE COAT APPLIED (EZ-WRAP 9" OR EQUAL)*
8) *ALL PENETRATIONS SHALL BE PRE-CAST INTO THE STRUCTURE. NO PENETRATION SHALL BE WITHIN SIX INCHES OF A WET WELL JOINT.*
9) *CABLE TRENCH SHALL BE PLASTIBETON OR ENGINEER APPROVED EQUAL WITH CENTER DIVIDER (PUMP POWER ONE SIDE, SIGNAL CABLES ON THE OTHER)..*

VALVE VAULT AND PIPING:

1) *FORCE MAIN PIPING SHALL BE CEMENT-LINED AND SEAL-COATED DUCTILE IRON PIPE.*
2) *JOINTS WITHIN THE VALVE VAULT AND WET WELL SHALL BE FLANGED UNLESS OTHERWISE NOTED ON THESE PLANS.*
3) *CHECK VALVES SHALL BE SWING-CHECK WITH OUTSIDE LEVERS AND SPRINGS.*
4) *VAULT DRAIN SHALL BE SELF-PRIMING. COORDINATE WITH BUILDING PLUMBER.*
5) *VALVE COATINGS AND MATERIALS SHALL BE SUITABLE FOR CONTACT WITH RAW SEWAGE.*

REQUIRED SUBMITTALS:

- ** WET WELL AND VALVE VAULT PRECAST DRAWINGS, INCLUDING HATCHES*
- ** WET WELL COATING*
- ** PUMPS, GUIDE RAILS, WET WELL PIPING, CABLE TRAY, AND APPURTENANCES*
- ** VALVE VAULT PLUMBING COMPONENTS (VALVES, GAUGES, FITTINGS, ETC)*
- ** CONTROL PANEL*
- ** GENERATOR, AUTOMATED TRANSFER SWITCH, FUEL TANK*
- ** OTHER ITEMS MAY BE REQUESTED BY THE CITY OF BATTLE GROUND*

O&M MANUALS, RECORD DRAWINGS (INCLUDING ELECTRICAL AND INSTRUMENTATION) AND TEST REPORTS WILL BE REQUIRED FOR ENGINEERING ACCEPTANCE.

CONSTRUCTION NOTES:

1. *12' DIA PRECAST WET WELL*
2. *108" x 48" ACCESS HATCH, OFFSET TO ONE SIDE. SEE NOTE BELOW.*
3. *8' x 10' x 6'-6" PRECAST VALVE VAULT*
4. *36" x 72" ACCESS HATCH. SEE NOTE BELOW.*
5. *5' x 10'-6" x 6' PRECAST METER VAULT*
6. *18" DIA INLET PIPE. IE=~~212.71~~ 211.25*
7. *INSTALL STAINLESS STEEL DEFLECTOR PANEL (SEE DETAIL, SHEET C3.2)*
8. *(3) FLYGT "N" IMPELLER PUMP CAPABLE OF 375 GPM AT 96 FEET OF TOTAL DYNAMIC HEAD, MAX SPEED 1750 RPM, (MODEL NP 3171 HT3--455 25 HP OR EQUAL). SEE NOTES BELOW FOR ADDITIONAL REQUIREMENTS*
9. *4" x 6" DI REDUCER (FLG)*
10. *6" DI FLG x PE PIPE*
11. *DISCHARGE PIPE SUPPORT (SEE DETAIL, SHEET C3.2). IF RECOMMENDED BY PUMP MANUFACTURER, EXTEND SUPPORT BRACKET TO PUMP GUIDE RAILS*
12. *INSTALL 6" RESTRAINED FLANGE COUPLING ADAPTER WITH STAINLESS STEEL HARDWARE*
13. *INSTALL 6" DI 90° BEND FLG*
14. *6" DI FLG x PE SPOOL*
15. *6" RESTRAINED COUPLER (EBAA 3800, SMITH-BLAIR MAXI-GRIP, OR EQUAL) OR DI REPAIR SLEEVE MJ WITH RESTRAINT (MEGA-LUG OR EQUAL)*
16. *6" ANNULAR PRESSURE SEAL WITH GAUGE (SEE DETAIL, SHEET C3.2) (3 REQ'D)*
17. *6" SWING CHECK VALVE WITH OUTSIDE LEVER AND SPRING FLG (3 REQ'D)*
18. *6" PLUG VALVE FLG (3 REQ'D)*
19. *6" x 6" FLG SPOOL*
20. *6" 45° BEND FLG*
21. *6" x 18" FLG SPOOL*
22. *6" x 24" FLG SPOOL*
23. *6" x 8" REDUCER FLG*
24. *8" x 12" FLG SPOOL*
25. *8" x 6" WYE FLG*
26. *8" RESTRAINED FLANGE ADAPTER (EBAA Z100 OR EQUAL)*
27. *8" FLG x PE SPOOL*
28. *8" SPARLING TIGER MAG ELECTROMANETIC FLOW METER FLG*
29. *8" ANNULAR PRESSURE SEAL WITH PRESSURE TRANSDUCER AND GAUGE (SEE DETAIL, SHEET C3.2)*
30. *8" x 12" FLG SPOOL*
31. *8" PLUG VALVE FLG*
32. *8" x 12" REDUCER FLG*
33. *12" WYE FLG, 12" 45° BEND FLG, 12" BLIND FLANGE TAPPED FOR 4" IPS, 4" CLOSE NIPPLE, 4" GATE VALVE FIPS, 4" CAMLOCK x MIPS FITTING, AND 4" CAMLOCK DUST CAP.*
34. *12" RESTRAINED FLANGE COUPLING ADAPTER (ROMAC RFCA, EBAA 2100, OR ENGINEER APPROVED EQUAL)*
35. *SS GUIDE RAIL (INSTALL PER PUMP MANUFACTURER'S RECOMMENDATIONS)*
36. *CONTROL FLOAT (TYP.)*
37. *12" PLUG VALVE FLG*
38. *12" x 48" DI SPOOL FLG*
39. *PIG LAUNCH CONNECTOR. CONTRACTOR TO SUPPLY:*
    - *(1) 4" CAMLOCK x 2" MIPS FITTING*
    - *(1) 2" BALL VALVE SS FIPS*
    - *(1) 2" CLOSE NIPPLE SS*
40. *NOT USED*
41. *FLOOD ALARM FLOAT. FLOAT TO SEND SIGNAL TO SCADA TO ALARM OPERATOR OF FLOODING IN VAULT. ALARM SHALL TRIGGER WHEN LIQUID REACHES 6" ABOVE VAULT FLOOR.*
42. *3" FLOOR DRAIN*
43. *PLUMB DRAIN TO WET WELL. MATERIAL SHALL MEET PLUMBLING CODE SL=2% (MIN.)*
44. *INSTALL 90° BEND AND DUCKBILL STYLE CHECK VALVE*
45. *STANDON MODEL S89 OR S92 PIPE SUPPORT (EITHER FLANGE OR CRADLE STYLE IS ACCEPTABLE IN ALL LOCATIONS). INSTALL AND ANCHOR PER MANUFACTURER'S RECOMMENDATIONS.*
46. *CONSTRUCT 6" PVC VENT PIPE. EXTEND VENT ABOVE GRADE, INSTALL DOWNTURNED ELBOW AND INSECT AND RODENT SCREENS. BOTTOM OF ELBOW SHALL BE AT LEAST TWELVE INCHES ABOVE ADJACENT GRADE.*
47. *INSTALL WSDOT TYPE 1 BOLLARD OR CITY APPROVED EQUAL.*
48. *INSTALL AIR/VACUUM VALVE ASSEMBLY PER CITY OF BATTLE GROUND DETAIL SS-5.4. EXTEND 2" PVC DISCHARGE TO WET WELL.*
49. *INSTALL DUCKBILL STYLE CHECK VALVE AT END OF DRAIN LINE.*
50. *EXTEND PIPE FROM FORCE MAIN TO AIR VALVE PER CITY DETAIL SS-5.4*
51. *BIOXIDE TANK FEED LINE PER CITY OF BATTLE GROUND DETAIL SS-6.3*

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CLIENT:

RALSTON INVESTMENTS
1440 SW TAYLOR
PORTLAND, OR 97205

PHONE: (503) 819-0792
EMAIL: tim@ralstoninvestments.com

PUMP STATION DETAIL AND ELEVATION FOR: CEDARS LANDING OFFSITE SANITARY SEWER

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN, VANCOUVER, WA 98660
360.695.1385
503.289.9936

CHARLES E. MCMURRY STATE OF WASHINGTON 37908 REGISTERED PROFESSIONAL ENGINEER

PRELIMINARY

4/4/19

CHANGES / REVISIONS	
DESCRIPTION:	DATE:
WET WELL ELEVATIONS	9/6/17
PUMP SPECS	10/02/17

DESIGNED: CEM

DRAWN: CEM / MS / TJB

CHECKED: CEM

DATE: FEBRUARY 2017

SCALE: H: 1"=4'
V:

CEDARS LANDING
OFFSITE SANITARY SEWER

JOB NO.: 8959.01.01

SHEET

C3.1

Salmon Creek Bridge Scour Repair Project

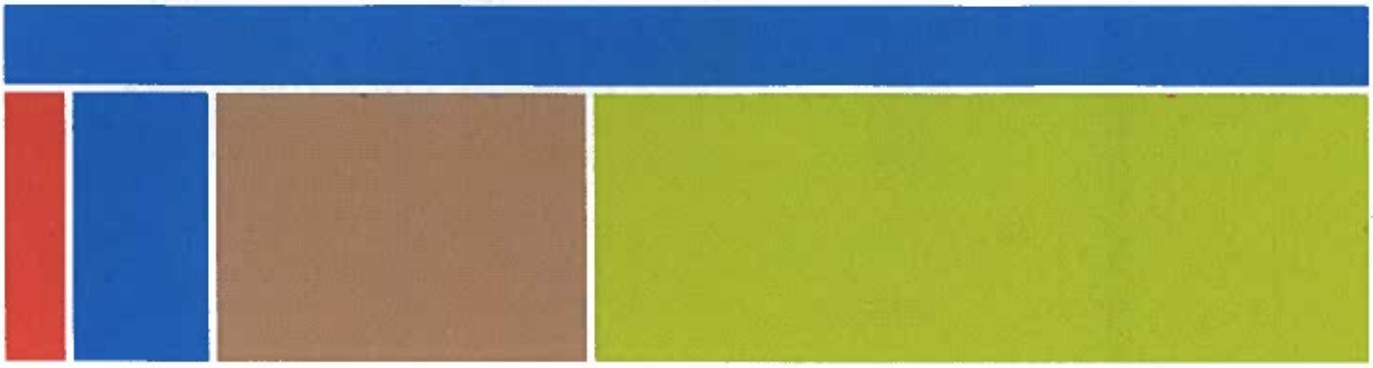
Hydraulic Report

Salmon Creek Bridge #331
NE Caples Road, 0.39 mi. N of NE 159th Street – CRP 381722

Submitted to:
Clark County Public Works
1300 Franklin Street
Vancouver, WA 98660
August 30, 2019

Prepared By:
Otak, Inc.
700 Washington Street, Suite 300
Vancouver, WA 98660
Project No. 19047

Otak



8-30-19

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TABLE OF CONTENTS

Introduction

Salmon Creek Bridge #331 is one of three existing scour critical bridges programmed for repairs in Clark County's 2018-2023 Transportation Improvement Program (TIP). Otak was hired to develop the engineering design and construction documents needed to construct scour countermeasures for the three bridges, including Salmon Creek Bridge.

In addition to the scour countermeasures the project will address the rehabilitation of the concrete substructure for Salmon Creek Bridge.

This report describes the hydraulic analyses conducted for the design of scour countermeasures at Salmon Creek Bridge. The work documented in this report was carried out by Otak, Inc. (Otak) under contract with Clark County Public Works (County). This work includes the following tasks:

- Review of background information and field investigations to evaluate existing hydraulic conditions.
- Review of existing hydrologic analysis to establish design flows.
- Hydraulic analyses and review of existing hydraulic models.
- Scour analyses to support the scour countermeasure design and development of the scour countermeasure design.
- Floodplain analyses to determine any impacts to Base (100-year) Flood Elevations to support No-Rise Certification.

Project Location

Salmon Creek Bridge #331 is located where NE Caples Road (Old State Highway 503) crosses over Salmon Creek just upstream of the confluence with Weaver Creek. The location of Salmon Creek Bridge is depicted in **Figure 1 in Appendix A**.

Existing Conditions

Salmon Creek Bridge #331 is located on NE Caples Road, between NE 163rd St. and NE 169th St. Built in 1923, the bridge has a 50-foot span and is 24 feet wide. A Photo Log of the site is included in **Appendix B**. The structure is a concrete Luten Arch that is backfilled with soil and base course to accommodate the asphalt roadway surface. A private pond overflow and roadside ditch discharges to the creek at the southeast bridge corner. Just upstream of the ditch discharge point, there are two trees that have been undercut by streamflow and are leaning towards the creek. The area north of the creek on both sides of the road is a Washington Department of Transportation (WSDOT) wetland mitigation area.

Salmon Creek Bridge – Looking upstream

Salmon Creek Bridge – Looking downstream

A Phase One and Two Scour Analysis was conducted by Vigil-Agrimis, Inc. in 2006. This analysis used hydraulic calculations to determine the bridge had a scour code of 5 indicating that the bridge foundations were stable. County bridge inspectors visually observed significant scour at both footings in 2016 and 2017 and adjusted the scour code to 3 indicating that the bridge foundations were unstable. The complete list of bridge scour ratings from the Washington State Bridge System Coding Guide has been included in **Appendix C**.

The available as-built drawings show an apparent arch bottom elevation (no separate spread footing) and attached side panels, called spandrel walls, that form the trough-like Luten structure that is backfilled for the asphalt paved road surface. Design assumptions related to the existing bridge configuration are based on these as-built drawings.

Upstream of the Salmon Creek bridge, there is a steep slope consisting of hardened soils along the left bank. The right bank has an active floodplain that shows some interaction with Weaver Creek that merges with Salmon Creek downstream of the bridge.

The road embankment is approximately 17 feet higher than the stream and does not overtop during any of the modeled flood flows, including the 500-year recurrence interval. Events larger than the 500-year recurrence interval were not modeled. The bridge spans the main channel, resulting in constriction to only the flows that are spread out onto the floodplain.

Downstream of the crossing, the floodplain is active on both sides of the channel. Salmon Creek flows between several ponds and wetland mitigation areas while converging with Weaver Creek.

The following graphics have been included in the report appendices:

- **Figure 2** in **Appendix A** shows the existing plan view for this bridge.
- **Appendix B** includes field reconnaissance photos of the bridge and surrounding features.
- **Appendix C** includes the available bridge as-built drawings.

Field reconnaissance of Salmon Creek at the Salmon Creek Bridge site was conducted by Otak staff on January 14th, 2019. Observations were made of the general characteristics of the creek in the vicinity of the bridge, the condition of the existing bridge, the lateral and vertical stability of the channel, evidence of general and local scour, and bed material characteristics. The field reconnaissance was followed up by a desktop review of available mapping and other information on the creek.

Salmon Creek shows minimal evidence of vertical or lateral instability near the Salmon Creek Bridge site. Gravel bars were observed upstream and downstream of the bridge. The existing channel at Salmon

Creek Bridge consists of primarily cobbles, gravels, and silts. There are large riprap pieces located within the channel in the direct vicinity of the bridge and a row of boulders spanning the channel downstream of the bridge.

Pebble counts (Wolman methodology) were conducted to inform the existing streambed gradation. This information was then used in scour calculations, as well as for sizing streambed material to be placed during construction. The existing streambed consists of coarse gravel and silt with median diameter (D_{50}) of 1.42 inches.

Hydrologic Data

Peak discharges used in the hydraulic analysis and design of the scour repair were taken from the Effective FIS for Clark County. The flows are derived from a 2002 Hydrological Simulation Program Fortran (HSPF) model from 2002, according to the FIS. **Table 1** lists the flood flows at Salmon Creek Bridge in cubic feet per second (cfs).

Table 1—Peak Flows for Salmon Creek Bridge Project Reach

Recurrence Interval (years)	Salmon Creek Bridge Discharge (cfs)
10	1,640
50	2,310
100	2,630
500	3,480

Hydraulic Model Development

The hydraulic design process consisted of modeling the Project reach under existing conditions using existing data provided by the County. The model results were used to aid the Project design with the goal of meeting the following criteria:

- Repair existing bridge scour
- Protect bridge from future scour
- Ensure no-rise conditions are met

A hydraulic analysis of Salmon Creek for the project reach was performed to provide a sound basis for the hydraulic design of the proposed scour repair and to analyze impacts to base flood elevations. The analysis was carried out using the USACE HEC-RAS computer software v5.0.6 to create a one-dimensional hydraulic model. The model was based on the hydraulic model used for the Effective Flood Insurance Study for Clark County (Effective FIS) that was provided by the County, with additional detail added based on a local survey of the site conducted by the County and LIDAR data in the floodplain from 2002, provided by the County. All vertical datums are in reference to NGVD 29.

A proposed conditions model was not created for Salmon Creek Bridge. The cross-sections under existing and proposed conditions are identical, with stream grades being restored to their existing elevations following the placement of the buried riprap.

Manning's *n* roughness values were selected based on engineering judgment from field observation and standard references (Chow, 1959; Barnes, 1967). The Manning's *n* values for the bounding Effective FIS

cross sections were left unchanged from the Effective FIS model, but are consistent with the values used for the new cross sections. A Manning's *n* value of 0.05 was used for the main channel that reflects the coarse channel bed, meandering planform, and high roughness from vegetation along the channel banks. This value is consistent with that used in the Effective FIS model for the reach. Manning's n values ranging from 0.08 to 0.14 were used for the overbank areas to represent the variations in land cover from medium to dense brush.

The detailed model is approximately 2,900 feet long and extends from Effective FIS Cross Section 15.223 at the downstream end to Effective FIS Cross Section 15.758 at the upstream end. Eight existing cross-sections are located between these two bounding cross-sections. Two new intermediate cross sections based on the topographic survey were added approximately 160 feet downstream and 145 feet upstream of the bridge. In addition, for data accuracy, roadway elevations from Effective FIS model were updated based on topographic survey elevation. The downstream starting water-surface elevation for the model was based on the computed elevation at the downstream cross-section from the Effective FIS model.

Several ponds are located throughout the modeled reach. The ponds were excluded from the stream conveyance through the use of ineffective flow areas.

Model Results

Only one HEC-RAS model was created for the Salmon Creek Bridge as the channel geometry is unchanged between existing and proposed condition. The model was run for the 10-year through the 500-year flood events using discharges listed in **Table 1. Table 2** summarizes the results for the 100-year flood event through the Salmon Creek Bridge project reach. The 100-year flood flows extend onto the floodplain both upstream and downstream of the bridge, however the road embankment does not overtop and disconnects the floodplains. A detailed model output is included in **Appendix D**.

Table 2—Salmon Creek Bridge Hydraulic Results for 100-Year Flood Event

Cross-Section ID	Water Surface Elevation (ft. NGVD)	Velocity in Channel (ft./sec)
15.758	211.54	4.64
15.642	210.49	4.25
15.556	209.70	5.41
15.50*	208.24	7.07
15.477	207.66	6.25
15.472	207.30	6.32
15.39*	206.59	6.40
15.382	205.53	5.50
15.297	203.49	7.05
15.223	202.07	5.00

*Interpolated Cross Section

Scour Analysis

A scour analysis was carried out to determine potential scour at Salmon Creek Bridge using the 100-year and 500-year peak discharges. The analysis follows procedures outlined in the Federal Highway Administration (FHWA) document Evaluating Scour at Bridges (FHWA, 2012). Scour components considered in the analysis include:

- Long-term degradation potential,
- General scour (contraction and bend scour), and
- Local scour (at the bridge abutments).

Long-term degradation potential at the Salmon Creek Bridge is assumed to be 1.0 feet. There is a band of boulders approximately 20 feet downstream of the bridge that will be removed and could cause some adjustment to the channel profile through a slight head cut moving upstream. The potential adjustment to the channel profile is estimated to be 1 foot lower at the bridge.

General scour at Salmon Creek Bridge is limited to contraction scour. The bridge spans the channel. However, the constriction of floodplain flows during the 500-year recurrence interval results in a calculated contraction scour of 0.9 feet. The channel does not meander through the project reach, so bend scour was not calculated.

Local scour at the Salmon Creek bridge abutments was determined to be 9.9 feet for the 100-year recurrence interval and 13.9 feet for the 500-year recurrence interval. Abutment scour will be protected against by hardening the streambed around the abutment, thus preventing the turbulence caused by the abutments from eroding the stream bed.

Table 3 summarizes the calculated scour at Smith Bridge.

Table 3—Salmon Creek Bridge Scour Summary

Type of Scour	100-year Scour Depth (feet)	500-year Scour Depth (feet)
Long-Term Scour	1.0	1.0
Contraction Scour	0.0	0.9
Abutment Scour	9.9*	13.9*
Total Scour	1.0	1.9

*Abutment scour will be protected against with the scour countermeasure design

Scour Countermeasure Design

The selected scour countermeasure design is buried riprap along each abutment and the base of the wingwalls. Design calculations using the computed hydraulic results were performed to determine the required size of riprap to be placed. The calculations were carried out using the USACE EM-1601 and modified Isbash methods as described in the HEC-23 document. Using these methods, it was determined that riprap meeting the WSDOT standard specification Rock for Erosion and Scour Protection Class A would be most suitable for the site.

Rock for Erosion and Scour Protection Class A has a D_{50} of 1.0 feet, which is slightly less than the calculated rock size, but much easier to place in constricted work areas than Class B. To account for the smaller size and add additional protection, the riprap thickness has been increased. The thickness of the riprap is also based on the estimated bottom of abutment. The riprap does not extend to a depth below that of the calculated abutment scour; however, the calculated abutment scour assumes that the turbulence can act directly on the streambed. The proposed riprap revetment will prevent this from happening and thus the total scour will be less. Scour will not occur to that depth under proposed conditions.

The riprap will be buried along the toe of the slopes upstream and downstream of the bridge in order to minimize disturbance to the over-steepened slopes. This configuration was discussed in the 3 Bridges Alternatives Analysis Supplemental Memo submitted to the County on April 16th, 2019. The memo is attached in **Appendix C.**

Channel Reconstruction

The existing streambed channel will be disturbed to install the buried riprap. The streambed within these disturbed areas will be reconstructed to match the existing streambed. The extents of impact to the streambed are limited to the excavation limits for the installation of the riprap. No change in final bed elevations is proposed.

Floodplain Analysis

The Salmon Creek Bridge is within a FEMA mapped Regulatory Floodway as shown on the FIRMette included in A**ppendix F**. The scour countermeasure was designed to minimize any obstruction or net fill in order to achieve a no-rise to the 100-year water surface elevation.

The design results in no change to the channel cross-section, meaning that no rise will occur in the 100-year water surface elevation.

Cut/Fill Volumes

In order to meet County floodplain requirements, the project must have balanced cut and fill below the base flood elevation at each project site. The Salmon Creek Bridge design will result in a balanced cut and fill by removing material to place the riprap and restoring the channel to match existing grade.

References and Bibliography

Clark County, 2019. Title 40: Clark County, Washington, Unified Development Code, Section 40.420 Flood Hazard Areas.

Federal Emergency Management Agency, 2012. Flood Insurance Study, Clark County Washington and Unincorporated Areas, Effective Date September 5.

Federal Highway Administration, 2009. Hydraulic Engineering Circular 23 (HEC-23), Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance-Third Edition, Publication No. FHWA-NHI-09-112.

Federal Highway Administration, 1989. Hydraulic Engineering Circular 11 (HEC-11), Design of Riprap Revetment, Publication No. FHWA-IP-89-016.

Federal Highway Administration, 2012. Hydraulic Engineering Circular 18 (HEC-18), Evaluating Scour at Bridges, Fifth Edition, Publication No. FHWA-HIF-12-003.

United States Army Corps of Engineers (USACE), 2010. “Approved Work Windows for Fish Protection for All Freshwaters Excluding Waters Within National Park Boundaries, Columbia River, Snake River, and Lakes by County and Specific Watercourse”.

Vigil-Agrimis, 2006. “Phase 2: Bridge Scour Analysis Draft. Salmon Creek Bridge #331”

Washington Department of Fish and Wildlife (WDFW), 2010. “Times When Spawning or Incubating Salmonids Are Least Likely to Be Within Washington State Freshwaters”

Washington State Department of Transportation, 2017. Hydraulics Manual, Publication No. M 23-03.05.

Wolman, M.G., 1954. A Method of Sampling Coarse Bed Material, Transactions of the American Geophysical Union, 35, p. 951-956.

Appendix A

Appendix A: Vicinity Map and Engineering Plans

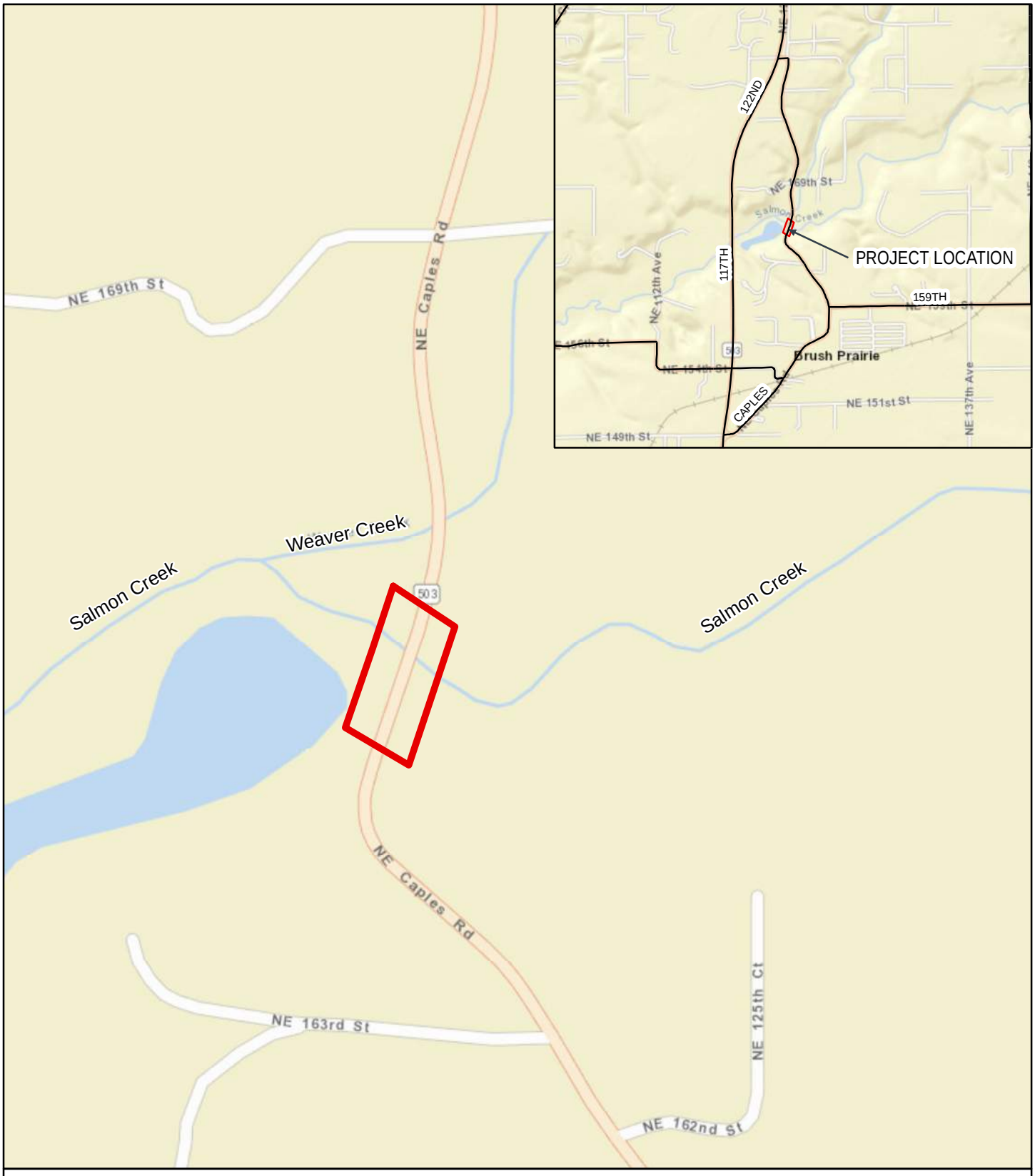

FIGURE 1
VICINITY MAP

Legend

Project Area

0 750 FEET

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SALMON CREEK BRIDGE SCOUR REPAIR PROJECT
CLARK COUNTY PUBLIC WORKS | WASHINGTON

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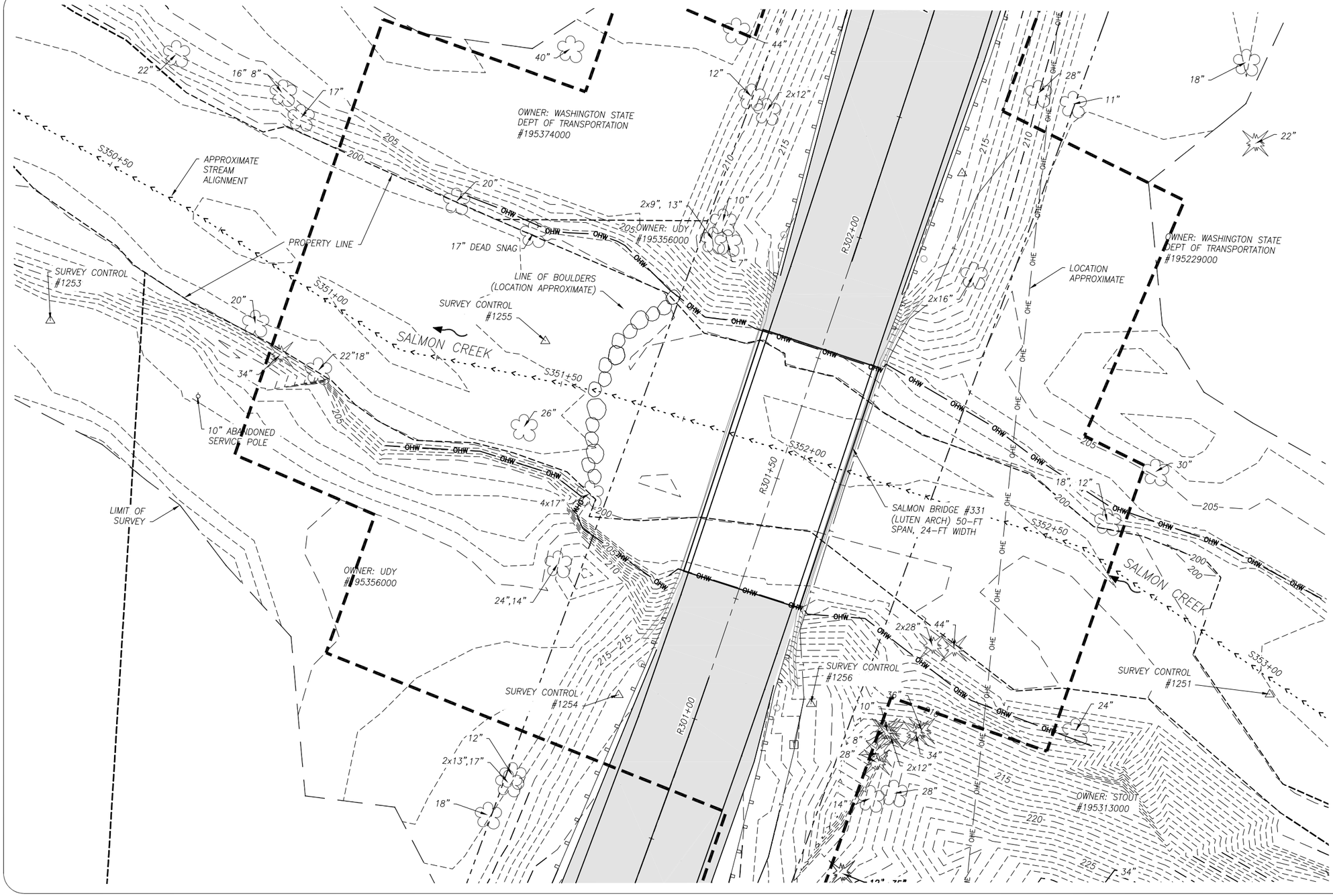

GENERAL NOTES

1. COORDINATES ARE IN WASHINGTON STATE PLANE SOUTH ZONE, NAD83(HARN).
2. PROJECT ELEVATIONS ARE IN THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929.
3. SURVEY PERFORMED BY CLARK COUNTY IN NOVEMBER 2018.
4. UNITS IN US FEET.

LEGENDS

- EXISTING TREE
- SURVEY CONTROL POINT
- 10" ABANDONED POLE
- GUY WIRE
- EXISTING COMMUNICATION PAD
- APPROXIMATE STREAM THALWEG
- EXISTING GUARDRAIL
- OHE — OHE — EXISTING OVERHEAD UTILITIES
- T — T — EXISTING TELEPHONE LINE ATTACHED TO BRIDGE
- RIGHT OF WAY
- PROPERTY LINE
- LIMIT OF SURVEY
- EXISTING PAVEMENT

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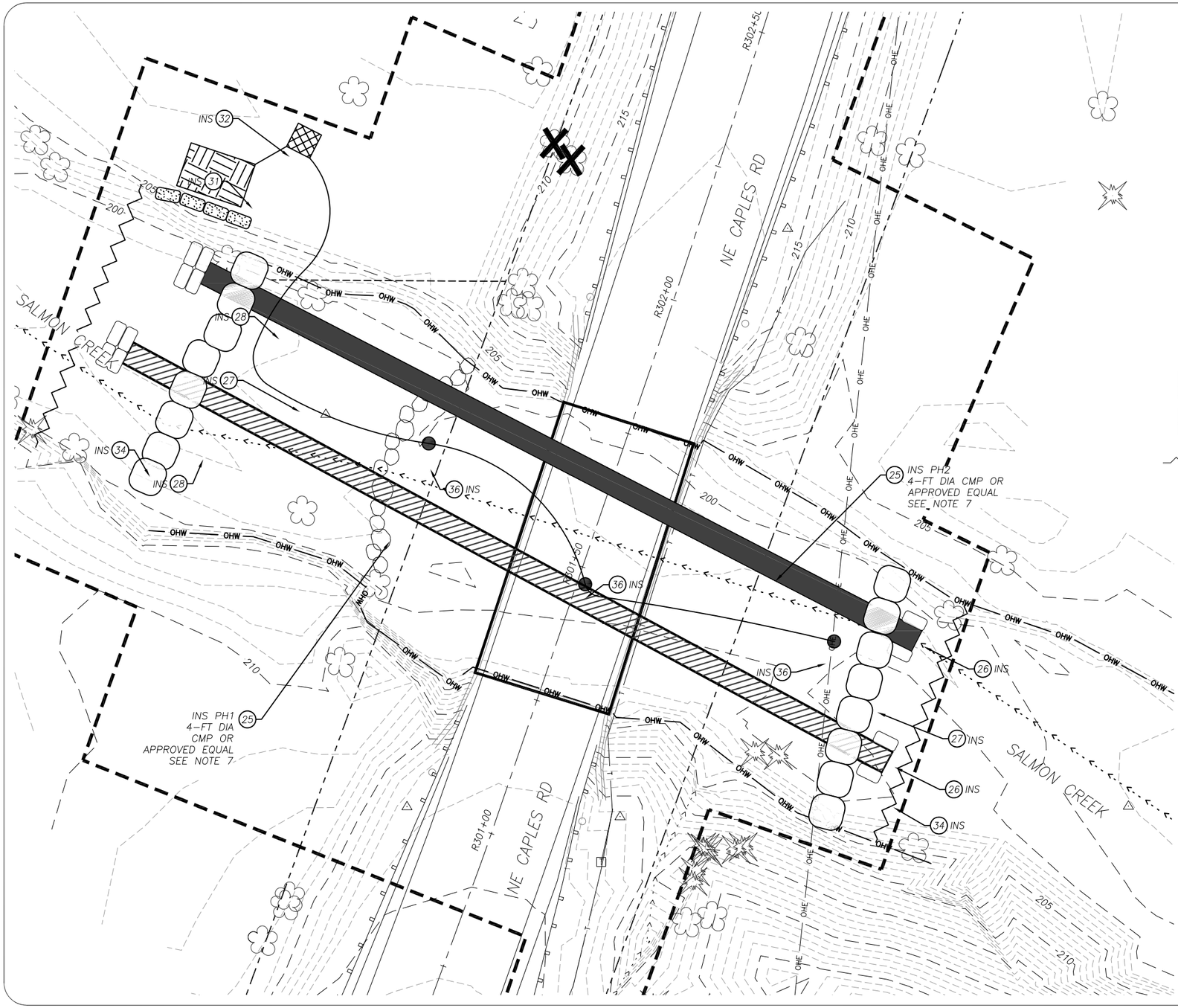
10' 0' 10' 20'
SCALE IN FEET

FIGURE 2
EXISTING CONDITIONS

Lehto, Smith, and Salmon Creek Bridges
(3Bridges)
Scour Repair Project
Clark County, WA



STREAM, STORM & UTILITIES

25 – PIPE/CULVERT
26 – TEMP INLET PROTECTION
27 – WORK AREA ISOLATION DAM
28 – OUTLET EROSION PROTECTION
29 – BYPASS PIPE
30 – EXISTING DITCH
31 – SEDIMENT CONTROL BAG
32 – DE-WATERING PUMP
34 – FISH BLOCK NET
35 – WETLAND
36 – DE-WATERING PUMP INTAKE AND DISCHARGE HOSE.

SITE PREPARATION NOTE LEGEND

RM – REMOVE
P – PROTECT
INS – INSTALL
A – ADJUST

(#) – BY CONTRACTOR

[X] – BY OTHERS

LEGEND

– SEDIMENT CONTROL BAG

– DE-WATERING PUMP

– FISH BLOCK NET

– WORK AREA ISOLATION DAM

– DE-WATERING PUMP INTAKE

WORK AREA ISOLATION NOTES

1. CONTRACTOR SHALL NOT WORK DIRECTLY WITHIN THE ORDINARY HIGH WATER OF THE CREEK WITHOUT THE USE OF AN APPROVED AND IN-PLACE WORK AREA ISOLATION PLAN.
2. CREEK TO BE DIVERTED THROUGH THE USE OF PUMPING OR ANCHORED DIVERSION PIPE. INSTALL MESH SCREEN AT PIPE OR PUMP INLETS FOR FISH PROTECTION. INSTALL SUFFICIENT GRAVEL BAGS ON/AROUND PIPE INLET/OUTLET TO STABILIZE AND PREVENT EROSION. DIVERSION METHODS SHALL BE SIZED TO DIVERT A MINIMUM FLOW RATE OF 65 CFS. CONTRACTOR TO ADJUST LOCATION OF PIPE TO ACCOMMODATE WORK.
3. DEWATERING THE WORK AREA SHALL OCCUR AT A RATE SLOW ENOUGH TO ALLOW THE SAFE CAPTURE AND RELOCATION OF FISH SPECIES AND OTHER AQUATIC ORGANISMS TO AVOID STRANDING.
4. CONTRACTOR TO SUBMIT TEMPORARY STREAM DIVERSION AND DEWATERING PLAN TO OWNER A MINIMUM OF TWO WEEKS PRIOR TO BEGINNING IN STREAM WORK. SEE SPECIFICATION FOR REQUIREMENTS.
5. INSTALL FISH BLOCK NET AS REQUIRED FOR TEMPORARY STREAM DIVERSION.

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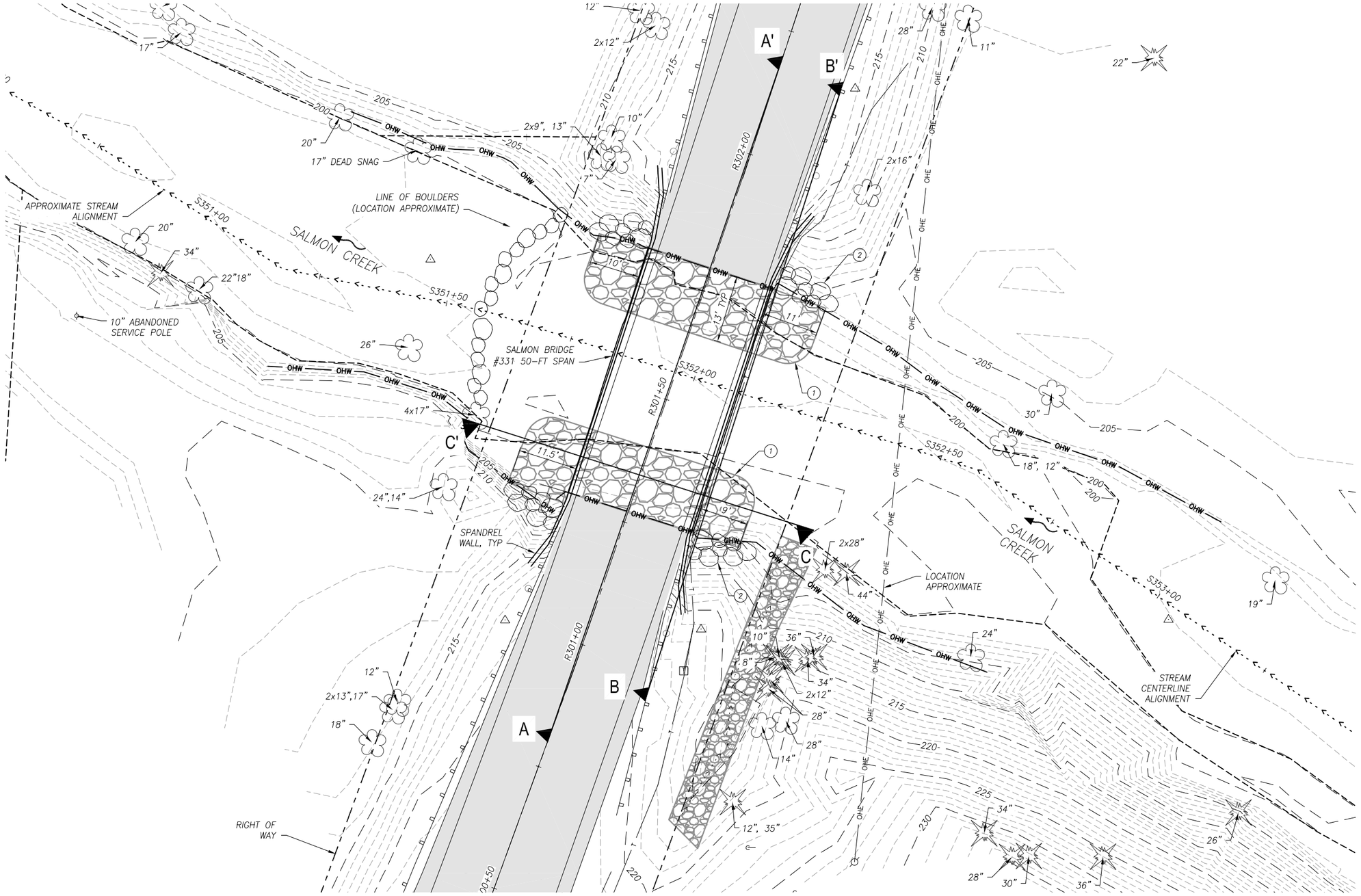
10' 0' 10' 20'
SCALE IN FEET

FIGURE 3
WORK AREA ISOLATION PLAN

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA



GENERAL NOTES

1. COORDINATES ARE IN WASHINGTON STATE PLANE SOUTH ZONE, NAD83(HARN).
2. PROJECT ELEVATIONS ARE IN THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929.
3. SURVEY PERFORMED BY CLARK COUNTY ON NOVEMBER 16, 2018.
4. UNITS IN US FEET.
5. IN-WATER WORK WINDOW AUGUST 1 TO SEPTEMBER 30.

CONSTRUCTION NOTES

(1) INSTALL CLASS A RIPRAP.

(2) INSTALL HABITAT BOULDERS.

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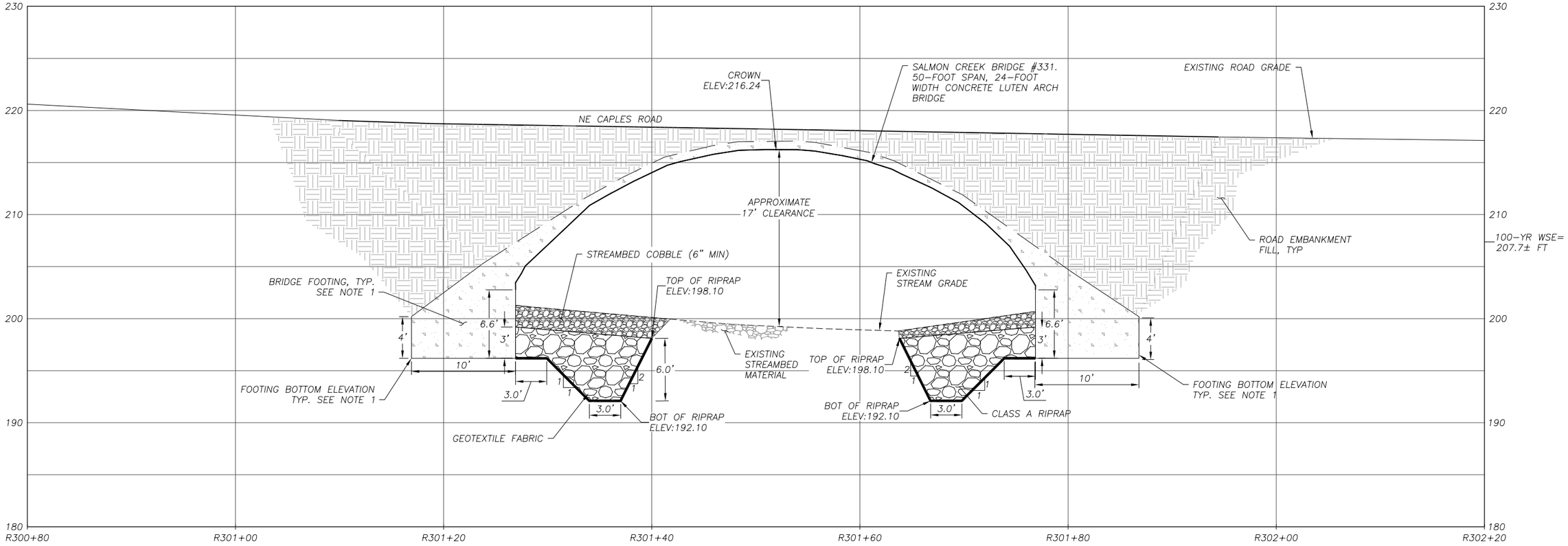
10' 0' 10' 20'
SCALE IN FEET

FIGURE 4
PLAN VIEW

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA

NOTES:

1. BRIDGE FOOTING DIMENSIONS AND ELEVATIONS ARE BASED ON AS-BUILT DRAWINGS DATED SINCE 1923 AND CONVERTED TO PROJECT VERTICAL DATUM (NGVD29).
2. ELEVATION IN FEET, ESTABLISHED USING THE NATIONAL GEODETIC VERTICAL DATUM 1929.
3. STREAM RIPRAP SHALL BE CLASS A RIPRAP WITH A D50 = 1.0 FOOT.



SALMON CREEK BRIDGE SECTION A-A' (LOOKING DOWNSTREAM)

Otak

Otak, Inc.
700 Washington St., Suite 300
Vancouver, WA 98660
360.737.9613
www.otak.com

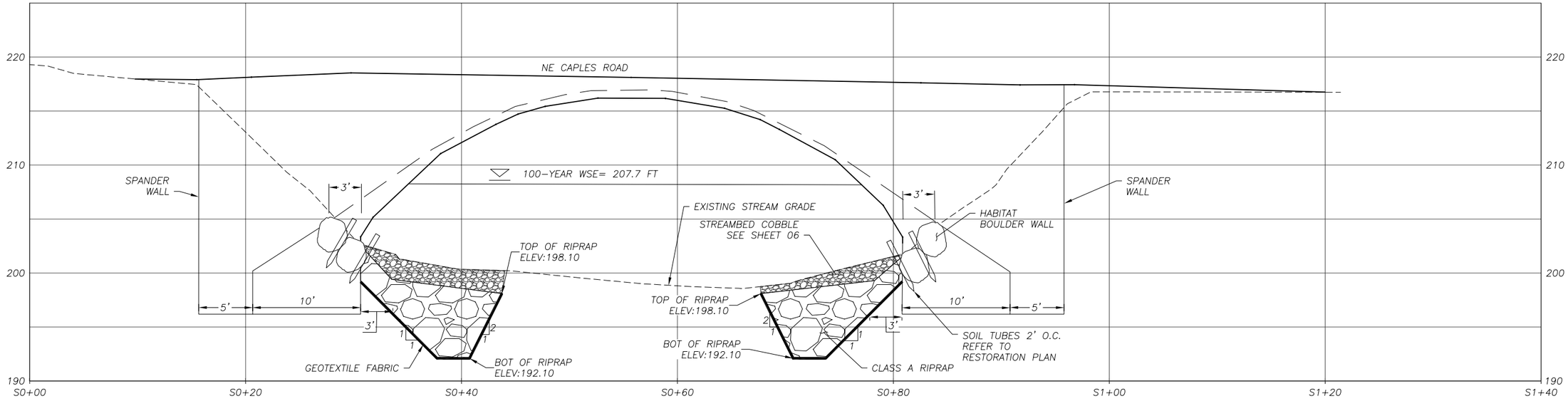
5 0 5 10 HORIZ
5 0 5 10 VERT.
SCALE IN FEET

FIGURE 5
BRIDGE SECTION

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA

NOTE:

1. THIS CONFIGURATION IS TYPICAL RIPRAP FOR AREA UPSTREAM AND DOWNSTREAM THE BRIDGE.



SALMON CREEK UPSTREAM FACE B–B' (LOOKING DOWNSTREAM)

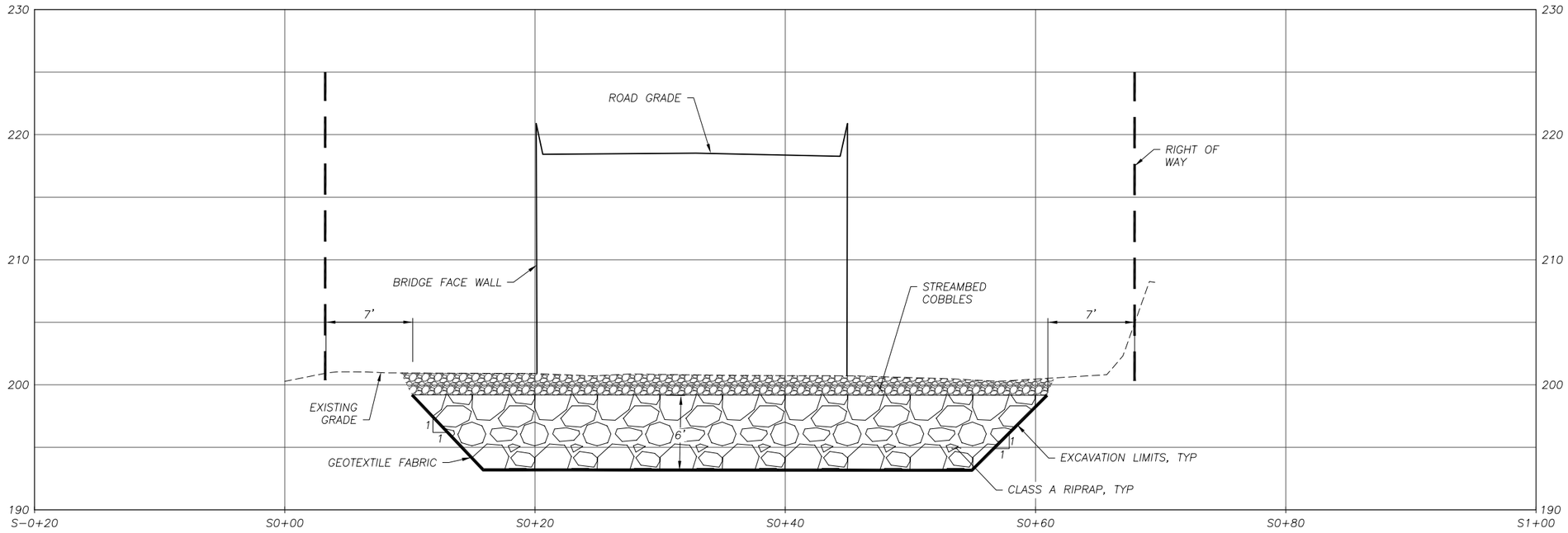
Otak

Otak, Inc.
700 Washington St., Suite 300
Vancouver, WA 98660
360.737.9613
www.otak.com

5 0 5 10 HORIZ
5 0 5 10 VERT.
SCALE IN FEET

FIGURE 6
STREAM SECTION

Lehto, Smith, and Salmon Creek Bridges
(3Bridges)
Scour Repair Project
Clark County, WA



NE CAPLES RD RIGHT OF BANK SECTION C–C' (LOOKING SOUTH)

Otak, Inc.
700 Washington St., Suite 300
Vancouver, WA 98660
360.737.9613
www.otak.com

5 0 5 10 HORIZ
5 0 5 10 VERT.
SCALE IN FEET

FIGURE 7
ROAD EMBANKMENT SECTION

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA

Appendix B

Appendix B: Field Reconnaissance Photo Log

Photo Log

Photo 1: Salmon Creek Bridge – Looking downstream

Photo 2: Salmon Creek Bridge – Looking upstream

Photo 3: Salmon Creek Bridge – Concrete spalling

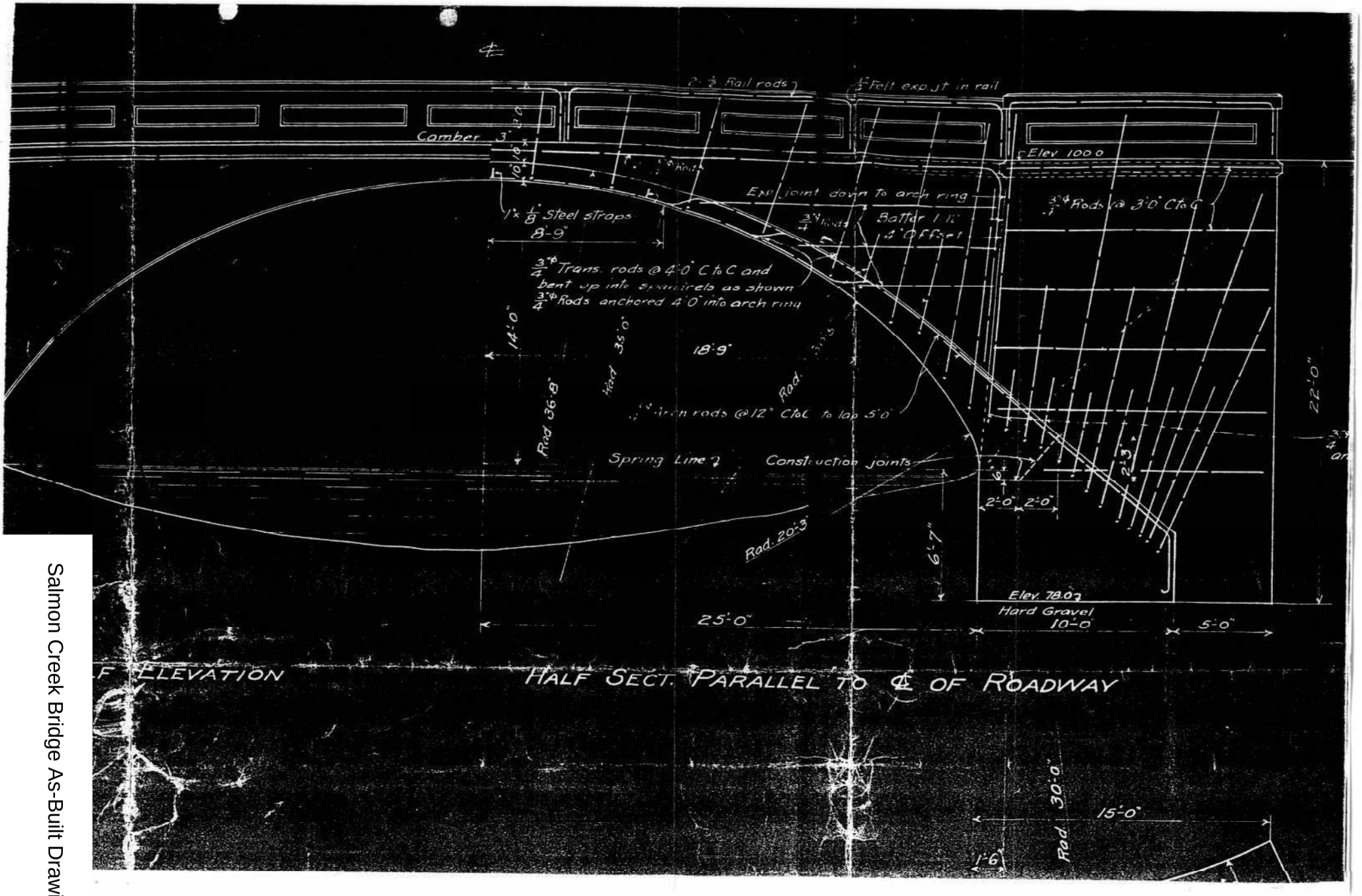
Photo 4: Salmon Creek Bridge – South Abutment

Photo 5: Salmon Creek Bridge – North Abutment

Photo 6: Salmon Creek Bridge – ditch/pond overflow channel

Appendix C

Appendix C: Supporting Documentation



Salmon Creek Bridge As-Built Drawing

WSBIS Item 1680 – Scour **Pulldown**
NBI Item 113

Applicable Structure Types

- **Bridges & culverts carrying public roadways**

Code as indicated below to identify the current status of the bridge regarding its vulnerability to scour:

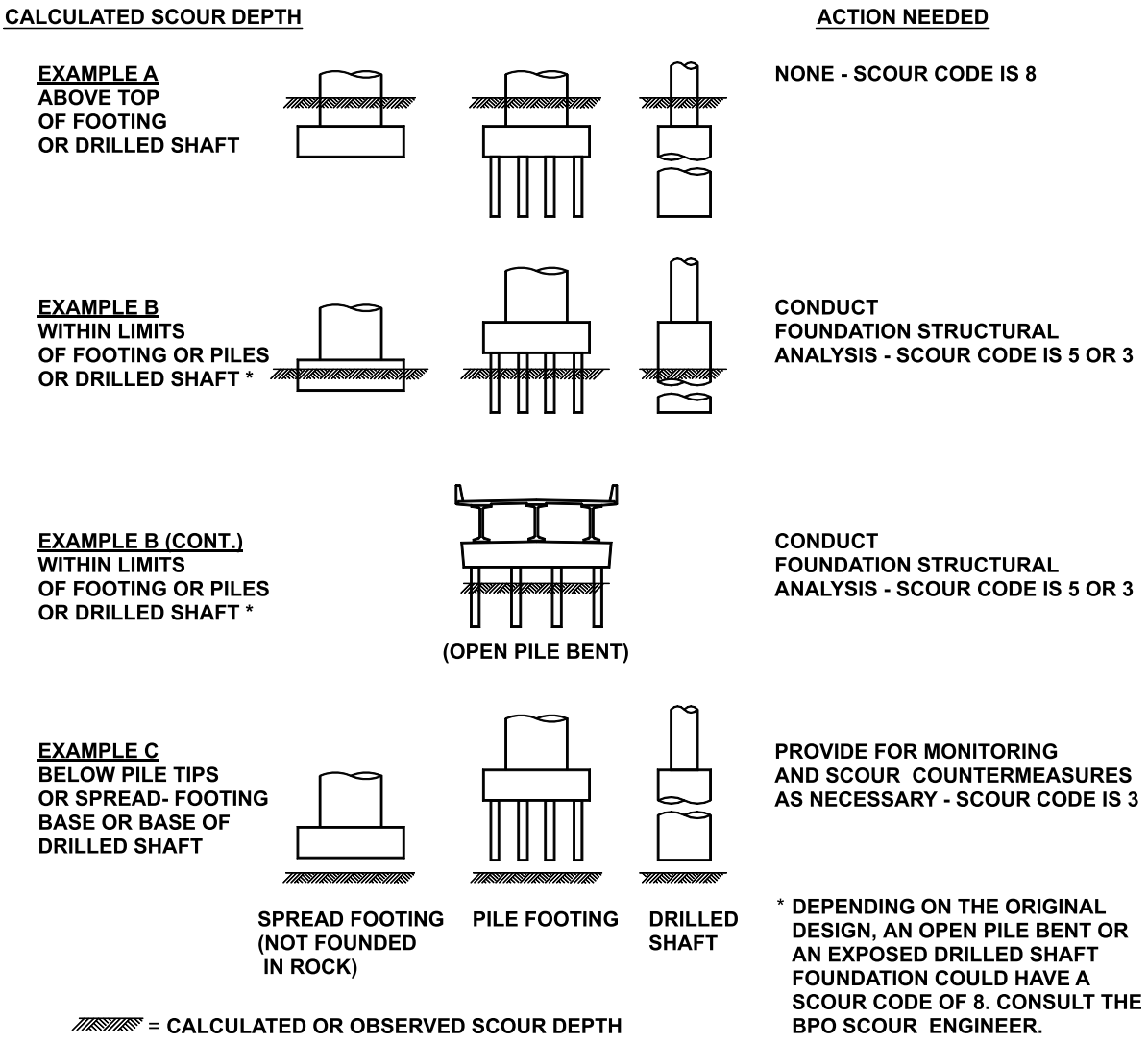
Table 1680 Scour Rating

WSBIS Code	Description
N	Bridge not over waterway.
U	Bridge with unknown foundation that has not been evaluated for scour. Until risk can be determined, a plan of action should be developed and implemented to reduce the risk to users from a bridge failure during or immediately after a flood event (see HEC 23).
T	Bridge over tidal waters that has not been evaluated for scour, but considered low risk. Bridge will be monitored with regular inspection cycle and with appropriate underwater inspections. (Unknown foundations in tidal waters should be coded U.)
9	Bridge foundations (including piles) on dry land well above flood water elevations.
8	Bridge foundations determined to be stable for the assessed or calculated scour conditions. Scour is determined to be above top of footing or drilled shaft (Example A) by: • assessment (e.g., bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), or • calculation (exposed drilled shafts may be included by calculations), or • installation of properly designed countermeasures (see HEC 23).
7	Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a plan of action have been implemented to reduce the risk to users from a bridge failure during or immediately after a flood event.
6	Scour calculation/evaluation has not been made.
5	Bridge foundations determined to be stable for assessed or calculated scour conditions. Scour is determined to be within the limits of footing or piles, including open pile bents, or drilled shafts (Example B) by: • assessment (e.g., bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), or • calculations, or • installation of properly designed countermeasures (see HEC 23).
4	Bridge foundations determined to be stable for assessed or calculated scour conditions; field review indicates action is required to protect exposed foundations (see HEC 23).
3	Bridge is scour critical; bridge foundations determined to be unstable for assessed or calculated scour conditions: • Scour within limits of footing or piles, or drilled shafts (Example B) • Scour below spread-footing base or pile tips, or base of shafts (Example C)
2	Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations, which are determined to be unstable by: • a comparison of calculated scour and observed scour during the bridge inspection, or • an engineering evaluation of the observed scour condition reported by the bridge inspector in WSBIS Item 1676 – Substructure.
1	Bridge is scour critical; field review indicates that failure of piers/abutments is imminent. Bridge is closed to traffic. Failure is imminent based on: • a comparison of calculated and observed scour during the bridge inspection, or • an engineering evaluation of the observed scour condition reported by the bridge inspector in WSBIS Item 1676 – Substructure.
0	Bridge is scour critical. Bridge has failed and is closed to traffic.

These codes are generally determined based on scour analyses made by hydraulic, geotechnical, or structural engineers. However, bridge inspectors play a key role in determining selected scour codes:

- Scour code 4 can be determined by the bridge inspector regardless of any previous higher scour code, based on observed conditions.
- For scour codes of 2 or less, the WSBIS Item 1676 – Substructure code must have a matching code.
- For WSDOT bridges, all changes to the 1680 Scour Code must be reviewed and approved by the BPO Sour Engineer.

Figure WSBIS 1680



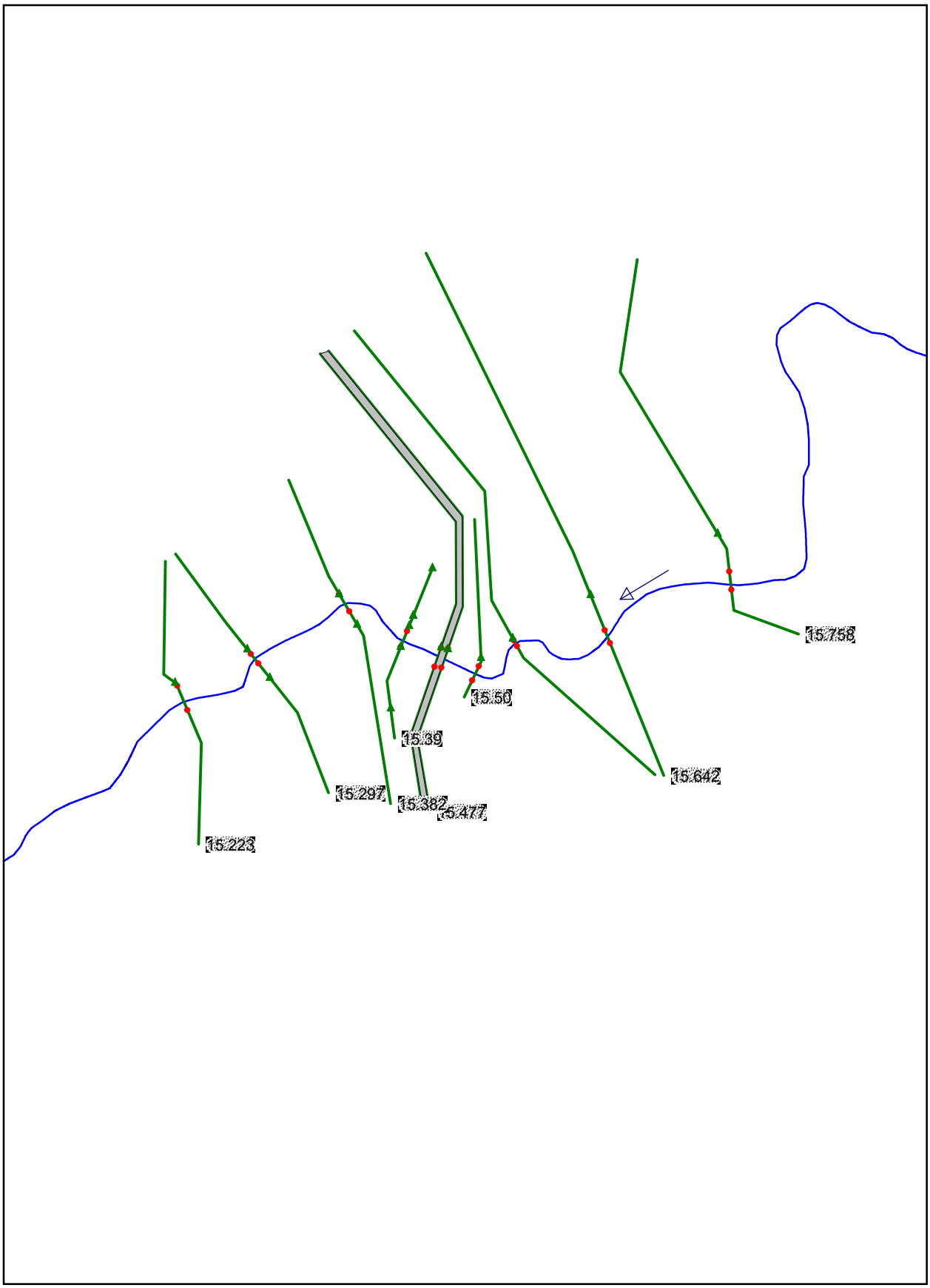
NBI Commentary:

This item has been modified based on an April 27, 2001 FHWA memo regarding FHWA Items 60 and 113 (WSBIS Items 1676 and 1680). This memo is available at www.fhwa.dot.gov/engineering/hydraulics/policymemo/revguide.cfm.

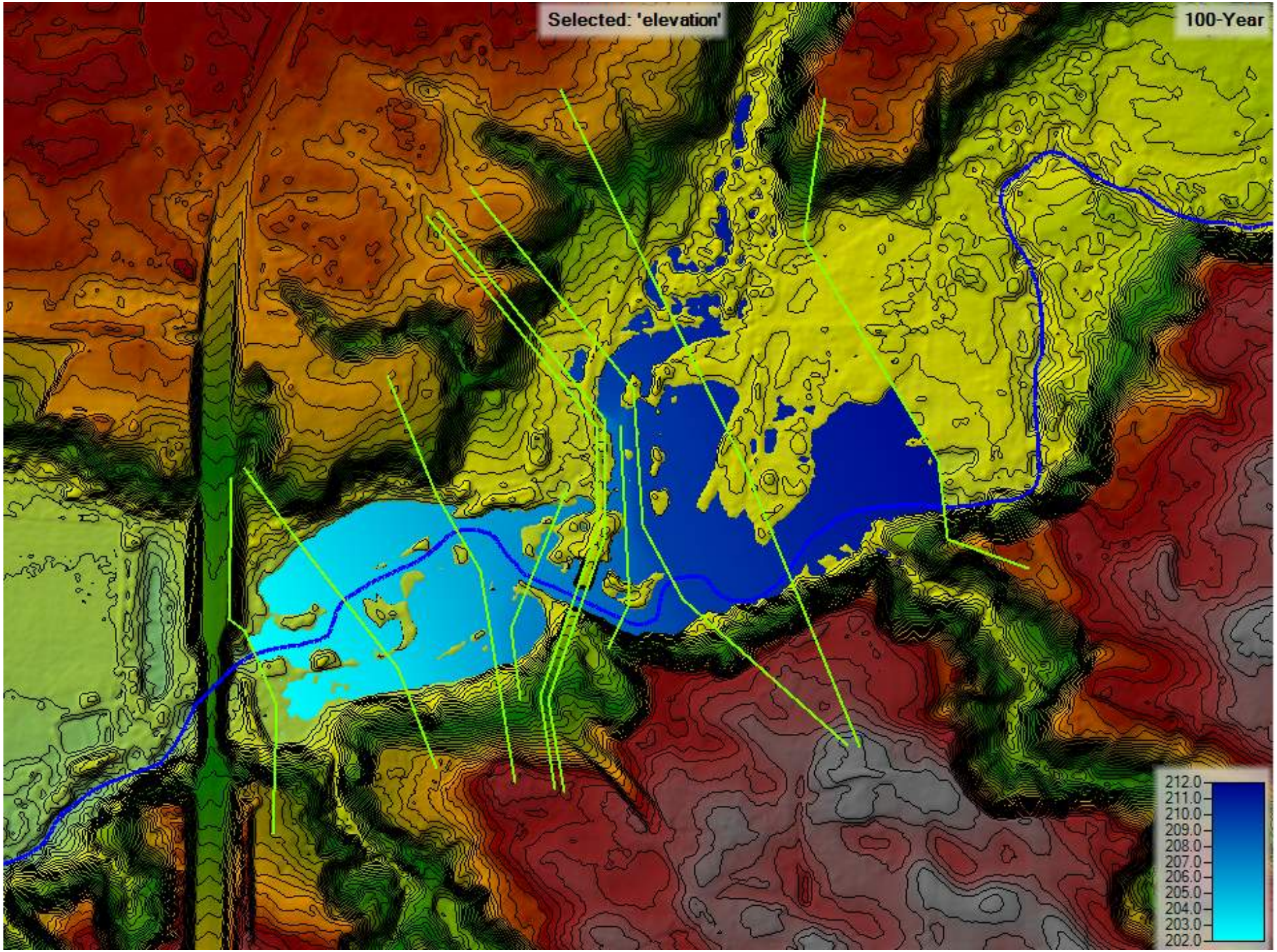
Appendix D

Appendix D: HEC-RAS Output

Salmon Creek Bridge HEC-RAS Cross-Section Locations

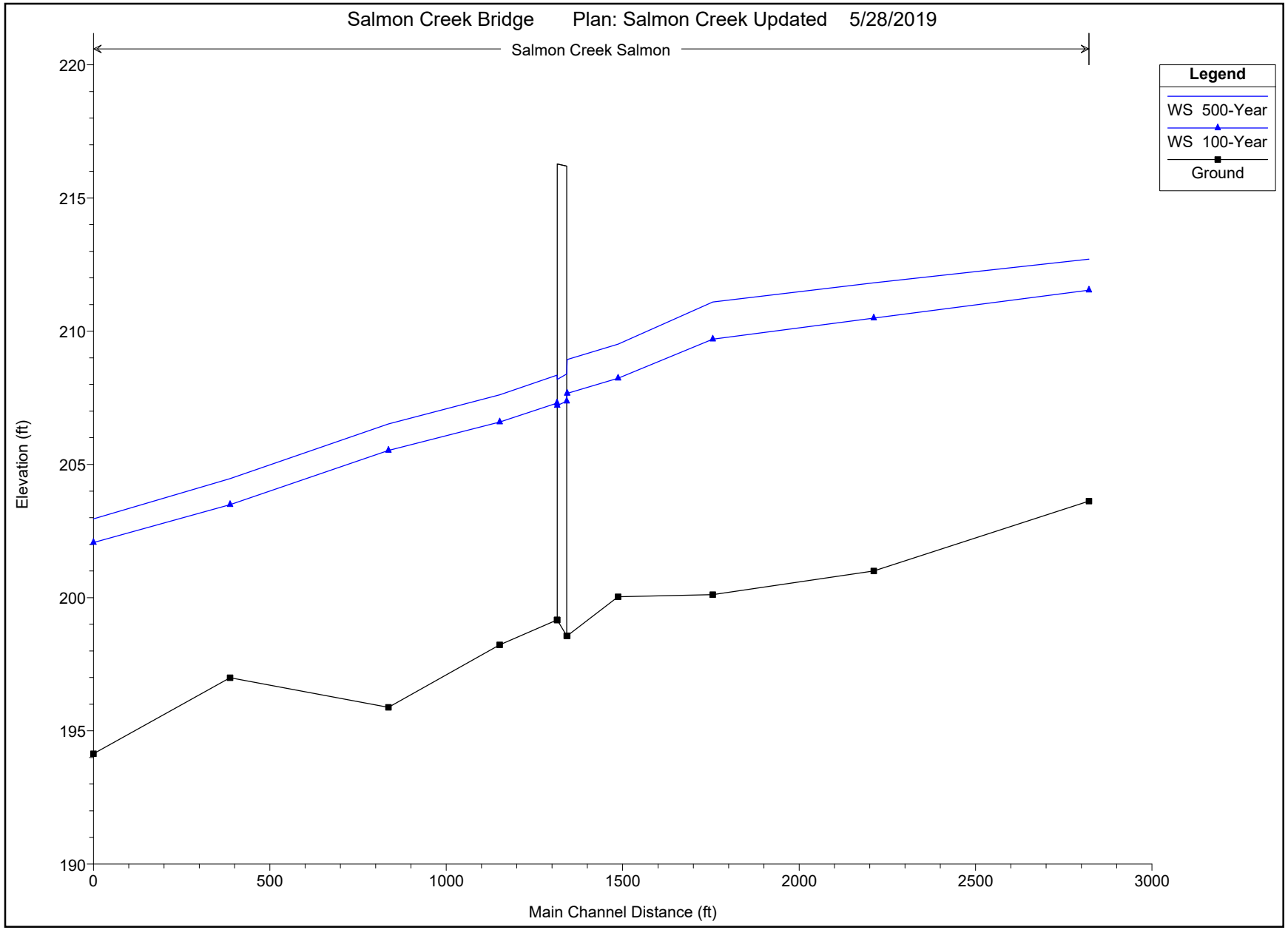


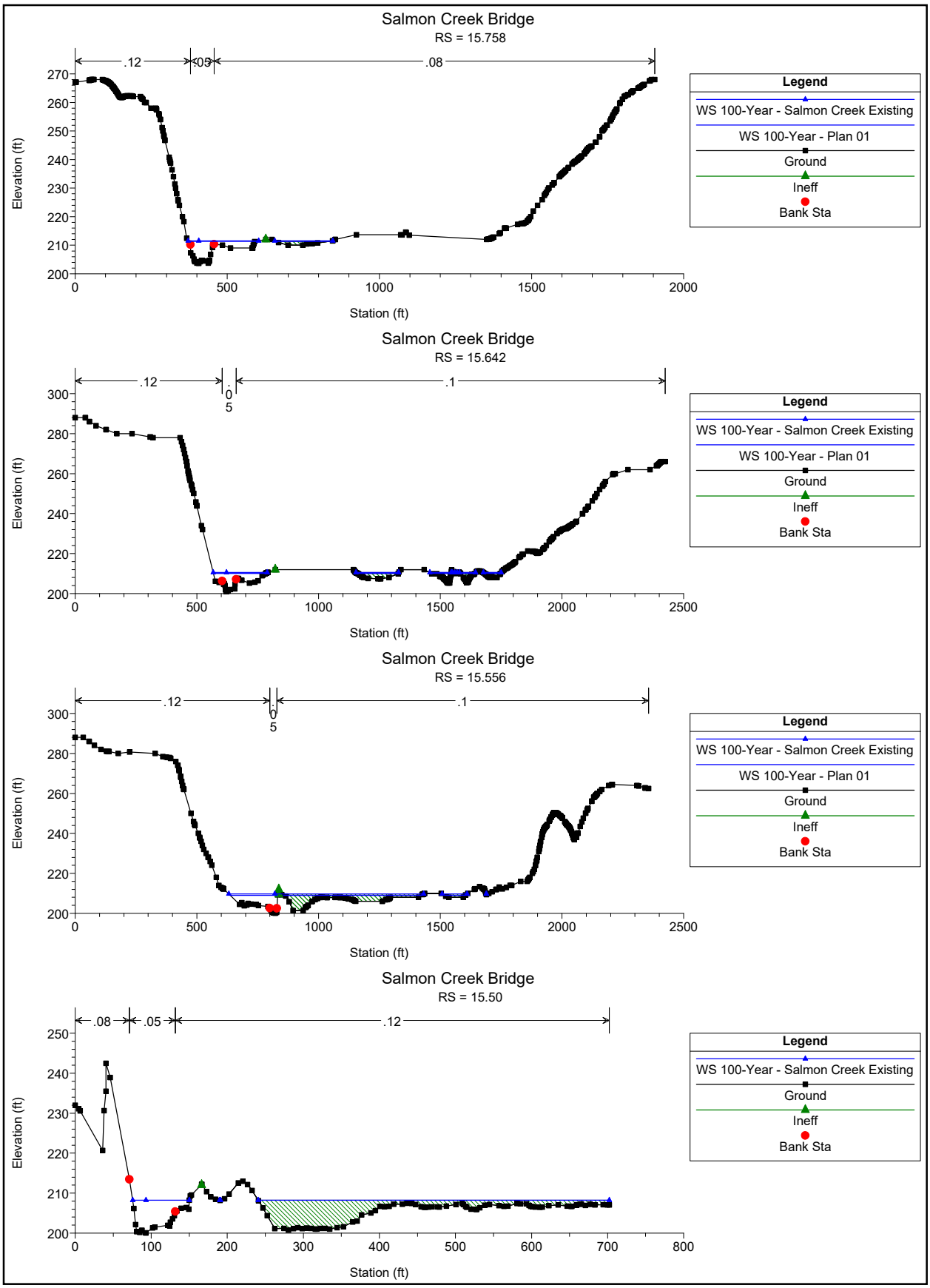
1 in Horiz. = 600 ft 1 in Vert. = 600 ft

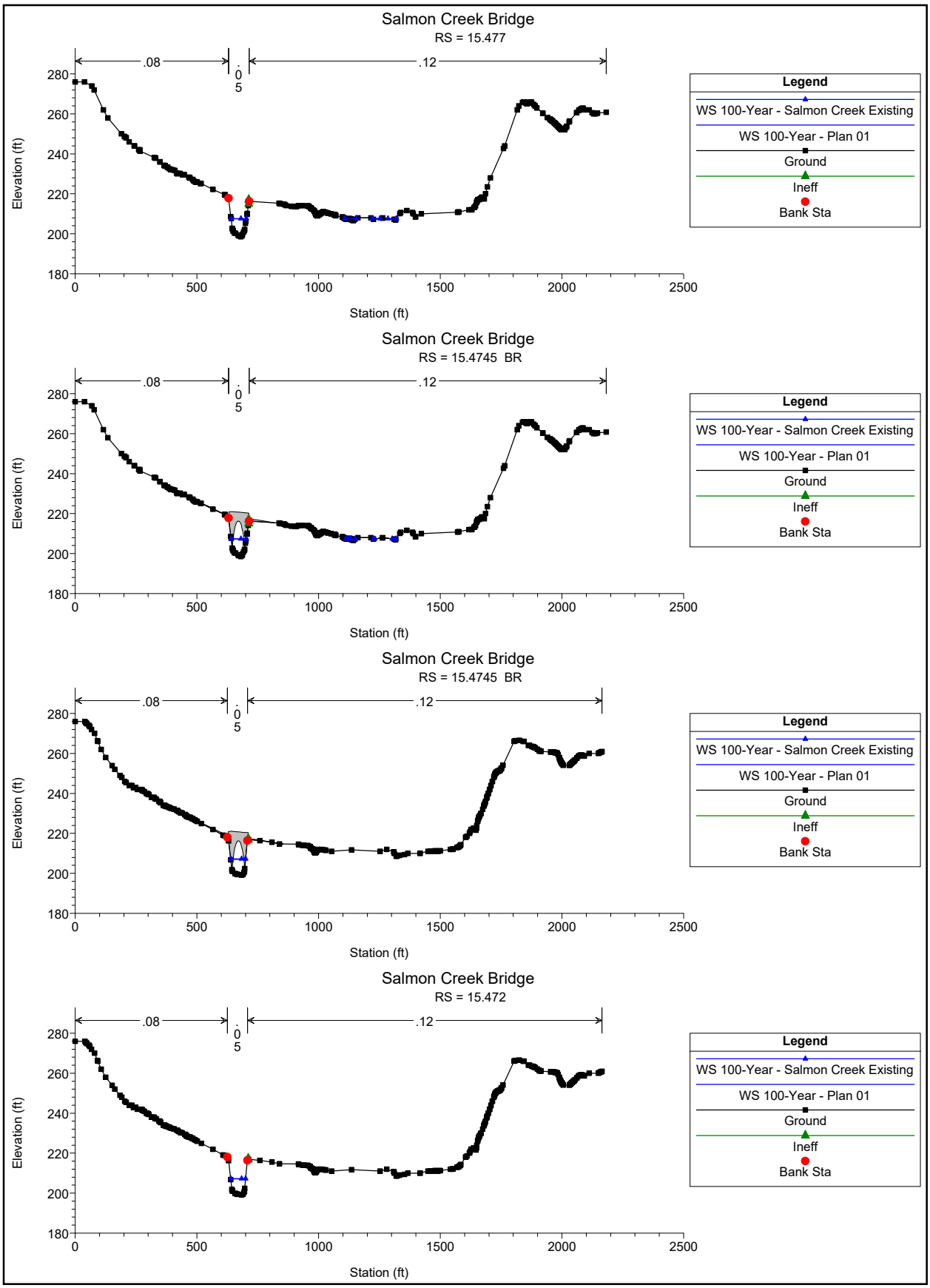


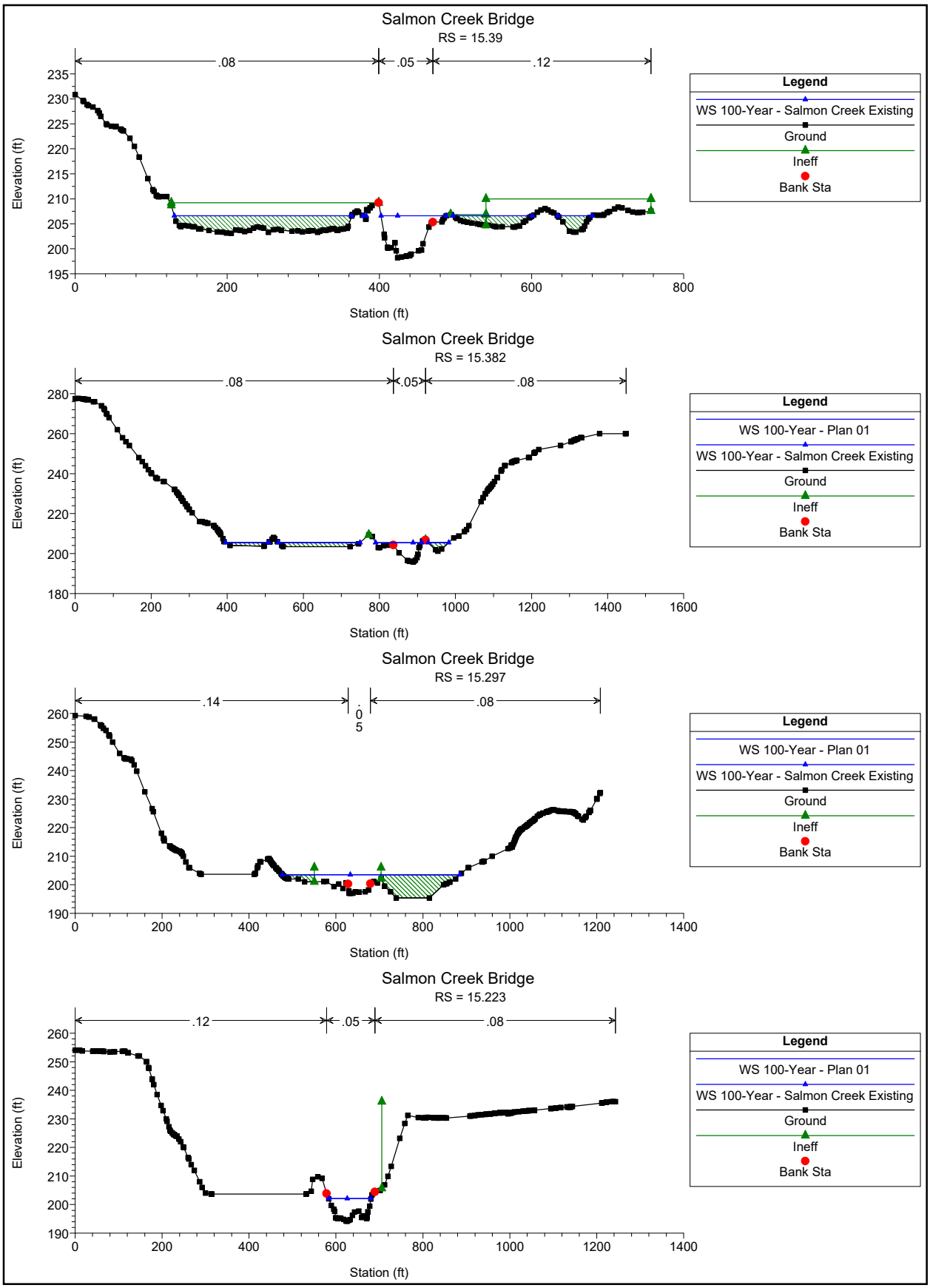
100-YEAR FLOOD MAP PROVIDED FOR CONTEXT ONLY AND IS NOT INTENDED TO REPLACE FEMA FIRM

Salmon Creek Bridge HEC-RAS Profile




Salmon Creek Bridge
RS = 15.758
.12
.05
.08
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.642
.12
.05
.1
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.556
.12
.05
.1
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.50
.08
.05
.12
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
Ground
Ineff
Bank Sta


Salmon Creek Bridge
RS = 15.477
.08
.05
.12
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.4745 BR
.08
.05
.12
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.4745 BR
.08
.05
.12
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.472
.08
.05
.12
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
WS 100-Year - Plan 01
Ground
Ineff
Bank Sta


Salmon Creek Bridge
RS = 15.39
.08
.05
.12
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Salmon Creek Existing
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.382
.08
.05
.08
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Plan 01
WS 100-Year - Salmon Creek Existing
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.297
.14
.05
.08
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Plan 01
WS 100-Year - Salmon Creek Existing
Ground
Ineff
Bank Sta
Salmon Creek Bridge
RS = 15.223
.12
.05
.08
Elevation (ft)
Station (ft)
Legend
WS 100-Year - Plan 01
WS 100-Year - Salmon Creek Existing
Ground
Ineff
Bank Sta

Salmon Creek Bridge HEC-RAS Output Table

HEC-RAS Plan: Salmon Creek Existing River: Salmon Creek Reach: Salmon

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Salmon	15.758	500-Year	3480.00	203.62	212.71	209.56	212.89	0.001448	4.13	1561.60	654.02	0.27
Salmon	15.758	100-Year	2630.00	203.62	211.54	208.40	211.83	0.002294	4.64	771.65	422.18	0.33
Salmon	15.642	500-Year	3480.00	201.00	211.81	207.83	212.04	0.001364	4.53	1348.32	769.66	0.27
Salmon	15.642	100-Year	2630.00	201.00	210.49	207.09	210.70	0.001487	4.25	1033.46	637.92	0.27
Salmon	15.556	500-Year	3480.00	200.11	211.09	207.14	211.36	0.001769	5.73	1370.18	1040.81	0.31
Salmon	15.556	100-Year	2630.00	200.11	209.70	206.52	209.96	0.001914	5.41	1075.88	904.89	0.32
Salmon	15.50	500-Year	3480.00	200.03	209.52		210.41	0.005122	7.71	500.29	568.97	0.49
Salmon	15.50	100-Year	2630.00	200.03	208.24		209.00	0.005294	7.07	403.27	537.48	0.49
Salmon	15.477	500-Year	3480.00	198.57	208.93	205.28	209.68	0.004070	6.92	502.79	328.08	0.44
Salmon	15.477	100-Year	2630.00	198.57	207.66	204.39	208.27	0.003880	6.25	420.73	178.21	0.43
Salmon	15.4745		Bridge									
Salmon	15.472	500-Year	3480.00	199.16	208.35	205.01	209.16	0.004557	7.22	481.91	63.54	0.46
Salmon	15.472	100-Year	2630.00	199.16	207.30	204.14	207.93	0.004022	6.32	416.30	61.80	0.43
Salmon	15.39	500-Year	3480.00	198.23	207.61		208.39	0.004781	7.11	555.67	574.76	0.48
Salmon	15.39	100-Year	2630.00	198.23	206.59		207.22	0.004648	6.40	426.42	472.99	0.46
Salmon	15.382	500-Year	3550.00	195.88	206.52	202.93	207.06	0.003389	6.09	666.50	543.60	0.41
Salmon	15.382	100-Year	2680.00	195.88	205.53	202.02	205.98	0.003135	5.50	542.84	503.55	0.39
Salmon	15.297	500-Year	3550.00	196.99	204.47	202.75	205.16	0.005328	7.59	754.02	556.54	0.51
Salmon	15.297	100-Year	2680.00	196.99	203.49	202.10	204.11	0.005656	7.05	603.27	408.65	0.51
Salmon	15.223	500-Year	3550.00	194.14	202.96	199.82	203.46	0.003481	5.69	623.63	101.21	0.40
Salmon	15.223	100-Year	2680.00	194.14	202.07	199.13	202.46	0.003106	5.00	535.48	96.90	0.38

Plan: Salmon Creek Existing Salmon Creek Salmon RS: 15.4745 Profile: 100-Year

E.G. US. (ft)	208.27	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	207.66	E.G. Elev (ft)	208.20	208.03
Q Total (cfs)	2630.00	W.S. Elev (ft)	207.37	207.22
Q Bridge (cfs)	2630.00	Crit W.S. (ft)	204.34	204.11
Q Weir (cfs)		Max Chl Dpth (ft)	8.80	8.06
Weir Sta Lft (ft)		Vel Total (ft/s)	7.29	7.22
Weir Sta Rgt (ft)		Flow Area (sq ft)	360.67	364.19
Weir Submerg		Froude # Chl	0.43	0.45
Weir Max Depth (ft)		Specif Force (cu ft)	1987.03	1987.38
Min El Weir Flow (ft)	217.26	Hydr Depth (ft)	8.25	8.33
Min El Prs (ft)	216.20	W.P. Total (ft)	64.00	67.27
Delta EG (ft)	0.34	Conv. Total (cfs)	33942.8	33371.1
Delta WS (ft)	0.36	Top Width (ft)	43.74	43.72
BR Open Area (sq ft)	633.47	Frctn Loss (ft)	0.16	0.01
BR Open Vel (ft/s)	7.29	C & E Loss (ft)	0.01	0.10
BR Sluice Coef		Shear Total (lb/sq ft)	2.11	2.10
BR Sel Method	Energy only	Power Total (lb/ft s)	15.40	15.16

Appendix E

Appendix E: Scour Calculations

Hydraulic Data for:
Salmon Creek Bridge #331 Scour Repair Project

100-year Event				500-year Event			
Y_o	=	8.25	ft	Y_o	=	9.73	ft
Q_1	=	2,575	cfs	Q_1	=	3,370	cfs
Q_2	=	2,630	cfs	Q_2	=	3,480	cfs
A_1	=	364	ft^2	A_1	=	437	ft^2
A_2	=	361	ft^2	A_2	=	405	ft^2
W_1	=	56.2	ft	W_1	=	57.3	ft
W_2	=	43.7	ft	W_2	=	41.6	ft
V_m	=	7.07	fps	V_m	=	7.71	fps
D_{50}	=	36.1	mm	D_{50}	=	36.1	mm
Energy Slope	=	5.294E-03	ft/ft	Energy Slope	=	5.122E-03	ft/ft
Acceleration of Gravity	=	32.2	ft/sec^2	Acceleration of Gravity	=	32.2	ft/sec^2
Fall Velocity, ω	=	2.76	fps	Fall Velocity, ω	=	2.76	fps

By: Marisan G Elisabeth

Date: 30-Jan-18

Scour Calculation Summary
Salmon Creek Bridge #331 Scour Repair Project
Contraction Scour Mode

The following calculations are based on Equation 6.1 in HEC-18, 5th Edition:
$V_c = K_u Y_1^{1/6} D_{50}^{1/3}$

100-year Event		
Approach Section Main Channel Area, A_1 (ft^2)	=	364
Approach Section Main Channel Topwidth, W_1 (ft^2)	=	56.24
Approach Section Average Channel Depth, $Y_1 = A_1/W_1$ (ft)	=	6.5
Median Grain Size, D_{50} (ft)	=	0.118
K_u	=	11.17
Critical Velocity for bed material transport, V_c (fps)	=	7.49
Approach Section Main Channel Discharge, Q_1 (cfs)	=	2,575
Approach Section Main Channel Velocity, V_m (fps)	=	7.07
Scour Mode:		**Clear Water**
500-year Event		
Approach Section Main Channel Area, A_1 (ft^2)	=	437
Approach Section Main Channel Topwidth, W_1 (ft^2)	=	57.26
Approach Section Average Channel Depth, $Y_1 = A_1/W_1$ (ft)	=	7.6
Median Grain Size, D_{50} (ft)	=	0.118
K_u	=	11.17
Critical Velocity for bed material transport, V_c (fps)	=	7.70
Approach Section Main Channel Discharge, Q_1 (cfs)	=	3,370
Approach Section Main Channel Velocity, V_m (fps)	=	7.71
Scour Mode:		**Live Bed**

Scour Calculation Summary
Salmon Creek Bridge #331 Scour Repair Project
Clear-Water Contraction Scour
100-Year Event

The following calculations are based on Equations 6.4 and 6.5, HEC-18, 5th Edition:

$Y_2=((K_uQ^2)/(D_m^{2/3}W^2))^{3/7}$

$Y_s=Y_2-Y_0$

K_u	=	0.0077
Discharge, Q (cfs)	=	2,630
Median Grain Size, D_{50} (ft)	=	0.118
Diameter of smallest non-transportable particle, D_m (ft)	=	0.148
Topwidth, W (ft)	=	43.7
Computed Average Depth in Contracted Section, Y_2 (ft)	=	7.18
Existing Average Depth Before Scour, Y_0 (ft)	=	8.25
Computed Average Contraction Scour Depth, Y_s (ft)	=	**(1.1)**

Scour Calculation Summary
Salmon Creek Bridge #331 Scour Repair Project
Live-Bed Contraction Scour
500-Year Event

The following calculations are based on Equations 6.2 and 6.3, HEC-18, 5th Edition:

$Y_2/Y_1=(Q_2/Q_1)^{6/7}(W_1/W_2)^{k1}$

$Y_s=Y_2-Y_0$

Energy Slope	=	0.005122
Fall Velocity, ω (fps)	=	2.76
Average approach channel depth, $Y_1 = A_1/W_1$ (ft)	=	7.6
Acceleration of Gravity, g (ft/sec^2)	=	32.2
Upstream Shear Velocity, V_* (fps)	=	1.12
V^*/ω	=	0.41
k_1 (from HEC-18)	=	0.59
Upstream Channel Discharge, Q_1 (cfs)	=	3,370
Contracted Section Channel Discharge, Q_2 (cfs)	=	3,480
Upstream Main Channel Width, W_1 (ft)	=	57.26
Contracted Section Main Channel Width, W_2 (ft)	=	43.7
Computed Average Depth in Contracted Section, Y_2 (ft)	=	9.2
Existing Average Depth Before Scour, Y_0 (ft)	=	8.25
Computed Average Contraction Scour Depth, Y_s (ft)	=	**0.9**

Scour Calculation Summary
Salmon Creek Bridge #331 Scour Repair Project
Live-Bed Abutment Scour US

Section 8.6.3 HEC-18, 5th Edition

$y_{max} = \alpha_A * y_c$

$y_s = y_{max} - y_0$

$y_c = y_1(q_{2c}/q_1)^{(6/7)}$

		100-yr	500-yr
q_{2c} (cfs)	=	60.13	83.71
q_1 (cfs)	=	45.79	58.86
q_{2c}/q_1 (unitless)	=	1.31	1.42
y_1 (feet)	=	6.48	7.63
y_c (feet)	=	8.18	10.32
α_A (unitless)	=	1.7	1.65
Y_{max} (feet)	=	13.91	17.03
y_0 (feet)	=	8.80	9.83
y_s (feet)	=	5.11	7.20

Scour Calculation Summary
Salmon Creek Bridge #331 Scour Repair Project
Clear-Water Abutment Scour US

Section 8.6.3 HEC-18, 5th Edition

$y_{max} = \alpha_B * y_c$

$y_s = y_{max} - y_0$

$y_c = (q_{2f}/K_u D_{50}^{1/3})^{(6/7)}$

		100-yr	500-yr
q_{2c} (cfs)	=	60.13	83.71
q_1 (cfs)	=	45.79	58.86
q_{2c}/q_1 (unitless)	=	1.31	1.42
y_1 (feet)	=	6.48	7.63
D_{50} (ft)	=	0.12	0.12
K_u (English Unit)	=	11.17	11.17
y_c (feet)	=	7.77	10.32
α_B (unitless)	=	2.4	2.3
Y_{max} (feet)	=	18.66	23.74
y_0 (feet)	=	8.80	9.83
y_s (feet)	=	9.86	13.91

RIPRAP SIZING CALCULATION

Project: Salmon Creek Bridge Scour Repair
Project No.: 19047

ODOT Tractive Force Method			
		100-yr	500-yr
V	=	7.29	8.6
Davg	=	8.25	9.73
SF	=	1.2	1
CSF	=	1.0	0.8
Ss	=	2.7	2.7
Csg	=	1.0	1.0
C	=	1.0	0.8
K1	=	0.534	0.534
D50	**=**	**0.35**	**0.40**

USACE EM-1601 Method			
		100-Year	500-Year
Vavg (ft/s)	=	7.29	8.6
Rc	=	1500	1500
W	=	43.74	41.57
Rc/W	=	34.29	36.08
Vdes (ft/s)	=	7.29	8.60
y (ft)	=	8.8	9.83
Side Slope (H:V)	=	1.5	1.5
Theta (deg)	=	33.69	33.69
K1	=	0.51	0.51
SG	=	2.65	2.65
Sf	=	1.3	1
Cs	=	0.3	0.3
Cv	=	1	1
CT	=	1	1
d30	=	0.53	0.60
d50 = 1.2*d30	**=**	**0.64**	**0.72**

FHWA Isbash for Abtuments			
		100-Year	500-Year
V	=	7.29	8.6
y	=	8.8	9.83
K	=	1.02	1.02
SG	=	2.65	2.65
Fr	=	0.43	0.48
D50	**=**	**1.02**	**1.42**

Design D50 for 100-year (ft)	**1.02**
Design D50 for 500-year (ft)	**1.42**

Appendix F

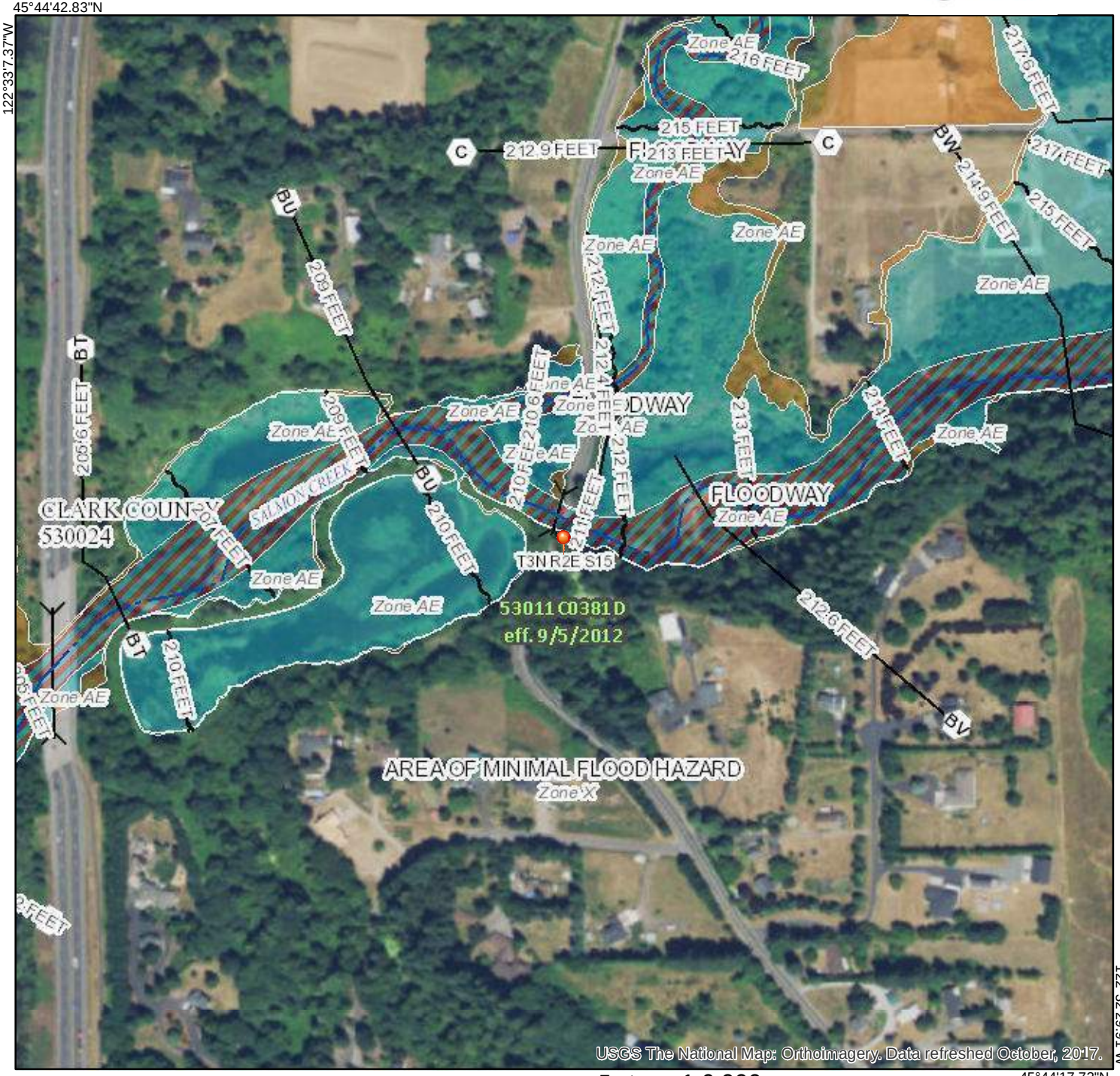
Appendix F: FIRM Panel

National Flood Hazard Layer FIRMette

FEMA

45°44'42.83"N

122°33'7.37"W



45°44'17.73"N

122°32'29.91"W

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/25/2019 at 6:19:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Smith Bridge Scour Repair Project

Hydraulic Report

Smith Bridge #211
NE 167th Avenue, 0.25 mi. S of NE 199th Street – CRP 381522

Submitted to:
Clark County Public Works
1300 Franklin Street
Vancouver, WA 98660
August 30, 2019

Prepared By:
Otak, Inc.
700 Washington Street, Suite 300
Vancouver, WA 98660
Project No. 19047

Otak

8-30-19

Hydraulic Report

Otak

TABLE OF CONTENTS

Appendices

Introduction

Smith Bridge #211 is one of three existing scour critical bridges programmed for repairs in Clark County's 2018-2023 Transportation Improvement Program (TIP). Otak was hired to develop the engineering design and construction documents needed to construct scour countermeasures for the three bridges, including Smith Bridge.

This report describes the hydraulic analyses conducted for the design of scour countermeasures at Smith Bridge. The work documented in this report was carried out by Otak, Inc. (Otak) under contract with Clark County Public Works (County). This work includes the following tasks:

- Review of background information and field investigations to evaluate existing hydraulic conditions.
- Review of existing hydrologic analysis to establish design flows.
- Hydraulic analyses and review of existing hydraulic models.
- Scour analyses to support the scour countermeasure design and development of the scour countermeasure design.
- Floodplain analyses to determine any impacts to Base (100-year) Flood Elevations to support No-Rise Certification.

Project Location

Smith Bridge #211 located where NE 167th Avenue crosses over Salmon Creek approximately 0.25 miles south of the intersection with NE 199th Street**.** The location of Smith Bridge is depicted in **Figure 1 in Appendix A**.

Existing Conditions

Smith Bridge #211 is located on NE 167th Ave., approximately ¼ mile south of NE 199th St. The bridge was widened in 1963 and it is unknown when the original bridge was constructed. A Photo Log of the site is included in **Appendix B**. The single span pre-cast concrete bridge has a 40-foot span and is 26 feet wide. It is supported on shallow concrete spread footings. Concrete wingwalls are located on all four corners of the bridge. The northeast bridge corner is protected by a large concrete apron that is assumed to have been constructed when the bridge was widened. A roadside ditch discharges to the creek just upstream of the concrete apron and wingwall.

Smith Bridge – Looking upstream

Smith Bridge – Looking downstream

Scour is occurring along the south abutment and has been documented in bridge inspection reports provided by the County. Additionally, there is high potential for scour along the northern abutment initiated by a substantial bend in the creek just upstream of the bridge. Riprap is in the channel along the northern abutment but is not configured in a way that will ensure protection against potential scour. Additionally, there is an exposed 6-inch waterline located approximately 12 feet upstream of the bridge edge. This waterline is currently in use. The County will lead coordination with the utility.

Available bridge as-built drawings show the components that were required to widen the bridge including the wingwalls and associated spread footings. The bridge components required for widening were attached to the existing structure without reconstruction of the original abutment and foundation. It is assumed that the original bridge abutment foundation is a spread footing constructed to a depth that matches the foundation used for the wingwalls. The scour countermeasure design is based on this assumption. Investigations carried out during site visits could not determine the depth to the bottom of the footing.

Salmon Creek at Smith Bridge has a large floodplain, accessing pastures upstream of the crossing. The stream meanders through the fields with some large bends before flowing along the road embankment immediately upstream of the crossing. The stream then encounters a 90-degree bend to cross under the roadway. During large flood flows (e.g. 500-year recurrence interval) the roadway can overtop as the stream parallels the embankment.

The road largely cuts off floodplain flows, which are constricted through the bridge during flooding. The bridge span is large enough to not constrict the main channel, but the road embankment does constrict flows that have spread onto the floodplain.

Downstream of the crossing, the floodplain is active through rural properties largely consisting of forest. The stream continues through pools, riffles, and gravel bars that occur near existing stream bends.

The following graphics have been included in the report appendices:

- **Figure 2** in **Appendix A** shows the existing plan view for this bridge.
- **Appendix B** includes field reconnaissance photos of the bridge and surrounding features.
- **Appendix C** includes the available bridge as-built drawings.

Field reconnaissance of Salmon Creek at the Smith Bridge site was conducted by Otak staff on January 14th, 2019. Observations were made of the general characteristics of the creek in the vicinity of the bridge, the condition of the existing bridge, the lateral and vertical stability of the channel, evidence of general and local scour, and bed material characteristics. The field reconnaissance was followed up by a desktop review of available mapping and other information on the creek.

Salmon Creek shows some evidence of vertical or lateral instability near the Smith Bridge site. An exposed waterline indicates that the stream channel has lowered since the pipe was installed. Some aggradation was observed immediately downstream of the bridge. The existing channel at Smith Bridge consists of primarily cobbles, gravels, and silts. There are large riprap pieces located within the channel in the direct vicinity of the bridge.

Pebble counts (Wolman methodology) were conducted to inform the existing streambed gradation. This information was then used in scour calculations, as well as for sizing streambed material to be placed during construction. The existing streambed consists of coarse gravel and silt with median diameter (D_{50}) of 1.29 inches.

Hydrologic Data

Peak discharges used in the hydraulic analysis and design of the scour repair were taken from the Effective FIS for Clark County. The flows are derived from a 2002 Hydrological Simulation Program Fortran (HSPF) model from 2002, according to the FIS. **Table 1** lists the flood flows at each bridge in cubic feet per second (cfs).

Table 1—Peak Flows for Smith Bridge Project Reach

Recurrence Interval (years)	Smith Bridge Discharge (cfs)
10	1,130
50	1,770
100	2,110
500	3,120

Hydraulic Model Development

The hydraulic design process consisted of modeling the Project reach under existing and proposed conditions using existing data provided by the County. The model results were used to aid the Project design with the goal of meeting the following criteria:

- Repair existing bridge scour
- Protect bridge from future scour
- Ensure no-rise conditions are met

A hydraulic analysis of Salmon Creek for the project reach was performed to provide a sound basis for the hydraulic design of the proposed scour repair and to analyze impacts to base flood elevations. The analysis was carried out using the USACE HEC-RAS computer software v5.0.6 to create a one-dimensional hydraulic model. The model was based on the hydraulic model used for the Effective Flood Insurance Study for Clark County (Effective FIS) that was provided by the County, with additional detail added based on a local survey of the site conducted by the County and LIDAR data in the floodplain from 2002, provided by the County. The cross-sections within the work area were then updated to create a proposed conditions model. All vertical datums are in reference to NGVD 29.

Manning's *n* roughness values were selected based on engineering judgment from field observation and standard references (Chow, 1959; Barnes, 1967). The Manning's *n* values for the bounding Effective FIS cross sections were left unchanged from the Effective FIS model, but are consistent with the values used for the new intermediate cross sections. A Manning's *n* value of 0.06 was used for the main channel that reflects the coarse channel bed, meandering planform, and high roughness from vegetation along the channel banks. This value is consistent with that used in the Effective FIS model for the reach. Manning's *n* values of 0.06 to 0.13 were used for the overbank areas to represent the variations in land cover from fenced pastures to dense forested vegetation.

The detailed model is approximately 2,100 feet long and extends from Effective FIS Cross Section 18.801 at the downstream end to Effective FIS Cross Section 19.604 at the upstream end. Six existing cross-sections are located between these two bounding cross-sections. One new intermediate cross-section based on the topographic survey was added between cross-sections 19.160 and 19.024, approximately 60 feet downstream of the bridge. Interpolated cross section were added between the two upstream and

the two downstream sections. The downstream starting water-surface elevation for the model was based on the computed elevation at the downstream cross-section from the Effective FIS model.

Model Results

The Smith Bridge HEC-RAS model was run for both existing conditions and project conditions for the 10-year through the 500-year flood events using discharges listed in **Table 1. Table 2** summarizes the results for the 100-year flood event through the Smith Bridge project reach. As indicated in **Table 2**, the project does not result in an increase to the 100-year water surface elevations. Velocities are in the range of 4 to 7 feet per second. The 100-year flood flows extend onto the floodplain on the right (north) bank both upstream and downstream of the bridge, however the road embankment does not overtop and disconnects the floodplains. The variation in velocity and water surface elevation shown between the existing and proposed models is a result of the channel grading to accomplish balanced cut/fill and no-rise while providing increased cover over the bridge foundations. A detailed model output is included in **Appendix D**.

Table 2—Smith Bridge Hydraulic Results for 100-Year Flood Event

Cross-Section ID	Water Surface Elevation (ft. NGVD)			Velocity in Channel (ft./sec)		
	Exist.	Prop.	Diff.	Exist.	Prop.	Diff.
19.604	263.24	263.24	0.00	4.32	4.32	0.00
19.547*	253.84	253.84	0.00	4.39	4.39	0.00
19.489*	261.86	261.86	0.00	4.46	4.46	0.00
19.432*	261.17	261.17	0.00	4.54	4.54	0.00
19.375*	260.47	260.47	0.00	4.58	4.59	0.01
19.318*	259.78	259.77	-0.01	4.63	4.65	0.02
19.260*	259.09	259.06	-0.03	4.66	4.72	0.06
19.203	258.53	258.16	-0.37	4.21	5.30	1.09
19.166	257.01	256.94	-0.07	7.02	6.17	-0.85
19.163**	257.01	256.94	-0.07	7.02	6.17	-0.85
19.160	256.58	256.56	-0.02	7.62	6.87	-0.75
19.100	256.03	256.03	0.00	3.63	3.63	0.00
19.062*	255.06	255.06	0.00	4.77	4.77	0.00
19.024	254.41	254.41	0.00	4.20	4.20	0.00
18.989*	253.81	253.81	0.00	5.04	5.04	0.00
18.953*	253.17	253.17	0.00	5.36	5.36	0.00
18.918	252.26	252.26	0.00	6.26	6.26	0.00
18.860*	251.16	251.16	0.00	5.35	5.35	0.00
18.801	250.61	250.61	0.00	3.9	3.9	0.00

*Interpolated Cross Section
**Internal Bridge Cross Section

Scour Analysis

A scour analysis was carried out to determine potential scour at Smith Bridge using the 100-year and 500-year peak discharges. The analysis follows procedures outlined in the Federal Highway Administration (FHWA) document Evaluating Scour at Bridges (FHWA, 2012). Scour components considered in the analysis include:

- Long-term degradation potential,

- General scour (contraction and bend scour), and
- Local scour (at the bridge abutments).

Long-term degradation potential at Smith Bridge was estimated to be zero. There is no evidence of active degradation in the channel or signs downstream of profile adjustments moving upstream. An exposed waterline upstream of the bridge could indicate that a profile adjustment has occurred in the past, however it is assumed the exposed waterline is a result of bend scour addressed below.

General scour calculations at Smith Bridge analyzed contraction scour. The contraction scour was calculated to be zero which is consistent with field observations that showed no evidence of contraction scour and the bridge span is wide enough to not significantly constrict the flow.

General scour also includes bend scour. The bend near Smith Bridge is upstream of the bridge and is unlikely to impact the bridge. The bend is likely the cause of the observed scour hole upstream of the bridge. At the downstream limit of the scour hole, a waterline is exposed. The upstream bank is currently well protected by vegetated riprap. The proposed countermeasure design will not disturb the existing protection and stabilized bank. The proposed riprap protection is designed to be deeper than the existing upstream scour hole to protect the abutment if the scour hole were to migrate under the bridge, although this occurrence is unlikely.

Local scour at the Smith Bridge abutments was estimated to be 8.4 feet for the 100-year recurrence interval and 3.5 feet for the 500-year recurrence interval. Abutment scour will be protected against by hardening the streambed around the abutment, thus preventing the turbulence caused by the abutment from eroding the stream bed.

Table 3 summarizes the calculated scour at Smith Bridge.

Table 3—Smith Bridge Scour Summary

Type of Scour	100-year Scour Depth (feet)	500-year Scour Depth (feet)
Long Term Scour	0.0	0.0
Contraction Scour	0.0	0.0
Abutment Scour	8.4*	3.5*
Total scour	0.0	0.0

*Abutment scour will be protected against with the scour countermeasure design

Scour Countermeasure Design

The selected scour countermeasure design is buried riprap along each abutment and the base of the wingwalls. Design calculations using the computed hydraulic results were performed to determine the required size of riprap to be placed. The calculations were carried out using the USACE EM-1601 and modified Isbash methods as described in the HEC-23 document. Using these methods, it was determined that riprap meeting the WSDOT standard specification Rock for Erosion and Scour Protection Class A would be most suitable for the site.

Rock for Erosion and Scour Protection Class A has a D_{50} of 1.0 feet, which is slightly less than the calculated rock size, but much easier to place in constricted work areas than Class B. To account for the smaller size and add additional protection, the riprap thickness has been increased. The thickness of the

riprap is also based on the estimated bottom of abutment. The riprap does not extend to a depth below that of the calculated abutment scour; however, the calculated abutment scour assumes that the turbulence can act directly on the streambed. The proposed riprap revetment will prevent this from happening and thus the total scour will be less. Scour will not occur to that depth under proposed conditions. The depth is also based on the measured bend scour hole upstream of the bridge, protecting against the unlikely migration of the scour hole downstream.

The proposed scour countermeasure will tie into the existing ditch and the existing vegetated riprap located on the outside of the bend. The existing concrete cap will be left in place. The large rock fragments that are located beneath the bridge will be removed.

Floodplain Analysis

The Smith Bridge site is within a FEMA mapped Regulatory Floodway as shown on the FIRMette included in A**ppendix F**. The scour countermeasure was designed to minimize any obstruction or net fill in order to achieve a no-rise to the 100-year water surface elevation.

Otak completed the water surface profile analysis for the Existing Conditions and the Proposed Conditions HEC-RAS models, as discussed previously. These models were used to determine whether the proposed scour repair will result in a rise in the 100-year water surface elevation. **Table 2** summarizes the water surface elevations during the 100-year flood event. There are no increases in computed 100-year water-surface elevations as a result of the project.

Cut/Fill Volumes

In order to meet County floodplain requirements, the project must have balanced cut and fill below the base flood elevation. The Smith Bridge design will result in a net cut of approximately 60 cubic yards as a result of a lowering and widening of the channel through the bridge to achieve the “no-rise”.

The existing streambed channel will be disturbed to install the buried riprap. Additionally, some stream grading will be required to tie into existing grades. The streambed channel within these disturbed areas will be reconstructed using imported streambed materials that are similar in size compared to existing streambed materials. The proposed channel geometries closely resemble the existing channel geometry.

References and Bibliography

Clark County, 2019. Title 40: Clark County, Washington, Unified Development Code, Section 40.420 Flood Hazard Areas.

Federal Emergency Management Agency, 2012. Flood Insurance Study, Clark County Washington and Unincorporated Areas, Effective Date September 5.

Federal Highway Administration, 2009. Hydraulic Engineering Circular 23 (HEC-23), Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance-Third Edition, Publication No. FHWA-NHI-09-112.

Federal Highway Administration, 1989. Hydraulic Engineering Circular 11 (HEC-11), Design of Riprap Revetment, Publication No. FHWA-IP-89-016.

Federal Highway Administration, 2012. Hydraulic Engineering Circular 18 (HEC-18), Evaluating Scour at Bridges, Fifth Edition, Publication No. FHWA-HIF-12-003.

United States Army Corps of Engineers (USACE), 2010. “Approved Work Windows for Fish Protection for All Freshwaters Excluding Waters Within National Park Boundaries, Columbia River, Snake River, and Lakes by County and Specific Watercourse”.

Washington Department of Fish and Wildlife (WDFW), 2010. “Times When Spawning or Incubating Salmonids Are Least Likely to Be Within Washington State Freshwaters”

Washington State Department of Transportation, 2017. Hydraulics Manual, Publication No. M 23-03.05.

Wolman, M.G., 1954. A Method of Sampling Coarse Bed Material, Transactions of the American Geophysical Union, 35, p. 951-956.

Appendix A

Appendix A: Vicinity Map and Engineering Plans

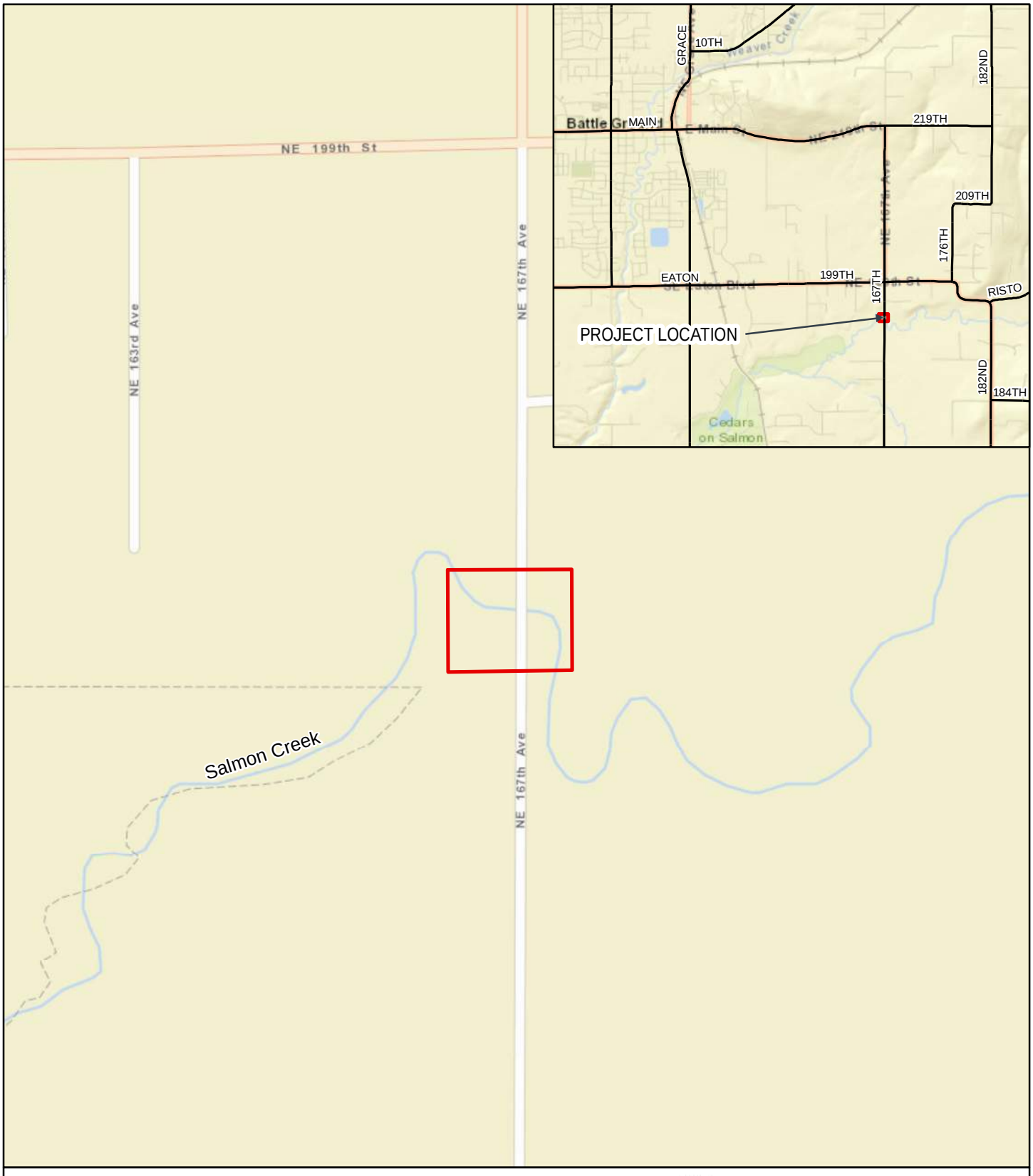


FIGURE 1
VICINITY MAP

Legend

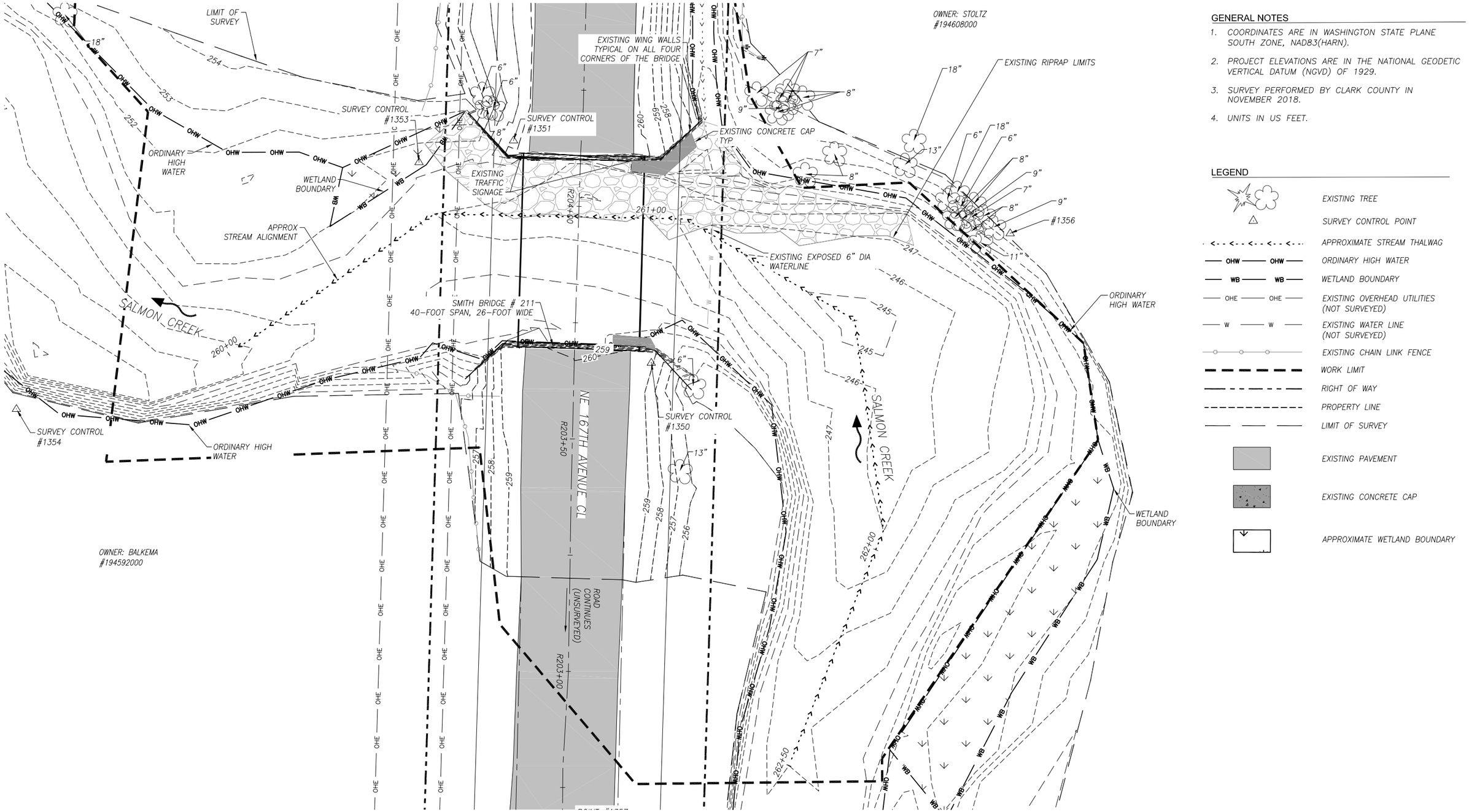
Project Area

0 750 FEET

Otak

SMITH BRIDGE SCOUR REPAIR PROJECT
CLARK COUNTY PUBLIC WORKS | WASHINGTON

V:\PROJECT\19000\19047\CADD\GIS\MXDS\VICINITYMAP SMITH BRIDGE.MXD



GENERAL NOTES

1. COORDINATES ARE IN WASHINGTON STATE PLANE SOUTH ZONE, NAD83(HARN).
2. PROJECT ELEVATIONS ARE IN THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929.
3. SURVEY PERFORMED BY CLARK COUNTY IN NOVEMBER 2018.
4. UNITS IN US FEET.

LEGEND

- EXISTING TREE
- SURVEY CONTROL POINT
- APPROXIMATE STREAM THALWAG
- ORDINARY HIGH WATER
- WETLAND BOUNDARY
- EXISTING OVERHEAD UTILITIES (NOT SURVEYED)
- EXISTING WATER LINE (NOT SURVEYED)
- EXISTING CHAIN LINK FENCE
- WORK LIMIT
- RIGHT OF WAY
- PROPERTY LINE
- LIMIT OF SURVEY
- EXISTING PAVEMENT
- EXISTING CONCRETE CAP
- APPROXIMATE WETLAND BOUNDARY

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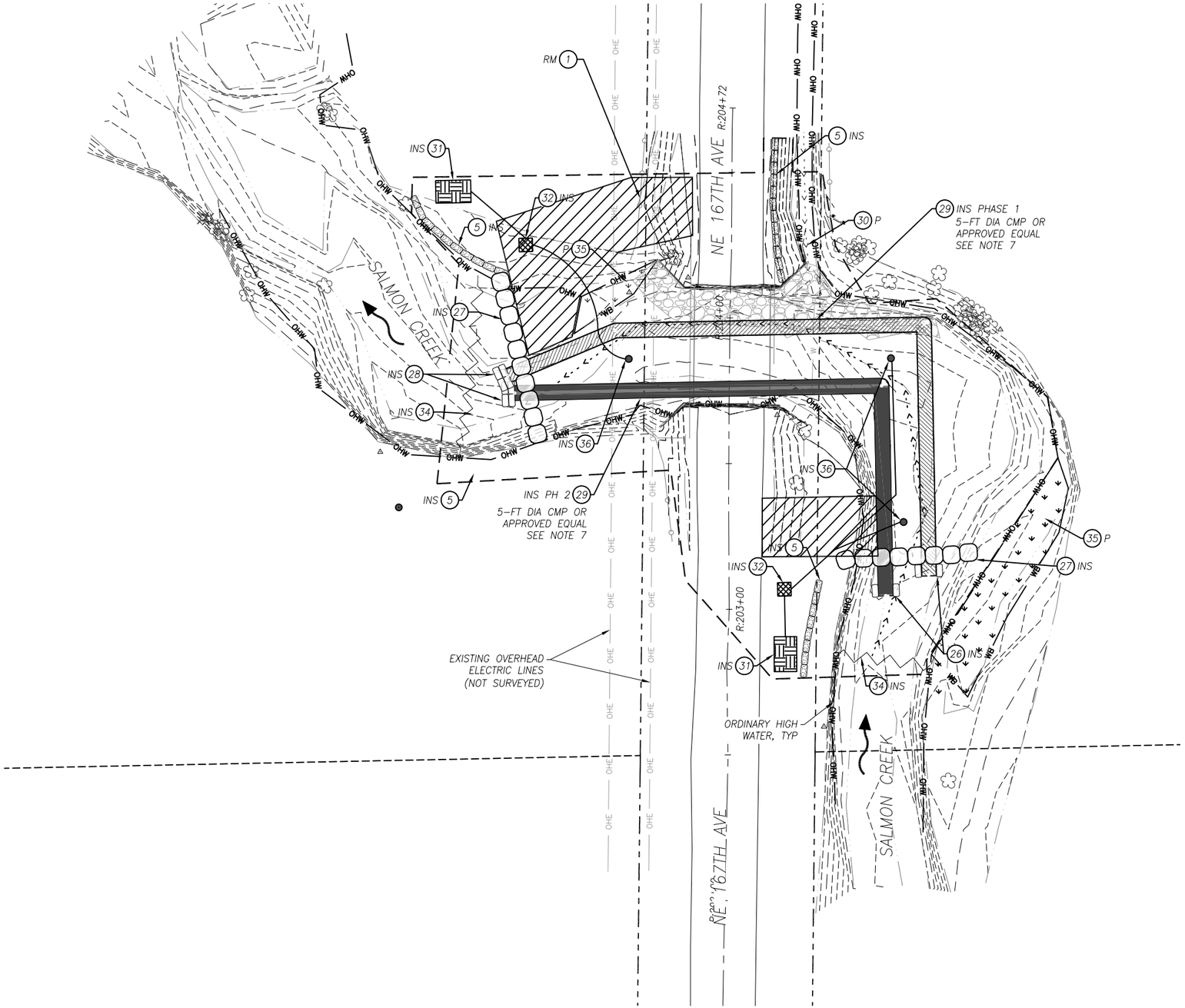
10' 0' 10' 20'
SCALE IN FEET

FIGURE 2
EXISTING CONDITIONS

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA



ROADWAY

1 – FENCE
2 – TREE/SHRUB
5 – STRAW WATTLES

STREAM, UTILITIES, & STRUCTURAL

25 – PIPE/CULVERT
26 – TEMP INLET PROTECTION
27 – WORK AREA ISOLATION DAM
28 – OUTLET EROSION PROTECTION
29 – BYPASS PIPE
30 – EXISTING DITCH
31 – SEDIMENT CONTROL BAG
32 – DE-WATERING PUMP
33 – CONSTRUCTION ACCESS
34 – FISH BLOCK NET
35 – WETLAND
36 – DE-WATERING PUMP INTAKE AND DISCHARGE HOSE

SITE PREPARATION NOTE LEGEND

RM – REMOVE
P – PROTECT
INS – INSTALL
A – ADJUST

(#) – BY CONTRACTOR

□ – BY OTHERS

LEGEND

– SEDIMENT CONTROL BAG
– DE-WATERING PUMP
– APPROXIMATE WETLAND BOUNDARY
– FISH BLOCK NET
– WORK AREA ISOLATION DAM
– DE-WATERING PUMP INTAKE
– TREE REMOVAL

WORK AREA ISOLATION NOTES

6. CONTRACTOR SHALL NOT WORK DIRECTLY WITHIN THE ORDINARY HIGH WATER OF THE CREEK WITHOUT THE USE OF AN APPROVED AND IN-PLACE WORK AREA ISOLATION PLAN.
7. CREEK TO BE DIVERTED THROUGH THE USE OF PUMPING OR ANCHORED DIVERSION PIPE. INSTALL MESH SCREEN AT PIPE OR PUMP INLETS FOR FISH PROTECTION. INSTALL SUFFICIENT GRAVEL BAGS ON/AROUND PIPE INLET/OUTLET TO STABILIZE AND PREVENT EROSION. DIVERSION METHODS SHALL BE SIZED TO DIVERT A MINIMUM FLOW RATE OF 50 CFS. CONTRACTOR TO ADJUST LOCATION OF PIPE TO ACCOMMODATE WORK.
8. DEWATERING THE WORK AREA SHALL OCCUR AT A RATE SLOW ENOUGH TO ALLOW THE SAFE CAPTURE AND RELOCATION OF FISH SPECIES AND OTHER AQUATIC ORGANISMS TO AVOID STRANDING.
9. CONTRACTOR TO SUBMIT TEMPORARY STREAM DIVERSION AND DEWATERING PLAN TO OWNER A MINIMUM OF TWO WEEKS PRIOR TO BEGINNING IN STREAM WORK. SEE SPECIFICATION FOR REQUIREMENTS.
10. INSTALL FISH BLOCK NET AS REQUIRED FOR TEMPORARY STREAM DIVERSION.

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20' 0' 20' 40'
SCALE IN FEET

FIGURE 3
WORK AREA ISOLATION PLAN

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA

GENERAL NOTES

1. COORDINATES ARE IN WASHINGTON STATE PLANE SOUTH ZONE, NAD83(HARN).
2. PROJECT ELEVATIONS ARE IN THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929.
3. SURVEY PERFORMED BY CLARK COUNTY IN NOVEMBER 2018.
4. UNITS IN US FEET.
5. IN-WATER WORK WINDOW AUGUST 1 TO SEPTEMBER 30.

LEGEND

- EXISTING TREE
- SURVEY CONTROL POINT
- OHE — OHE — EXISTING OVERHEAD UTILITIES
- W — W — EXISTING WATER LINE
- EXISTING CHAIN LINK FENCE
- WORK LIMIT
- RIGHT OF WAY
- PROPERTY LINE
- EXISTING EDGE OF PAVEMENT
- OHW — OHW — ORDINARY HIGH WATER
- WB — WB — WETLAND BOUNDARY
- EXISTING CONCRETE CAP
- CLASS A RIPRAP
- APPROXIMATE WETLAND BOUNDARY
- PROPOSED CHANNEL GRADING AREA

EXISTING EDGE OF PAVEMENT
EXISTING ROAD SIDE DITCH
R204+72
R204+50
ROADWAY CONTINUES (UNSURVEYED)
CONTRACTOR TO PROTECT WETLAND, TYP
SMITH BRIDGE # 211
40-FOOT SPAN, 26-FOOT WIDE
APPROX STREAM ALIGNMENT
EXISTING CONCRETE PAD
PROPOSED CHANNEL GRADING AREA
EXISTING 6-INCH EXPOSED WATERLINE
PROPOSED CLASS A RIPRAP
R203+50
NE 167TH AVENUE CL
SALMON CREEK
R204+00
261+00
260+50
260+00
261+50
262+00

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10' 0' 10' 20'
SCALE IN FEET

FIGURE 4
PLAN VIEW

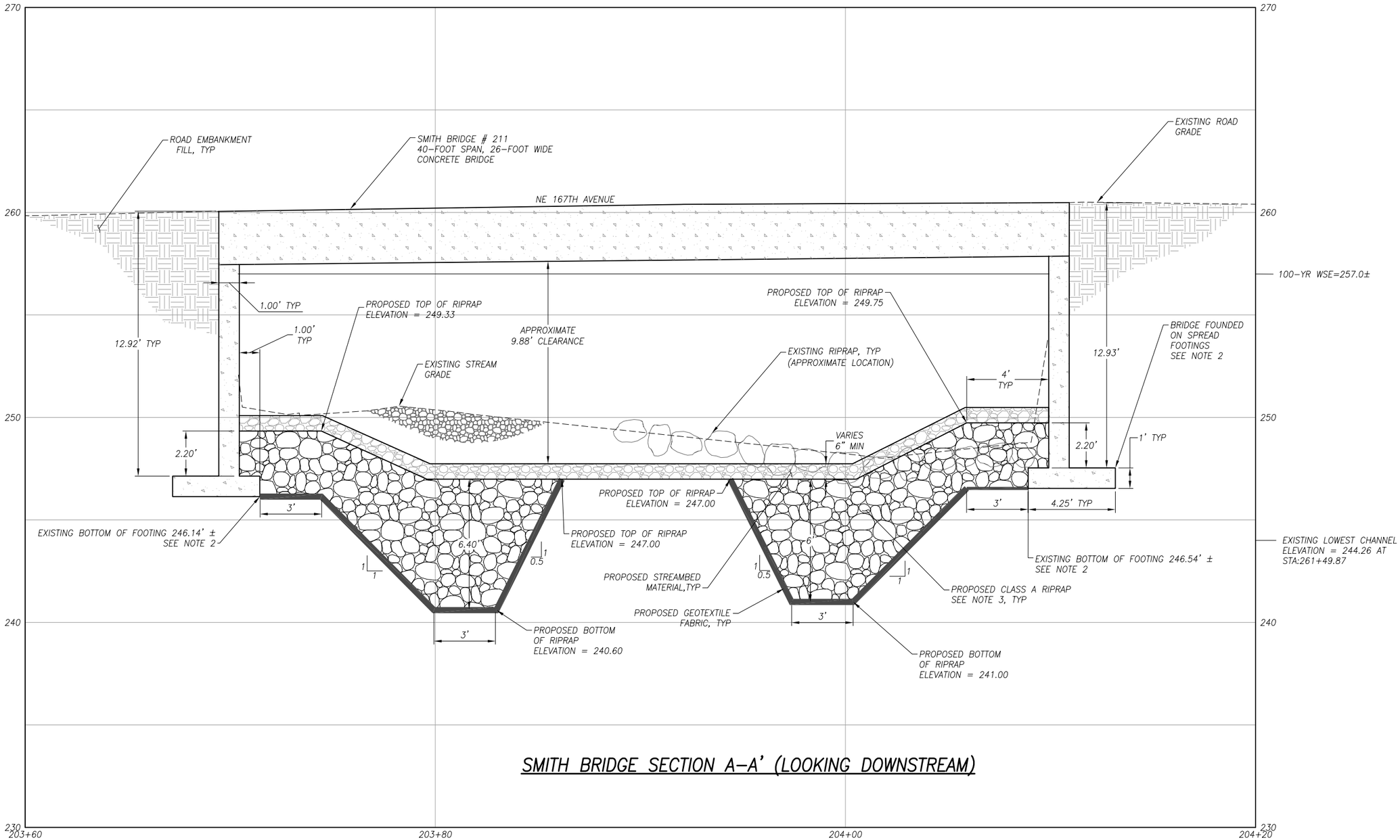
Lehto, Smith, and Salmon Creek Bridges
(3Bridges)
Scour Repair Project
Clark County, WA

NOTES:

1. ELEVATION IN FEET, ESTABLISHED USING THE NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD 29).

2. BRIDGE FOOTING DIMENSIONS AND ELEVATIONS ARE BASED ON AS-BUILT DRAWINGS DATED APRIL 10TH 1963 AND CONVERTED TO PROJECT VERTICAL DATUM (NGVD 29).

3. STREAM RIPRAP SHALL BE CLASS A RIPRAP WITH A D50 = 1.0 FOOT.



SMITH BRIDGE SECTION A-A' (LOOKING DOWNSTREAM)

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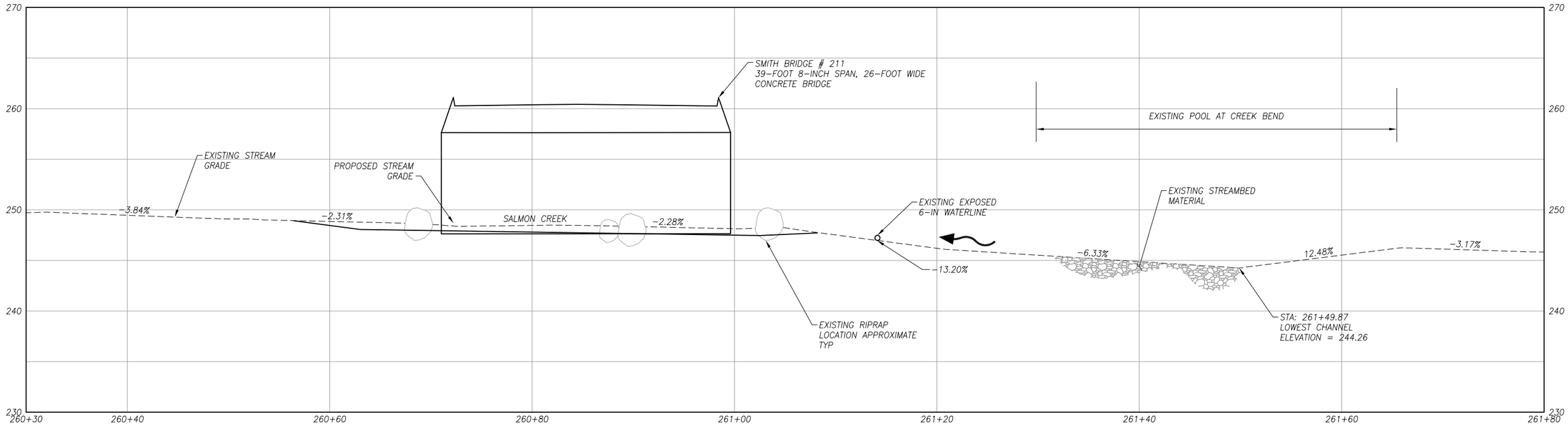
www.otak.com

2.5 0 2.5 5 HORIZ
2.5 0 2.5 5 VERT
SCALE IN FEET

FIGURE 5
BRIDGE SECTION

Lehto, Smith, and Salmon Creek Bridges (3Bridges)
Scour Repair Project
Clark County, WA



STREAM PROFILE

Otak

Otak, Inc.
700 Washington St., Suite 300
Vancouver, WA 98660
360.737.9613
www.otak.com

5 0 5 10 HORIZ
5 0 5 10 VERT.
SCALE IN FEET

FIGURE 6
STREAM PROFILE

Lehto, Smith, and Salmon Creek Bridges
(3Bridges)
Scour Repair Project
Clark County, WA

Appendix B

Appendix B: Field Reconnaissance Photo Log

Photo Log

Photo 1: Smith Bridge – Looking downstream

Photo 2: Smith Bridge – Looking upstream

Photo 3: Smith Bridge existing riprap under bridge

Photo 4: Smith Bridge - bank erosion downstream

Photo 6: Smith Bridge – roadside ditch outlet to stream

Photo 7: Smith Bridge – vegetated riprap on outside of upstream bend

Appendix C

Appendix C: Supporting Documentation

SEC. 12, T.3N., R.2E.W.M.

#19 194561 ALVA H. KALIAN, JR. 30 A.
SE¼ NW¼ & SW¼ NE¼ SEC. 12

#10 194552 ORRIN H. McLAURY 20 A.
E½ NW¼ NE¼ SEC. 12

#20 194562 EDWIN THOSPRSON 40 A.
SE¼ NE¼ SEC. 12

#18 194560 LAWRENCE P. PARTLOW 40 A.
NE¼ NE¼ SEC. 12

Salmon Creek

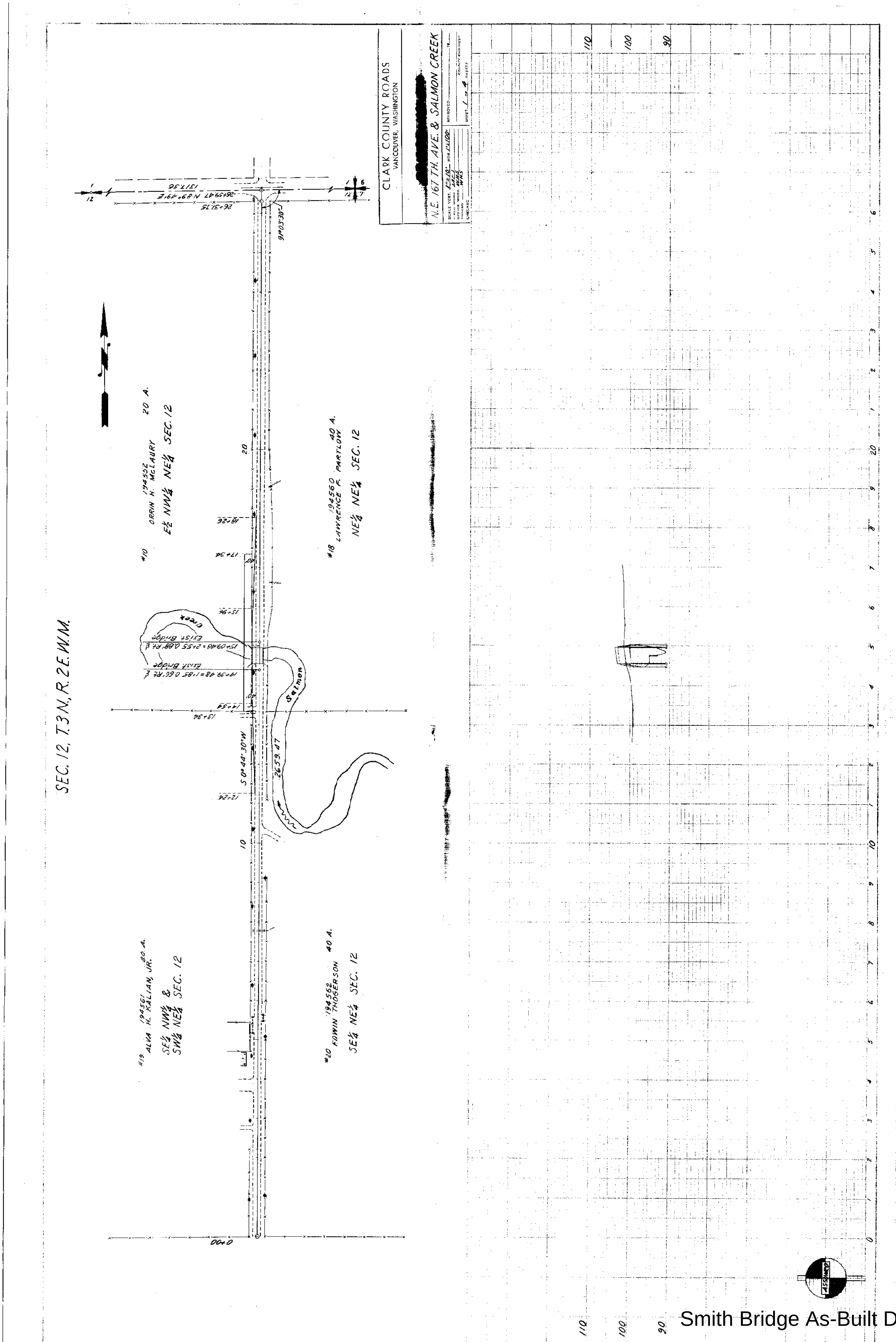
Drafting Room

CLARK COUNTY BOARD
VANCOUVER, WASHINGTON

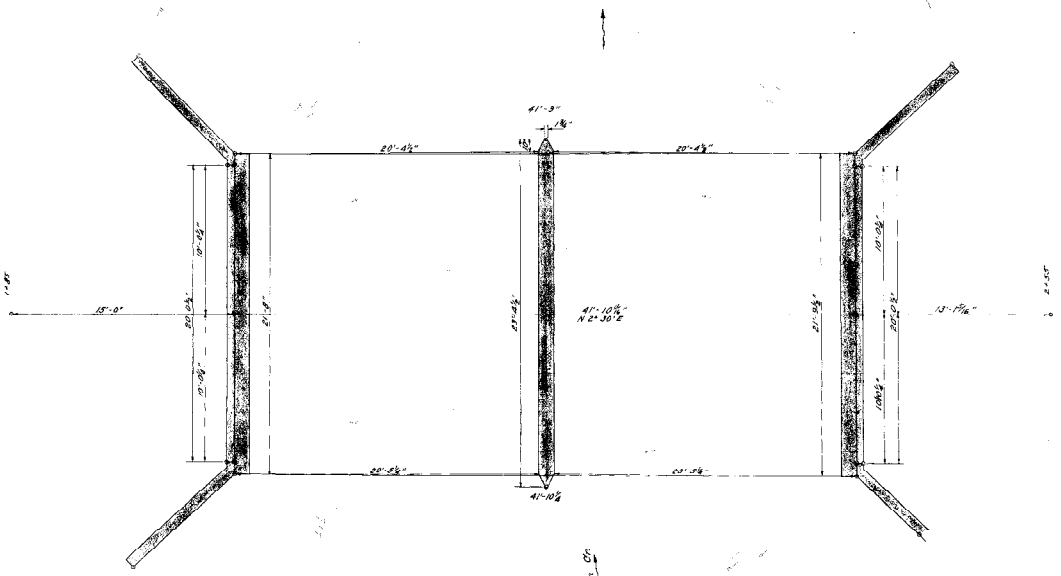
BRIDGE NO. 211
N.E. 167 TH. AVE. & SALMON CREEK

PLATE 1 - PLAN - PROFILE O. P. & R. E. STANDARD
KEUFFEL & ESSER CO., NEW YORK.

Smith Bridge As-Built Drawing



Smith Bridge As-Built Drawing

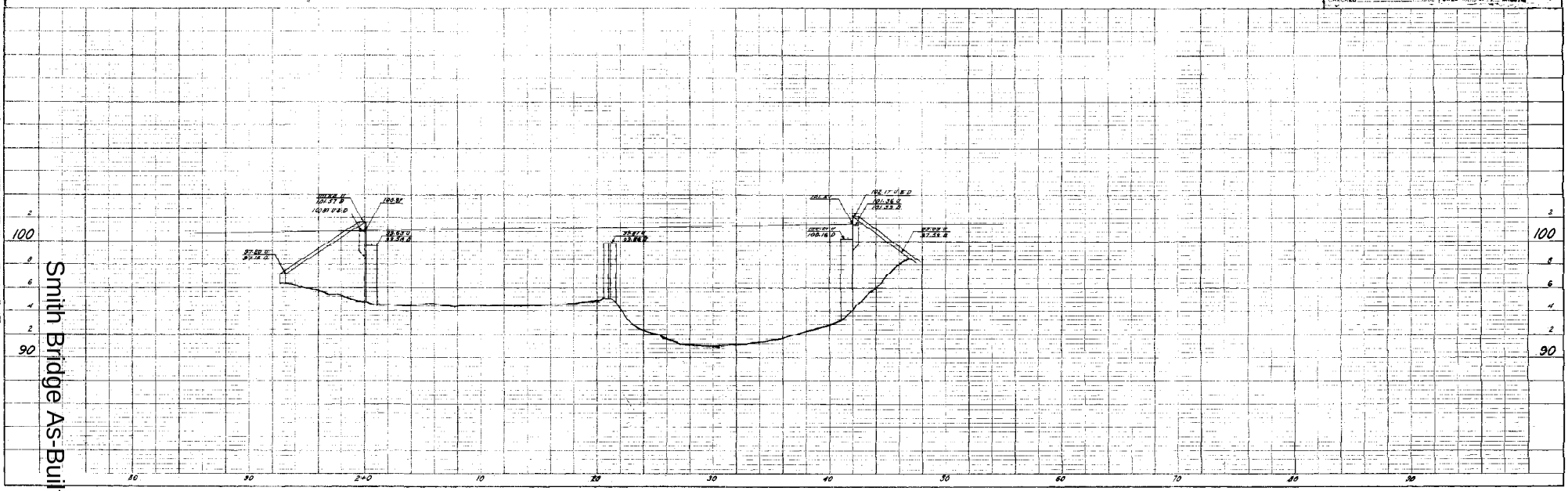


CLARK COUNTY ROADS
VANCOUVER WASHINGTON

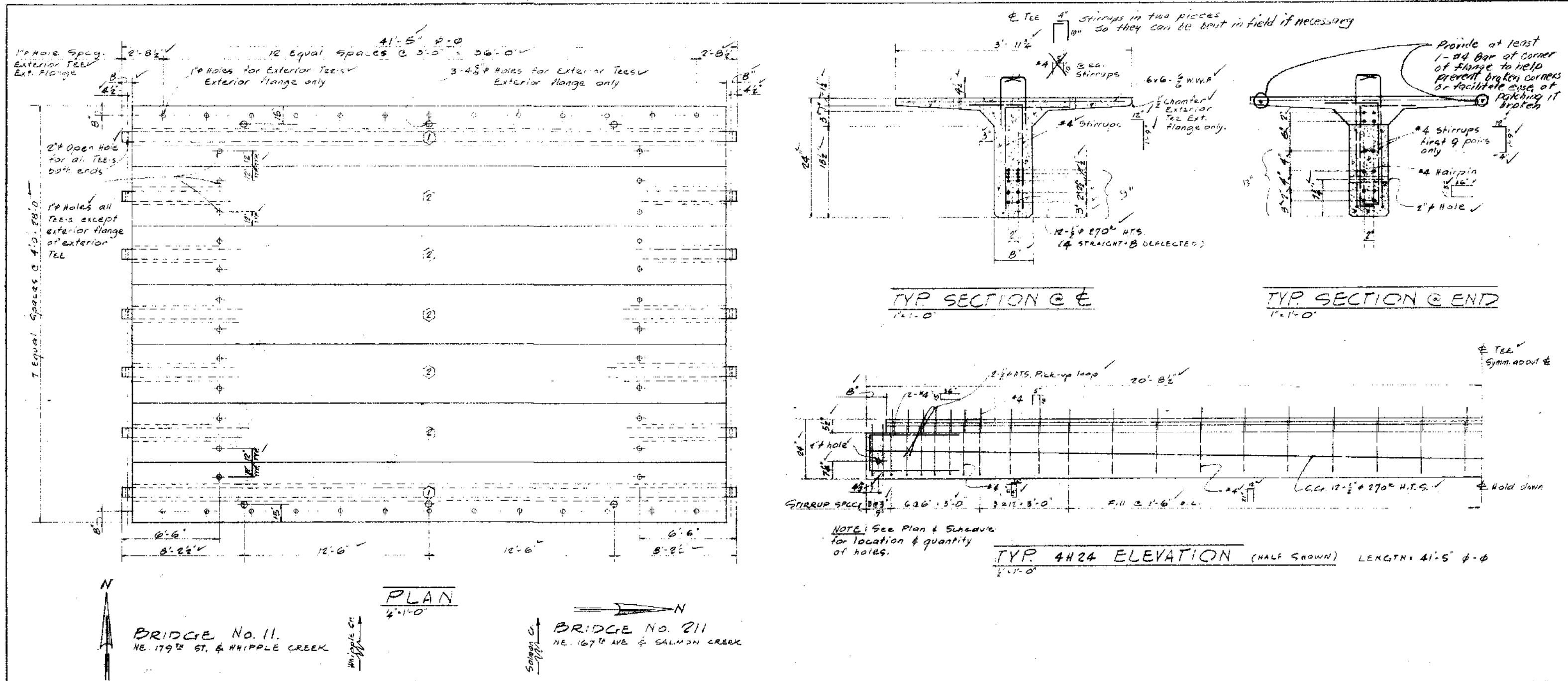
RECONSTRUCTING BRIDGE NO 211
ON N.E. 167TH AVE.

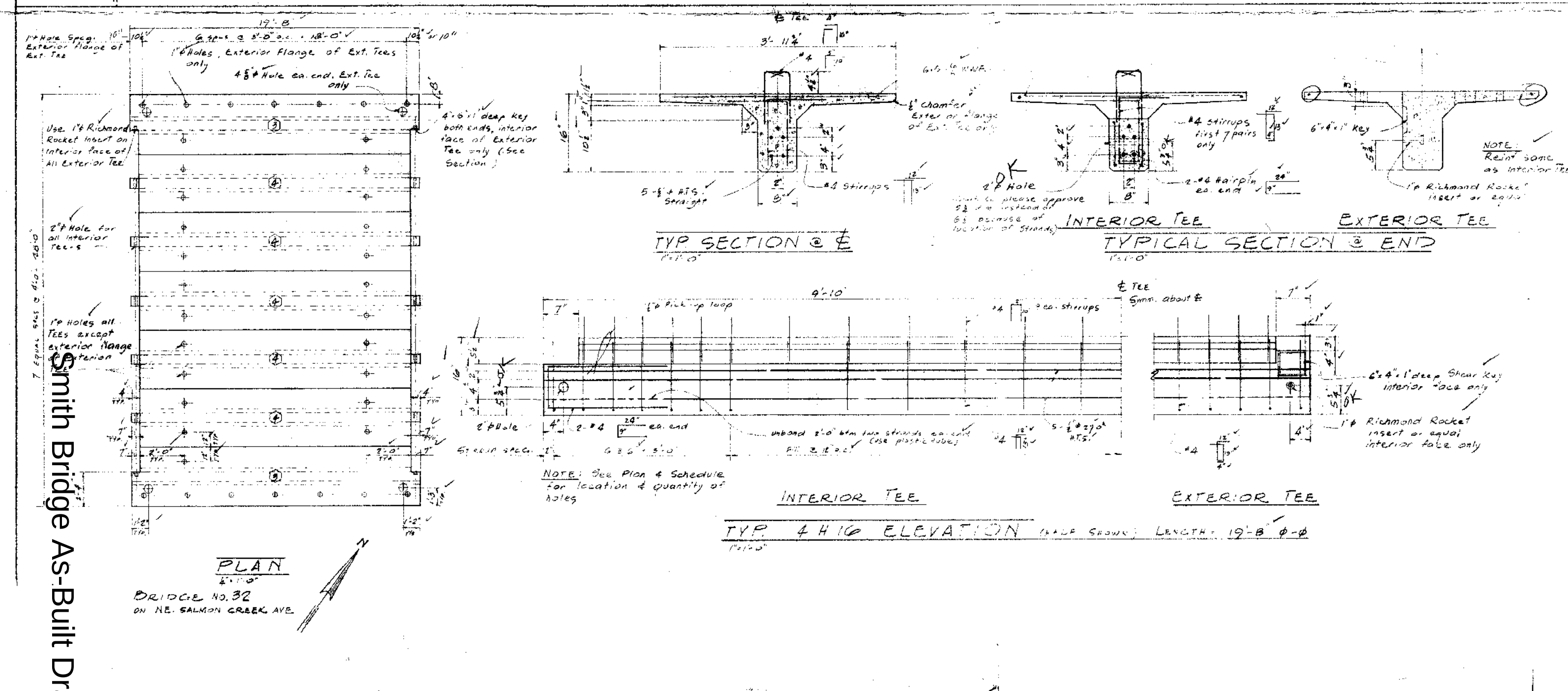
FIELD WORK WHS
OFFICE WORK
TRACED
CHECKED

COUNTY ENGINEER
SHEET 2 OF 4 SHEETS



Smith Bridge As-Built Drawing





LIN TEE SCHEDULE

BRIDGE	MK	No	LENGTH	WIDTH	½φ 270k	#4]	#4 ┐	#4 ▭	#4	REMARKS
#11	(1)	2	41'-5"	3'-11¾"	12	36	48	4	38	[illegible]
	(2)	5	41'-5"	do	12	36	48	4	38	[illegible]
#211	(1)	2	41'-5"	do	12	Same as Bridge No. 11				
	(2)	5	41'-5"	do	12					
#32	(3)	2	19'-8"	do	5	28	24	4	24	9-1"φ Holes + 2-4⅝φ Holes in flange [illegible]
	(4)	5	19'-8"	do	5	28	24	4	24	[illegible]

GENERAL NOTES: OK

PRESTRESSING STRAND: Shall be ½"φ 270k 7 wire stress relieved High Tensile Strand. F_u = 41,000 lb, F_i = 24,710 lbs / ea. strand, F_e = 23,550 lbs

MILD STEEL REINFORCEMENT: Shall be intermediate grade steel f_s = 20,000 psi & shall conform to ASTM A15 & A305

CONCRETE: Hard rock aggregates, class 4½ cement for bridge No 11 & No 211:
f_{ci} = 5300 psi @ Transfer
f_c = 5300 psi @ 28 days
for bridge No 32:
f_{ci} = 4000 psi @ Transfer
f_c = 5000 psi @ 28 days

FINISH: All Tee Girder Flanges shall receive a rough transverse broom finish. Exterior girders to receive a sack finish on fascia.

HANDLING: Tees shall be maintained in an upright position at all times and shall be lifted by means of hooks provided at ends.

DESIGN L.L - AASHO H 20-S16-44

OK except as corrected

REVISIONS:

CLARK COUNTY BRIDGES:
No. 11
No. 211
No. 32
CLARK COUNTY WASHINGTON

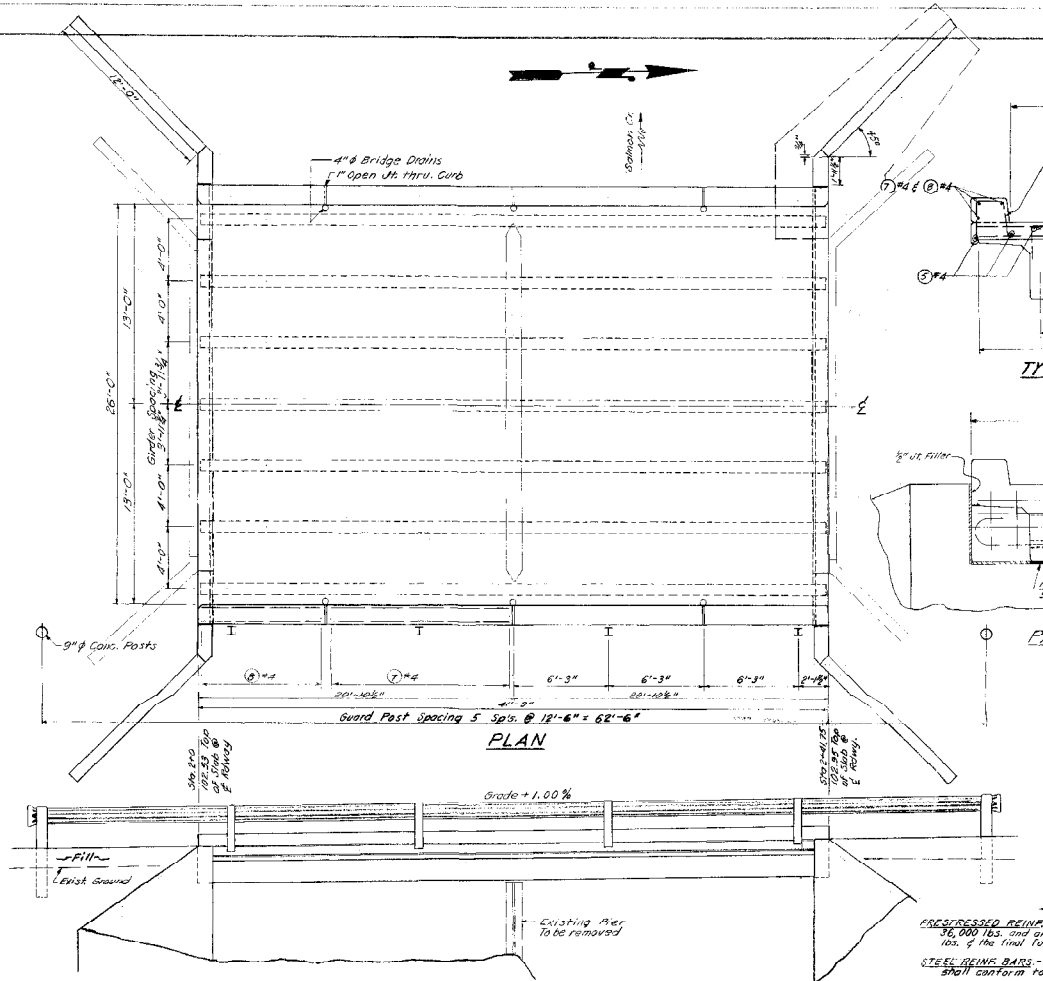
CONTRACTOR: CLARK CO. ROADS

ARCHITECT: SO.

EMPIRE PRE-STRESS CONCRETE OF OREGON
9255 N. E. HALSEY ST. PORTLAND 20, OREG. AL 4-6535

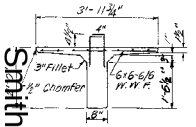
DRAWN BY & DESIGN: Laszlo | APPROVED BY: | SHEET: 1 of 1

DATE: April 3 1963 | JOB NUMBER: 343 | DRAWING NO.

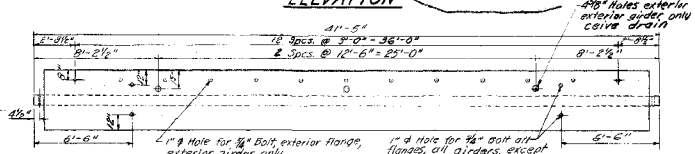


PLAN

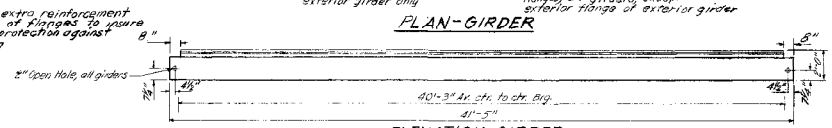
ELEVATION



SECTION-GIRDER

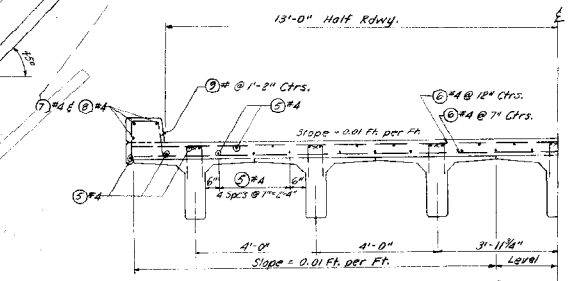


PLAN-GIRDER

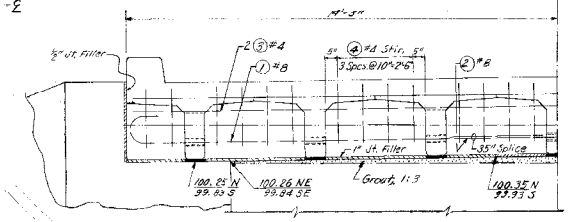


ELEVATION-GIRDER

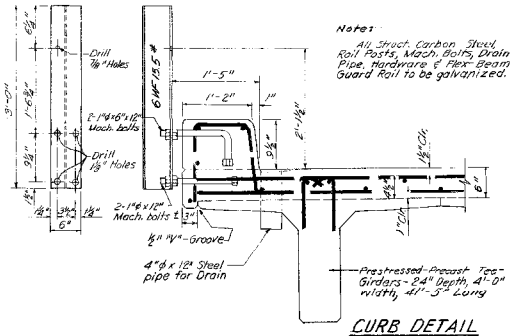
Provide extra reinforcement ends of flanges to insure proper protection against spalling



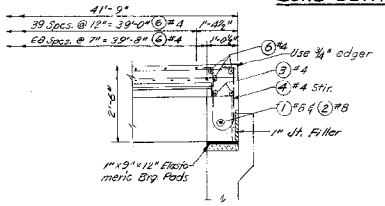
TYPICAL ROADWAY HALF CROSS SECTION



PART ELEVATION - ABUTMENT



CURB DETAIL



END DIAPHRAM

BAR LIST

All dimensions are out to out

Mk	LOCATION	NO.	SIZE	LENGTH	BENDING DIAGRAM
1	End Diaphram Lower Long.	2	8	14'-7½"	
2	" " " "	2	8	18'-7"	
3	" " Upper "	4	4	28'-1½"	Str.
4	" " Stirrups	56	4	8'-2¼"	
5	Deck Long Top & Bot.	98	4	41'-6"	Str.
6	" Transv. " "	115	4	28'-0"	Str.
7	Curb Long. (Interior Sections) Open Joint	12	4	12'-0"	Str.
8	" " End " "	12	4	7'-11"	Str.
9	Curb Anchor Bars	76	4	4'-0"	

GENERAL NOTES FOR PRESTRESSED GIRDERS

PRESTRESSED REINF. - May be ½" ϕ M.I.T. "stress-relieved" strand with a min. breaking strength of 36,000 lbs. and an approximate area of 0.1438 sq. ins. The initial force per strand shall be 25,200 lbs. & the final force after losses shall be 20,160 lbs.

STEEL REINF. BARS - Shall be billet steel conc. reinf. bars, intermediate grade, with f_s - 20,000 psi, and shall conform to ASTM A15 & A305

CONCRETE - Shall have an ultimate compressive strength f'_c of 5000 psi at 28 days and a compressive strength at release of 4,000 psi.

FINISH - The outside faces of Exterior girders shall be sack finished. The tops of girder flanges shall be cleaned of laitance and given a rough broom finish.

WORKMANSHIP - No longitudinal dimension shall vary more than ½ inch and vertical and horizontal dimensions in overall height or width more than ¼ inch. Web or shear reinf. steel, tying girder to cast-in-place deck, shall be placed true to line and 4⅞" ± ⅛" above top of girder flange.

HANDLING OF GIRDERS - The girders shall be kept in an upright position at all times and lifted by an approved lifting strand.

DESIGN - ACI-ASCE Joint Committee 323, AASHO & WSHD Spec's.

LOADING - H20-S16-44 Live loading with cast-in-place deck & future cover dead loads, 90 lbs per sq. ft.

OBLIGATIONS - The Vendor shall furnish the County, computations, design data and shop drawings for approval.

ELASTOMERIC BEARING PADS - The pads shall be of a compound known as neoprene and for Bridge No. 11, shall be cast in molds under pressure and heat, but may be shaped for Bridge No. 211. Compositions for pads shall meet the requirements listed in AASHO, 1961 EASTM Method D15, Part B. Durometer Hardness = 70

Revised 4-12-63 ϕ of Construction

APPROXIMATE QUANTITIES

Removing Existing Structure	Lump Sum	
Concrete Class A-B SK.	30	Cu. Yds.
Steel Reinforcing Bars	7600	Lbs.
Precast-Prestressed Concrete Tee-Girders	7	Units
Structural Carbon Steel	375	Lbs.
Beam Guard Rail	125	Lin. Ft.
Bridge Drains	16	Units
Concrete Class B	60	Cu. Yds.
Concrete Class D	10	Cu. Yds.

CLARK COUNTY ROADS
VANCOUVER, WASHINGTON

7023

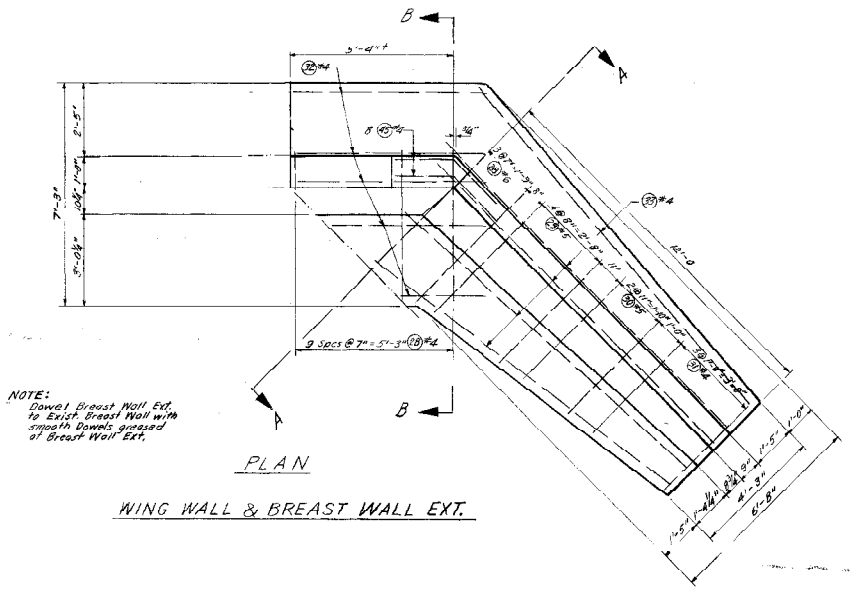
BRIDGE NO. 211
NE. 167 TH. AVE. & SALMON CREEK

SCALE VERT.	¼" = 1'-0" HOR. per FT.
FIELD WORK	W.M.S.
OFFICE WORK	W.M.S.
TRACED	W.M.S.
CHECKED	E.W.V.

APPROVED _____ 19__

_____ COUNTY ENGINEER

SHEET 2 OF 4 SHEETS



NOTE:
Dowel Breast Wall Ext. to Exist. Breast Wall with Smooth Dowels greased at Breast Wall Ext.

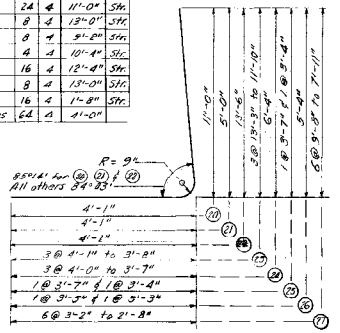
PLAN

WING WALL & BREAST WALL EXT.

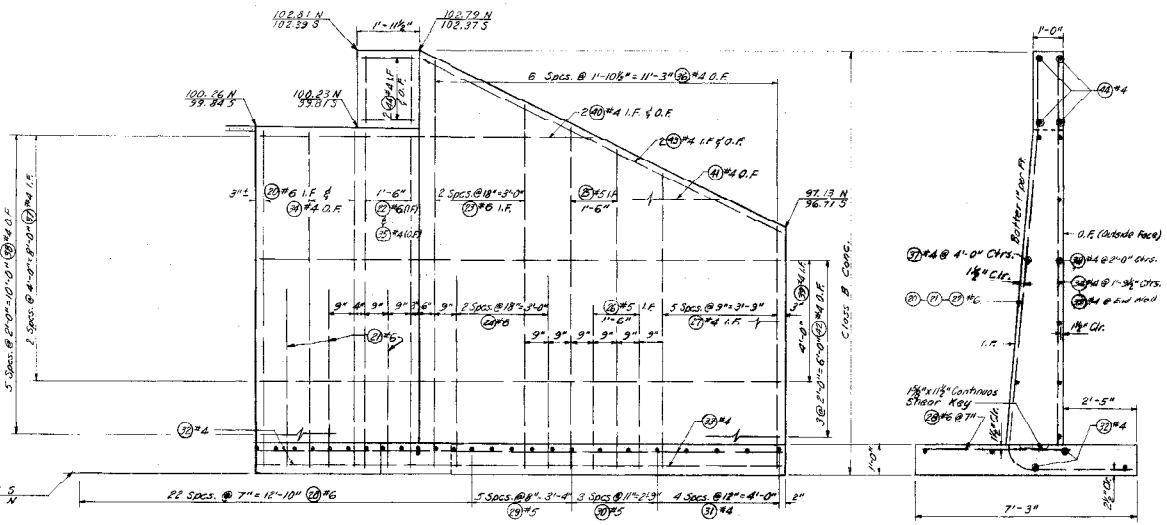
BAR LIST

All dimensions are out to out

MARK	LOCATION	NO	SIZE	LENGTH	BENDING DIAGRAM
20	Breast Wall Vert. I.F. & Ftg. Transv.	12	6	14'-9"	
21	" " " " " " "	12	6	8'-9"	
22	" " " " " " "	8	6	17'-3"	
23	Wing " " " " "	12	6	Varies	
24	" " " " " " "	12	6	Varies	
25	" " " " " " "	8	5	Varies	
26	" " " " " " "	8	5	Varies	
27	" " " " " " "	24	4	Varies	
28	Breast & Wing Wall Ftg. Top Transv.	56	6	Varies	Str. 8 @ 4'-10" & 6 @ 1'-2" to 4'-3" - 4 Sets
29	" " " " "	28	5	Varies	Str. 5 @ 4'-3" to 3'-11"-4 Sets
30	" " " " "	12	5	Varies	Str. 3 @ 3'-10" to 3'-6"- 4 Sets
31	" " " " "	16	4	Varies	Str. 4 @ 3'-4" to 3'-0"-4 Sets
32	Breast Wall Ftg. Top & Bot. Long.	20	4	Varies	Str. 3 @ 6'-6", 10 @ 5'-9" & 1 @ 5'-0"-4 Sets
33	Wing " " " " "	20	4	Varies	Str. 5 @ 12'-2" to 13'-8"-2 Sets
34	Breast " Vert. O.F.	12	4	10'-2"	Str.
35	" " " " @ End Wall	8	4	12'-8"	Str.
36	" " " "	28	4	Varies	Str. 7 @ 12'-6" to 7'-2"-4 Sets
37	" " Horiz. I.F.	12	4	12'-0"	Str.
38	" " O.F.	24	4	11'-0"	Str.
39	Wing " " I.F.	8	4	13'-0"	Str.
40	" " " " & O.F.	8	4	9'-2"	Str.
41	" " O.F.	4	4	10'-4"	Str.
42	" " " "	16	4	12'-4"	Str.
43	" " Top edge, O.F. & I.F.	8	4	13'-0"	Str.
44	End Wall Horiz. I.F. & O.F.	16	4	1'-8"	Str.
45	Breast & Wing Wall Corner Ties	64	4	4'-0"	



Make 2 Sets of (23) (24) (25) (26) & (27)

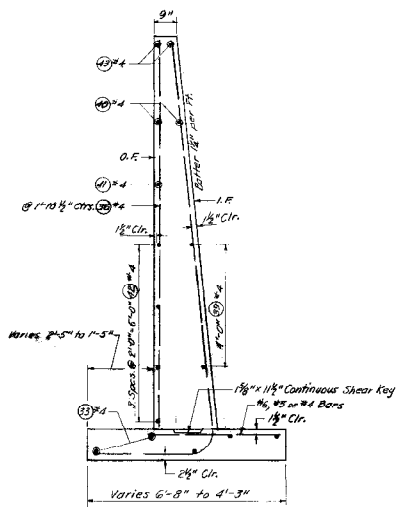


NOTE:
Add a 2' Pad under NW Breast Wall Ftg. Class D Conc.

ELEVATION

NOTE:
Place 3" Weep Holes in Walls (Verify in Field)

SECTION B-B



SECTION A-A

Revised 4-10-03 Breast & Wing Walls

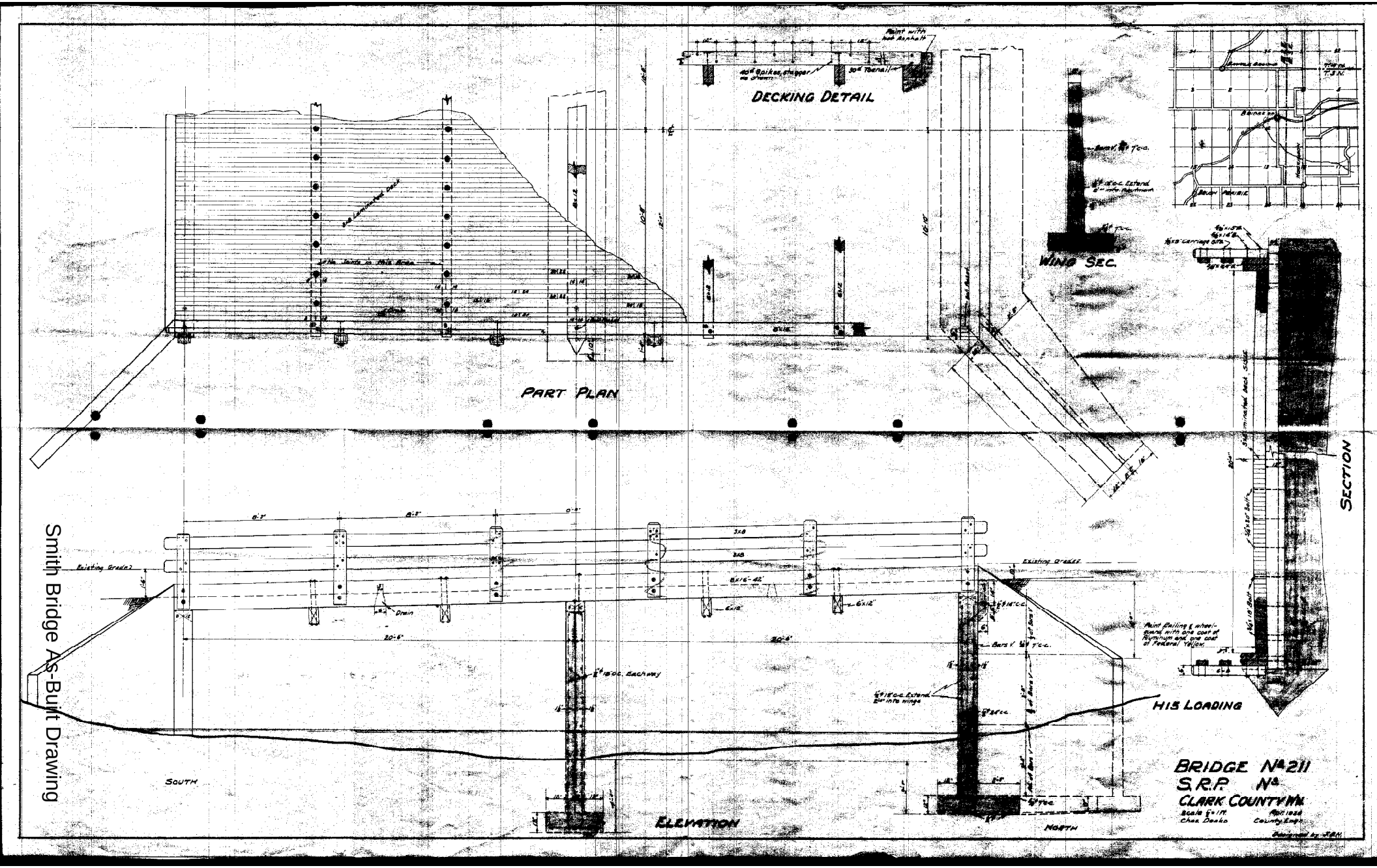
CLARK COUNTY ROADS
VANCOUVER, WASHINGTON

7023
BRIDGE NO. 211
N.E. 167TH. AVE & SALMON CREEK

SCALE FOR: ½" = 1'-0"
FIELD WORK: W.H.S.
OFFICE WORK: W.H.S.
TRACED: W.H.S.
CHECKED: E.E.R.

APPROVED _____ 19__
COUNTY ENGINEER
SHEET 4 OF 4 SHEETS

Smith Bridge As-Built Drawing

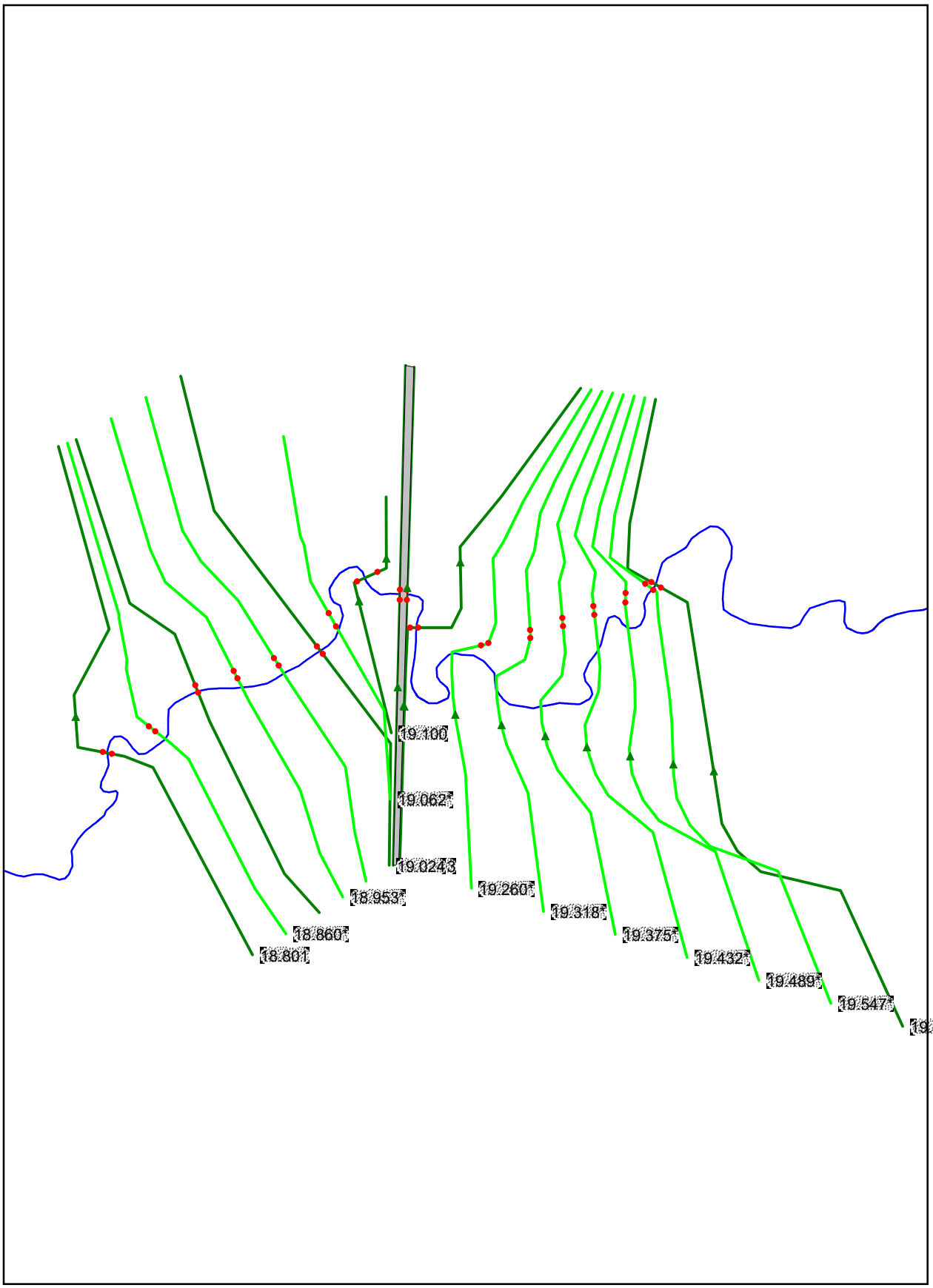


Smith Bridge As-Built Drawing

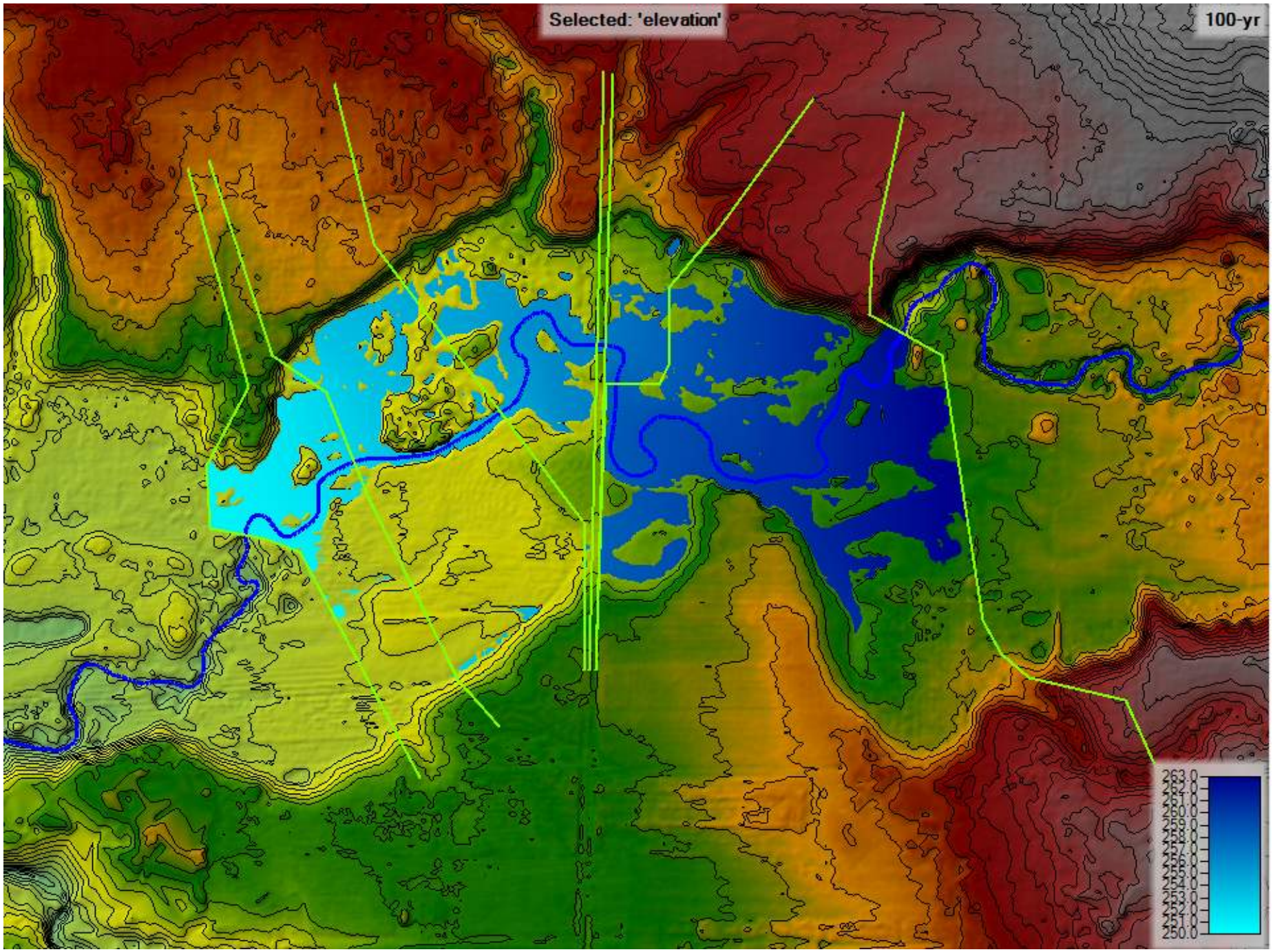
Appendix D

Appendix D: HEC-RAS Output

Smith Bridge HEC-RAS Cross-Section Locations

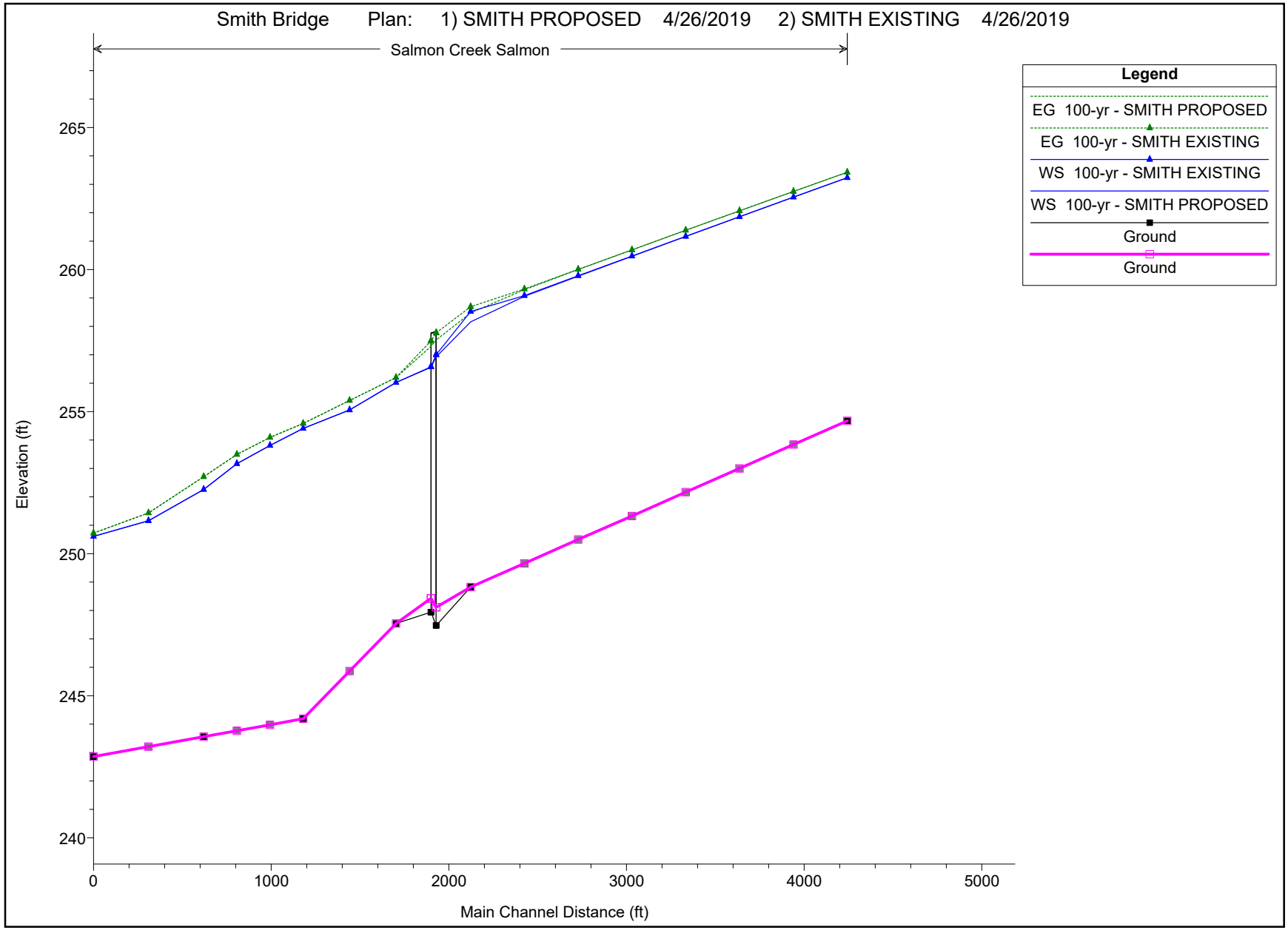


1 in Horiz. = 600 ft 1 in Vert. = 600 ft

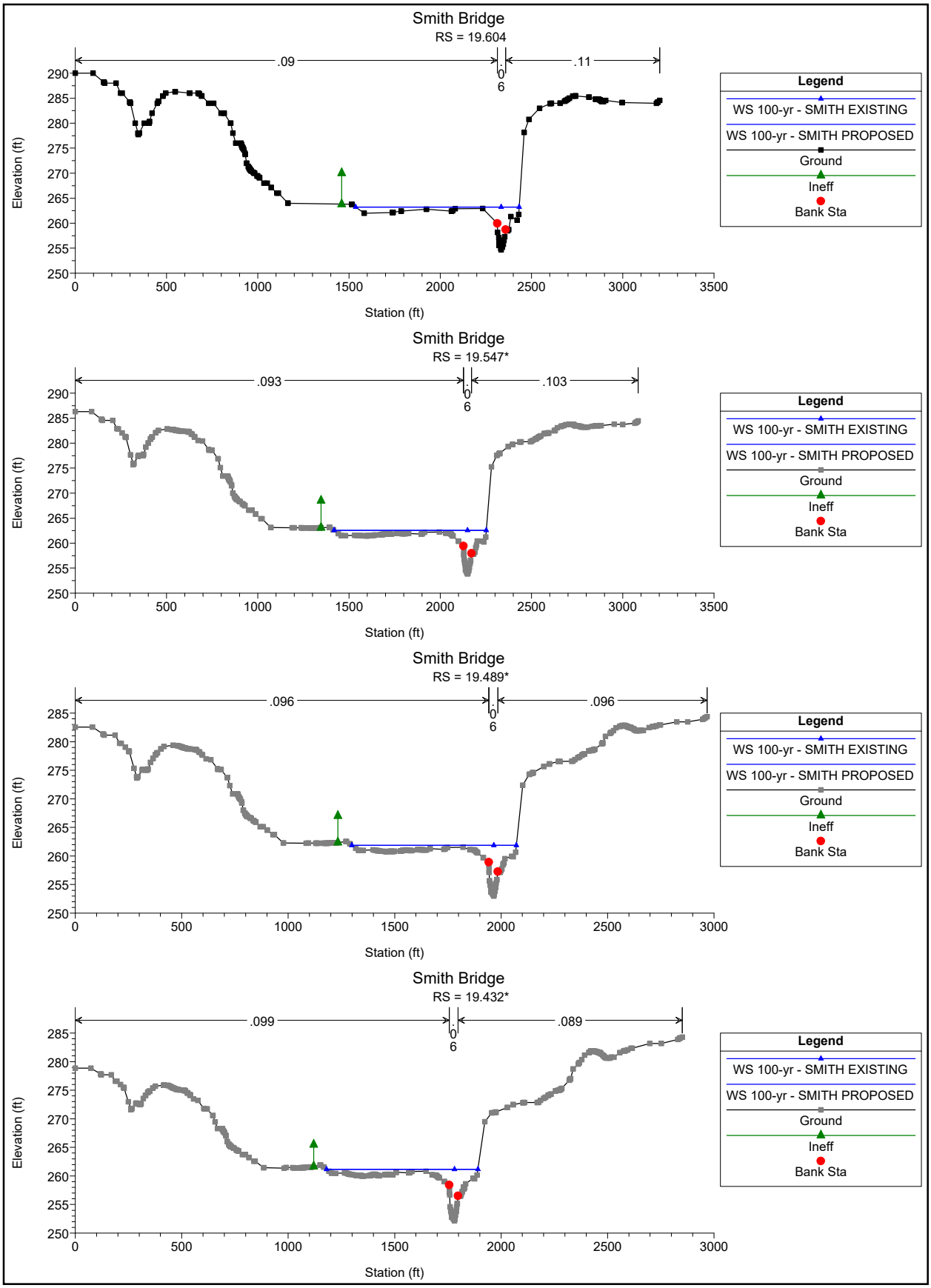


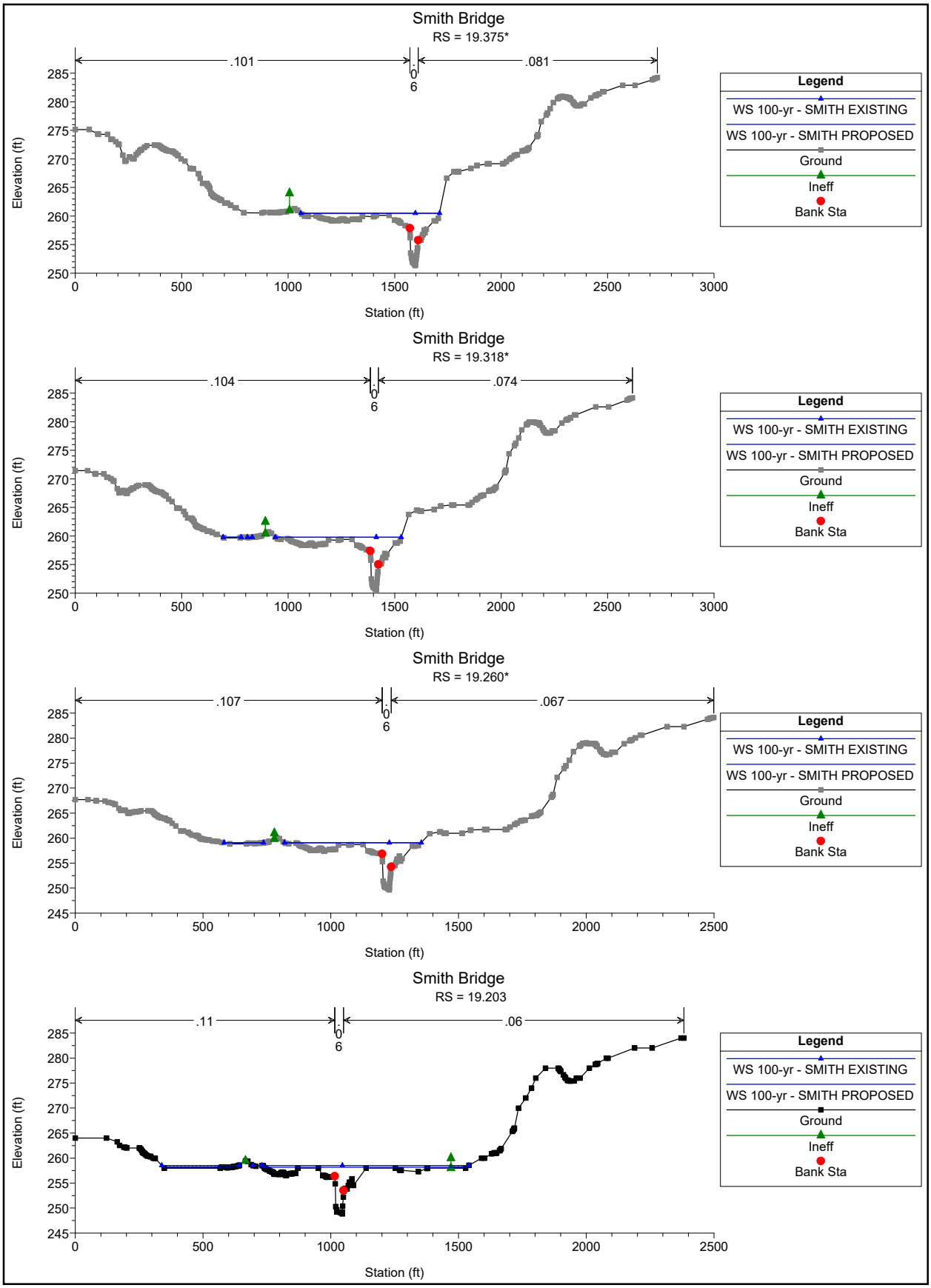
100-YEAR FLOOD MAP PROVIDED FOR CONTEXT ONLY AND IS NOT INTENDED TO REPLACE FEMA FIRM

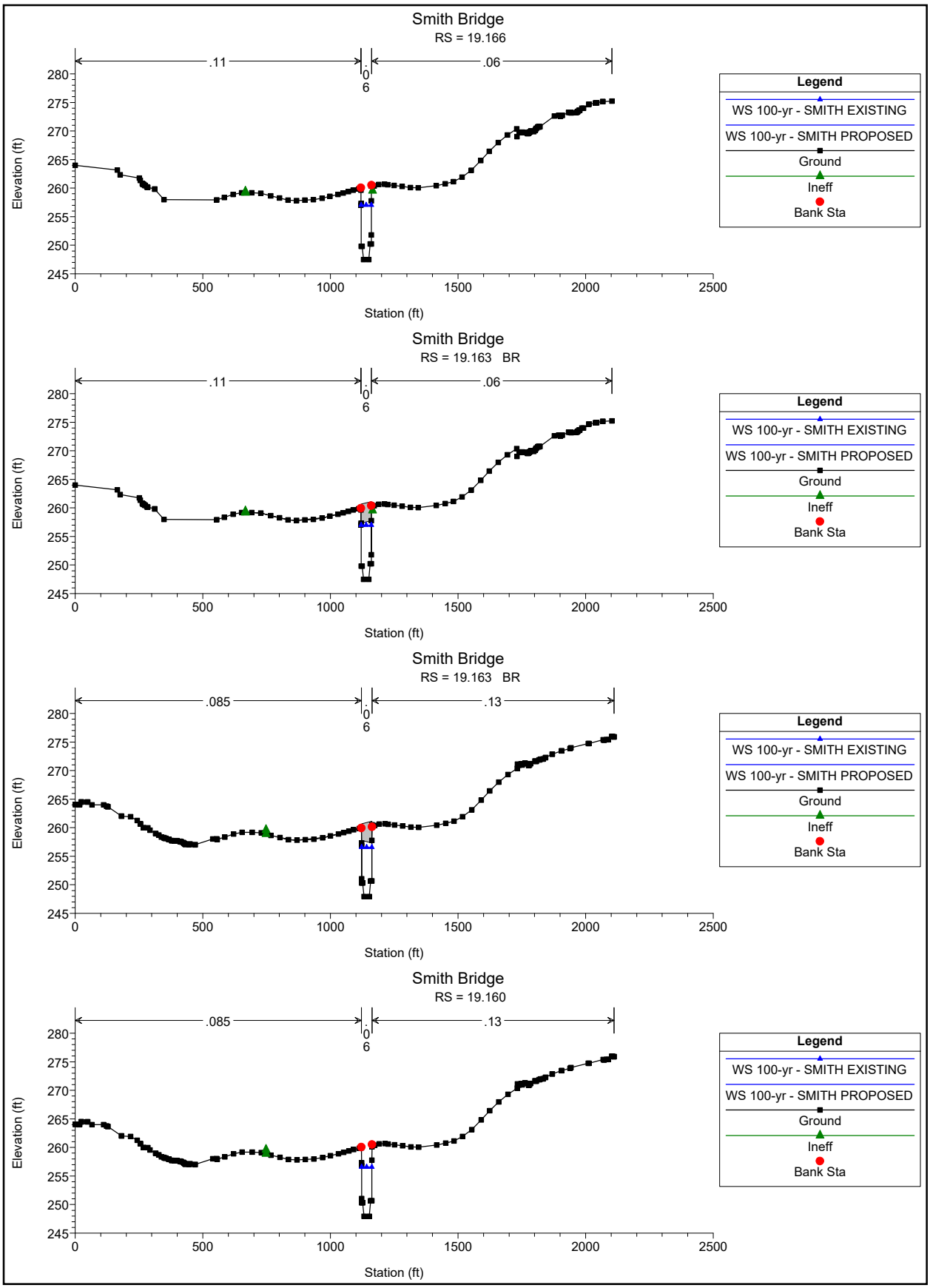
Smith Bridge HEC-RAS Profile

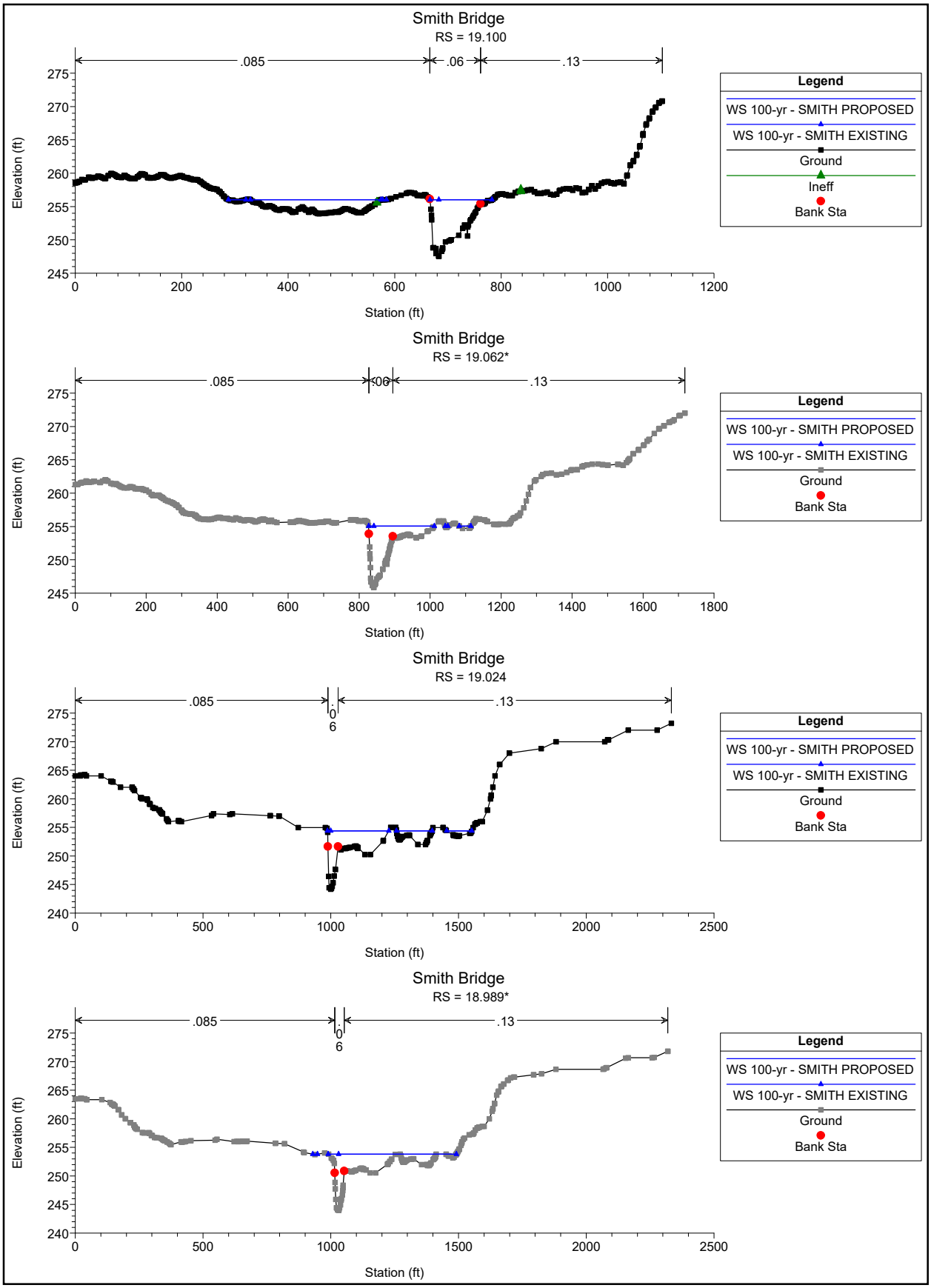


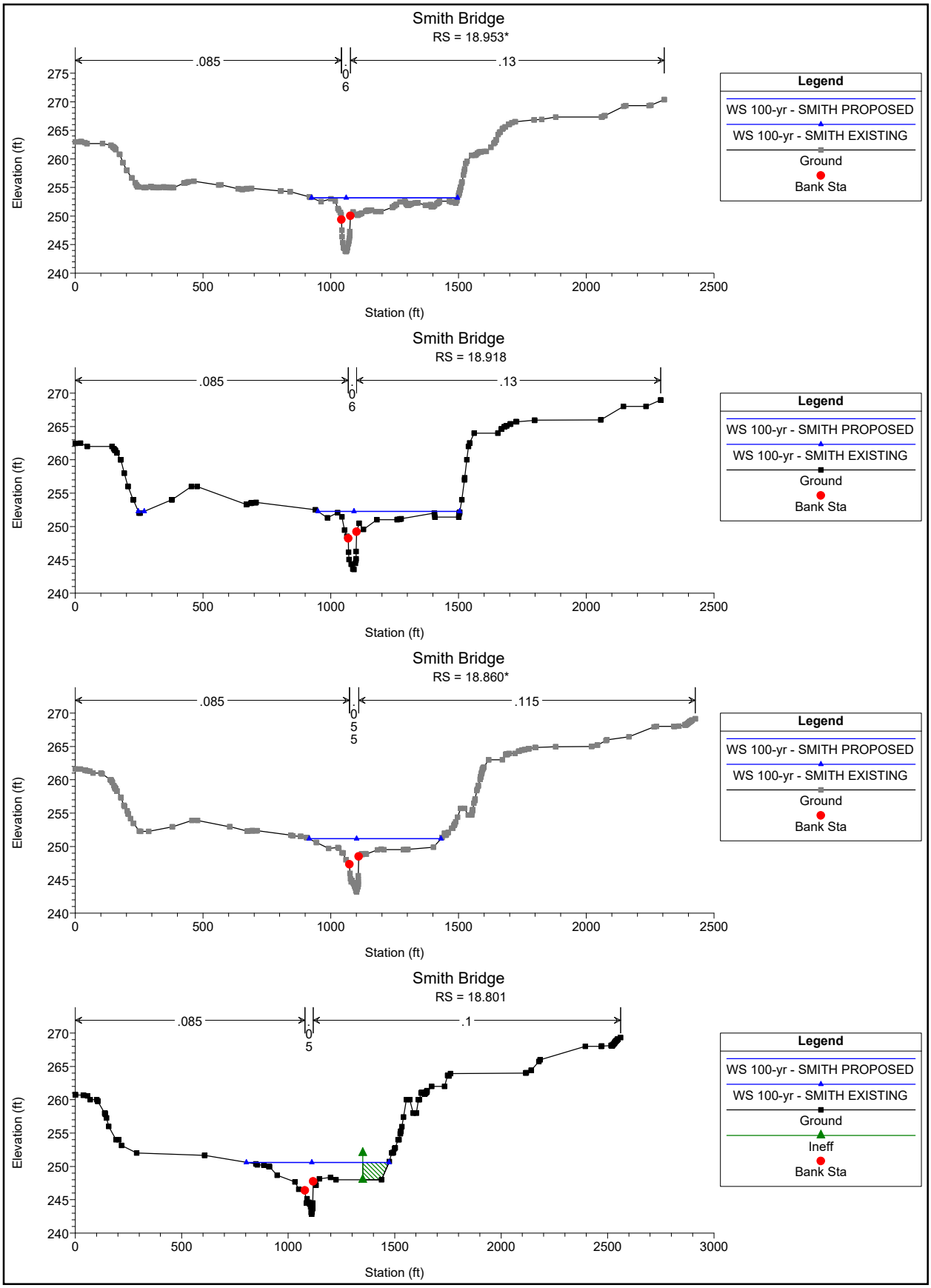
1 in Horiz. = 800 ft 1 in Vert. = 5 ft


Smith Bridge
RS = 19.604
.09
.11
0
6
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.547*
.093
.103
0
6
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.489*
.096
.096
0
6
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.432*
.099
.089
0
6
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta


Smith Bridge
RS = 19.375*
.101
.081
0.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.318*
.104
.074
0.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.260*
.107
.067
0.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.203
.11
.06
0.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta


Smith Bridge
RS = 19.166
.11
.06
.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.163 BR
.11
.06
.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.163 BR
.085
.13
.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.160
.085
.13
.06
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH EXISTING
WS 100-yr - SMITH PROPOSED
Ground
Ineff
Bank Sta


Smith Bridge
RS = 19.100
.085
.06
.13
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Ineff
Bank Sta
Smith Bridge
RS = 19.062*
.085
.13
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Bank Sta
Smith Bridge
RS = 19.024
.085
.13
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Bank Sta
Smith Bridge
RS = 18.989*
.085
.13
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Bank Sta


Smith Bridge
RS = 18.953*
.085
.13
0
6
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Bank Sta
Smith Bridge
RS = 18.918
.085
.13
0
6
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Bank Sta
Smith Bridge
RS = 18.860*
.085
.115
0
5
5
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Bank Sta
Smith Bridge
RS = 18.801
.085
.1
0
5
Elevation (ft)
Station (ft)
Legend
WS 100-yr - SMITH PROPOSED
WS 100-yr - SMITH EXISTING
Ground
Ineff
Bank Sta

Smith Bridge HEC-RAS Output Table

HEC-RAS River: Salmon Creek Reach: Salmon

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Salmon	19.604	100-yr	SMITH PROPOSED	2110.00	254.67	263.24	260.35	263.43	0.002430	4.32	1163.00	896.18	0.29
Salmon	19.604	100-yr	SMITH EXISTING	2110.00	254.67	263.24	260.35	263.43	0.002430	4.32	1163.03	896.18	0.29
Salmon	19.604	500-yr	SMITH PROPOSED	3120.00	254.67	263.91	261.27	264.08	0.002334	4.50	1783.28	1127.19	0.29
Salmon	19.604	500-yr	SMITH EXISTING	3120.00	254.67	263.91	261.27	264.08	0.002331	4.50	1784.29	1128.84	0.29
Salmon	19.547*	100-yr	SMITH PROPOSED	2110.00	253.84	262.55	259.65	262.75	0.002451	4.39	1133.35	833.68	0.29
Salmon	19.547*	100-yr	SMITH EXISTING	2110.00	253.84	262.55	259.65	262.75	0.002451	4.39	1133.40	833.68	0.29
Salmon	19.547*	500-yr	SMITH PROPOSED	3120.00	253.84	263.26	260.36	263.44	0.002350	4.58	1742.17	1185.56	0.29
Salmon	19.547*	500-yr	SMITH EXISTING	3120.00	253.84	263.26	260.36	263.44	0.002342	4.57	1744.99	1185.65	0.29
Salmon	19.489*	100-yr	SMITH PROPOSED	2110.00	253.00	261.86	258.97	262.07	0.002481	4.46	1098.24	772.14	0.29
Salmon	19.489*	100-yr	SMITH EXISTING	2110.00	253.00	261.86	258.97	262.07	0.002480	4.46	1098.45	772.15	0.29
Salmon	19.489*	500-yr	SMITH PROPOSED	3120.00	253.00	262.61	260.60	262.79	0.002375	4.66	1692.10	1105.46	0.29
Salmon	19.489*	500-yr	SMITH EXISTING	3120.00	253.00	262.62	260.60	262.80	0.002352	4.64	1699.62	1105.76	0.29
Salmon	19.432*	100-yr	SMITH PROPOSED	2110.00	252.17	261.17	258.30	261.38	0.002531	4.54	1054.36	710.60	0.29
Salmon	19.432*	100-yr	SMITH EXISTING	2110.00	252.17	261.17	258.30	261.38	0.002528	4.54	1055.10	710.64	0.29
Salmon	19.432*	500-yr	SMITH PROPOSED	3120.00	252.17	261.95	259.88	262.14	0.002418	4.74	1629.42	1027.31	0.29
Salmon	19.432*	500-yr	SMITH EXISTING	3120.00	252.17	261.98	259.90	262.16	0.002359	4.69	1647.81	1028.21	0.29
Salmon	19.375*	100-yr	SMITH PROPOSED	2110.00	251.33	260.47	257.52	260.69	0.002549	4.59	1009.38	650.23	0.29
Salmon	19.375*	100-yr	SMITH EXISTING	2110.00	251.33	260.47	257.52	260.70	0.002540	4.58	1011.66	650.35	0.29
Salmon	19.375*	500-yr	SMITH PROPOSED	3120.00	251.33	261.30	259.05	261.50	0.002416	4.78	1565.39	953.63	0.29
Salmon	19.375*	500-yr	SMITH EXISTING	3120.00	251.33	261.36	259.05	261.54	0.002285	4.67	1605.10	956.24	0.28
Salmon	19.318*	100-yr	SMITH PROPOSED	2110.00	250.50	259.77	256.81	260.00	0.002591	4.65	960.99	696.36	0.29
Salmon	19.318*	100-yr	SMITH EXISTING	2110.00	250.50	259.78	256.81	260.01	0.002562	4.63	967.46	699.27	0.29
Salmon	19.318*	500-yr	SMITH PROPOSED	3120.00	250.50	260.67	258.29	260.87	0.002367	4.78	1508.93	896.80	0.29
Salmon	19.318*	500-yr	SMITH EXISTING	3120.00	250.50	260.77	258.29	260.95	0.002170	4.61	1576.11	904.73	0.27
Salmon	19.260*	100-yr	SMITH PROPOSED	2110.00	249.66	259.06	256.07	259.30	0.002662	4.72	905.48	679.93	0.29
Salmon	19.260*	100-yr	SMITH EXISTING	2110.00	249.66	259.09	256.07	259.32	0.002583	4.66	922.02	688.60	0.29
Salmon	19.260*	500-yr	SMITH PROPOSED	3120.00	249.66	260.05	257.66	260.25	0.002324	4.77	1461.20	883.59	0.28
Salmon	19.260*	500-yr	SMITH EXISTING	3120.00	249.66	260.24	257.66	260.41	0.001990	4.47	1570.47	891.57	0.26
Salmon	19.203	100-yr	SMITH PROPOSED	2110.00	248.83	258.16	255.23	258.47	0.003487	5.30	879.97	1040.39	0.33
Salmon	19.203	100-yr	SMITH EXISTING	2110.00	248.83	258.53	255.23	258.69	0.002078	4.21	1149.79	1146.73	0.26
Salmon	19.203	500-yr	SMITH PROPOSED	3120.00	248.83	259.85	256.88	259.90	0.000780	2.85	2773.69	1270.64	0.16
Salmon	19.203	500-yr	SMITH EXISTING	3120.00	248.83	260.10	256.88	260.13	0.000567	2.47	3247.86	1302.98	0.14
Salmon	19.166	100-yr	SMITH PROPOSED	2110.00	247.48	256.94	252.78	257.53	0.005384	6.17	342.19	39.77	0.37
Salmon	19.166	100-yr	SMITH EXISTING	2110.00	248.12	257.01	253.90	257.77	0.007791	7.02	300.65	39.77	0.45
Salmon	19.166	500-yr	SMITH PROPOSED	3120.00	247.48	258.35	254.10	259.27	0.007494	7.72	464.79	472.82	0.43
Salmon	19.166	500-yr	SMITH EXISTING	3120.00	248.12	258.30	255.21	259.48	0.010623	8.74	409.47	460.09	0.52
Salmon	19.163			Bridge									
Salmon	19.160	100-yr	SMITH PROPOSED	2110.00	247.94	256.56		257.29	0.007365	6.87	307.03	39.63	0.44
Salmon	19.160	100-yr	SMITH EXISTING	2110.00	248.43	256.58		257.48	0.010303	7.62	276.76	39.63	0.51
Salmon	19.160	500-yr	SMITH PROPOSED	3120.00	247.94	257.36		258.67	0.012404	9.21	338.75	107.61	0.56
Salmon	19.160	500-yr	SMITH EXISTING	3120.00	248.43	257.29	255.36	258.92	0.017315	10.23	305.01	101.53	0.65
Salmon	19.100	100-yr	SMITH PROPOSED	2110.00	247.54	256.03	253.09	256.20	0.002763	3.63	829.64	402.23	0.29
Salmon	19.100	100-yr	SMITH EXISTING	2110.00	247.54	256.03	253.09	256.20	0.002763	3.63	829.64	402.23	0.29
Salmon	19.100	500-yr	SMITH PROPOSED	3120.00	247.54	257.08	254.04	257.24	0.002365	3.81	1323.30	582.89	0.27
Salmon	19.100	500-yr	SMITH EXISTING	3120.00	247.54	257.08	254.04	257.24	0.002365	3.81	1323.30	582.89	0.27
Salmon	19.062*	100-yr	SMITH PROPOSED	2110.00	245.87	255.06		255.39	0.003624	4.77	577.77	226.16	0.34
Salmon	19.062*	100-yr	SMITH EXISTING	2110.00	245.87	255.06		255.39	0.003624	4.77	577.77	226.16	0.34
Salmon	19.062*	500-yr	SMITH PROPOSED	3120.00	245.87	256.04		256.46	0.004091	5.60	987.60	749.75	0.37
Salmon	19.062*	500-yr	SMITH EXISTING	3120.00	245.87	256.04		256.46	0.004091	5.60	987.60	749.75	0.37
Salmon	19.024	100-yr	SMITH PROPOSED	2110.00	244.19	254.41		254.58	0.002212	4.20	1159.88	478.84	0.27
Salmon	19.024	100-yr	SMITH EXISTING	2110.00	244.19	254.41		254.58	0.002212	4.20	1159.88	478.84	0.27
Salmon	19.024	500-yr	SMITH PROPOSED	3120.00	244.19	255.23		255.47	0.002916	5.16	1614.85	697.60	0.31
Salmon	19.024	500-yr	SMITH EXISTING	3120.00	244.19	255.23		255.47	0.002916	5.16	1614.85	697.60	0.31
Salmon	18.989*	100-yr	SMITH PROPOSED	2110.00	243.98	253.81		254.09	0.003038	5.04	1014.97	520.17	0.32
Salmon	18.989*	100-yr	SMITH EXISTING	2110.00	243.98	253.81		254.09	0.003038	5.04	1014.97	520.17	0.32
Salmon	18.989*	500-yr	SMITH PROPOSED	3120.00	243.98	254.60		254.89	0.003275	5.58	1485.32	629.79	0.33
Salmon	18.989*	500-yr	SMITH EXISTING	3120.00	243.98	254.60		254.89	0.003275	5.58	1485.32	629.79	0.33
Salmon	18.953*	100-yr	SMITH PROPOSED	2110.00	243.77	253.17		253.49	0.003413	5.36	986.79	571.56	0.34
Salmon	18.953*	100-yr	SMITH EXISTING	2110.00	243.77	253.17		253.49	0.003413	5.36	986.79	571.56	0.34
Salmon	18.953*	500-yr	SMITH PROPOSED	3120.00	243.77	253.93		254.25	0.003625	5.88	1442.01	634.39	0.35
Salmon	18.953*	500-yr	SMITH EXISTING	3120.00	243.77	253.93		254.25	0.003625	5.88	1442.01	634.39	0.35
Salmon	18.918	100-yr	SMITH PROPOSED	2110.00	243.56	252.26	250.01	252.71	0.005029	6.26	822.29	579.24	0.40
Salmon	18.918	100-yr	SMITH EXISTING	2110.00	243.56	252.26	250.01	252.71	0.005029	6.26	822.29	579.24	0.40
Salmon	18.918	500-yr	SMITH PROPOSED	3120.00	243.56	253.08		253.47	0.004737	6.51	1366.90	771.70	0.40
Salmon	18.918	500-yr	SMITH EXISTING	3120.00	243.56	253.08		253.47	0.004737	6.51	1366.90	771.70	0.40
Salmon	18.860*	100-yr	SMITH PROPOSED	2110.00	243.21	251.16		251.44	0.003554	5.35	977.50	516.47	0.37
Salmon	18.860*	100-yr	SMITH EXISTING	2110.00	243.21	251.16		251.44	0.003554	5.35	977.50	516.47	0.37

HEC-RAS River: Salmon Creek Reach: Salmon (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Salmon	18.860*	500-yr	SMITH PROPOSED	3120.00	243.21	252.05		252.30	0.003372	5.66	1497.59	685.84	0.36
Salmon	18.860*	500-yr	SMITH EXISTING	3120.00	243.21	252.05		252.30	0.003372	5.66	1497.59	685.84	0.36
Salmon	18.801	100-yr	SMITH PROPOSED	2110.00	242.86	250.61	248.98	250.72	0.001713	3.90	1308.24	669.73	0.28
Salmon	18.801	100-yr	SMITH EXISTING	2110.00	242.86	250.61	248.98	250.72	0.001713	3.90	1308.24	669.73	0.28
Salmon	18.801	500-yr	SMITH PROPOSED	3120.00	242.86	251.52	249.44	251.64	0.001658	4.21	1881.82	846.47	0.28
Salmon	18.801	500-yr	SMITH EXISTING	3120.00	242.86	251.52	249.44	251.64	0.001658	4.21	1881.82	846.47	0.28

Plan: SMITH PROPOSED Salmon Creek Salmon RS: 19.163 Profile: 100-yr

E.G. US. (ft)	257.53	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	256.94	E.G. Elev (ft)	257.52	257.30
Q Total (cfs)	2110.00	W.S. Elev (ft)	256.93	256.56
Q Bridge (cfs)	2110.00	Crit W.S. (ft)	252.77	253.26
Q Weir (cfs)		Max Chl Dpth (ft)	9.45	8.62
Weir Sta Lft (ft)		Vel Total (ft/s)	6.17	6.88
Weir Sta Rgt (ft)		Flow Area (sq ft)	341.97	306.55
Weir Submerg		Froude # Chl	0.37	0.41
Weir Max Depth (ft)		Specif Force (cu ft)	1898.26	1663.69
Min El Weir Flow (ft)	257.83	Hydr Depth (ft)	8.60	7.76
Min El Prs (ft)	257.79	W.P. Total (ft)	54.73	52.81
Delta EG (ft)	0.23	Conv. Total (cfs)	28729.2	24521.9
Delta WS (ft)	0.38	Top Width (ft)	39.77	39.51
BR Open Area (sq ft)	345.53	Frctn Loss (ft)	0.18	0.01
BR Open Vel (ft/s)	6.88	C & E Loss (ft)	0.04	0.00
BR Sluice Coef		Shear Total (lb/sq ft)	2.10	2.68
BR Sel Method	Energy only	Power Total (lb/ft s)	12.98	18.47

Appendix E

Appendix E: Scour Calculations

Hydraulic Data for: Smith Bridge # 211 Scour Repair Project							
100-year Event				**500-year Event**			
Y_o	=	7.51	ft	Y_o	=	8.18	ft
Q_1	=	1,222	cfs	Q_1	=	911	cfs
Q_2	=	2,110	cfs	Q_2	=	2,146	cfs
A_1	=	290	ft^2	A_1	=	340	ft^2
A_2	=	297	ft^2	A_2	=	323	ft^2
W_1	=	34.4	ft	W_1	=	34.4	ft
W_2	=	39.6	ft	W_2	=	39.6	ft
V_m	=	4.21	fps	V_m	=	2.68	fps
D_{50}	=	32.8	mm	D_{50}	=	32.8	mm
Energy Slope	=	2.076E-03	ft/ft	Energy Slope	=	6.800E-04	ft/ft
Acceleration of Gravity	=	32.2	ft/sec^2	Acceleration of Gravity	=	32.2	ft/sec^2
Fall Velocity, ω	=	2.63	fps	Fall Velocity, ω	=	2.63	fps

By: Enrique Diaz

Date: 30-Jan-18

Scour Calculation Summary
Smith Bridge # 211 Scour Repair Project
Contraction Scour Mode

The following calculations are based on Equation 6.1 in HEC-18, 5th Edition:
$V_c = K_u Y_1^{1/6} D_{50}^{1/3}$

100-year Event		
Approach Section Main Channel Area, A_1 (ft^2)	=	290
Approach Section Main Channel Topwidth, W_1 (ft^2)	=	34.42
Approach Section Average Channel Depth, $Y_1 = A_1/W_1$ (ft)	=	8.4
Median Grain Size, D_{50} (ft)	=	0.108
K_u	=	11.17
Critical Velocity for bed material transport, V_c (fps)	=	7.58
Approach Section Main Channel Discharge, Q_1 (cfs)	=	1,222
Approach Section Main Channel Velocity, V_m (fps)	=	4.21
Scour Mode:		**Clear Water**
500-year Event		
Approach Section Main Channel Area, A_1 (ft^2)	=	340
Approach Section Main Channel Topwidth, W_1 (ft^2)	=	34.42
Approach Section Average Channel Depth, $Y_1 = A_1/W_1$ (ft)	=	9.9
Median Grain Size, D_{50} (ft)	=	0.108
K_u	=	11.17
Critical Velocity for bed material transport, V_c (fps)	=	7.78
Approach Section Main Channel Discharge, Q_1 (cfs)	=	911
Approach Section Main Channel Velocity, V_m (fps)	=	2.68
Scour Mode:		**Clear Water**

Scour Calculation Summary
Smith Bridge # 211 Scour Repair Project
Clear-Water Contraction Scour
100-Year Event

The following calculations are based on Equations 6.4 and 6.5, HEC-18, 5th Edition:

$Y_2=((K_uQ^2)/(D_m^{2/3}W^2))^{3/7}$

$Y_s=Y_2-Y_0$

K_u	=	0.0077
Discharge, Q (cfs)	=	2,110
Median Grain Size, D_{50} (ft)	=	0.108
Diameter of smallest non-transportable particle, D_m (ft)	=	0.135
Topwidth, W (ft)	=	39.6
Computed Average Depth in Contracted Section, Y_2 (ft)	=	6.66
Existing Average Depth Before Scour, Y_0 (ft)	=	7.51
Computed Average Contraction Scour Depth, Y_s (ft)	=	**(0.9)**

Scour Calculation Summary
Smith Bridge # 211 Scour Repair Project
Clear-Water Contraction Scour
500-Year Event

The following calculations are based on Equations 6.4 and 6.5, HEC-18, 5th Edition:

$Y_2=((K_uQ^2)/(D_m^{2/3}W^2))^{3/7}$

$Y_s=Y_2-Y_0$

K_u	=	0.0077
Discharge, Q (cfs)	=	2,146
Median Grain Size, D_{50} (ft)	=	0.108
Diameter of smallest non-transportable particle, D_m (ft)	=	0.135
Topwidth, W (ft)	=	39.6
Computed Average Depth in Contracted Section, Y_2 (ft)	=	6.8
Existing Average Depth Before Scour, Y_0 (ft)	=	8.18
Computed Average Contraction Scour Depth, Y_s (ft)	=	**(1.4)**

Scour Calculation Summary
Smith Bridge # 211 Scour Repair Project
Clear-Water Abutment Scour US

Section 8.6.3 HEC-18, 5th Edition

$y_{max} = \alpha_B * y_c$

$y_s = y_{max} - y_0$

$y_c = (q_{2f}/K_u D_{50}^{1/3})^{(6/7)}$

		100-yr	500-yr
q_{2c} (cfs)	=	53.35	54.26
q_1 (cfs)	=	35.52	26.46
q_{2c}/q_1 (unitless)	=	1.50	2.05
y_1 (feet)	=	8.43	9.88
D_{50} (ft)	=	0.11	0.11
K_u (English Unit)	=	11.17	11.17
y_c (feet)	=	7.21	7.32
α_B (unitless)	=	2.4	1.9
Y_{max} (feet)	=	17.30	13.90
y_0 (feet)	=	8.87	10.45
y_s (feet)	=	8.43	3.45

RIPRAP SIZING CALCULATION

Project: Smith Bridge Scour Repair
Project No.: 19047

ODOT Tractive Force Method			
		100-yr	500-yr
V	=	7.79	10.22
Davg	=	6.91	7.97
SF	=	2	1
CSF	=	2.2	0.8
Ss	=	2.7	2.7
Csg	=	1.0	1.0
C	=	2.2	0.8
K1	=	0.534	0.534
D50	**=**	**0.99**	**0.74**

USACE EM-1601 Method			
		100-Year	500-Year
Vavg (ft/s)	=	7.79	6.79
Rc	=	10000	10000
W	=	39.17	39.67
Rc/W	=	255.30	252.08
Vdes (ft/s)	=	7.79	6.79
y (ft)	=	8.08	8.79
Side Slope (H:V)	=	2	2
Theta (deg)	=	26.57	26.57
K1	=	0.72	0.72
SG	=	2.65	2.65
Sf	=	1.3	1
Cs	=	0.3	0.3
Cv	=	1	1
CT	=	1	1
d30	=	0.41	0.22
d50 = 1.2*d30	**=**	**0.50**	**0.26**

FHWA Isbash for Abtuments			
		100-Year	500-Year
V	=	7.79	6.79
y	=	8.08	8.79
K	=	1.02	1.02
SG	=	2.65	2.65
Fr	=	0.48	0.40
D50	**=**	**1.17**	**0.89**

Design D50 for 100-year (ft)	**1.17**
Design D50 for 500-year (ft)	**0.89**

Appendix F

Appendix F: FIRM Panel

National Flood Hazard Layer FIRMette

FEMA

45°45'59.69"N

122°30'21.87"W

Feet

0 250 500 1,000 1,500 2,000

1:6,000

45°45'34.59"N

122°29'44.41"W

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/25/2019 at 6:18:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.