
Appendix G.7

West Duwamish – Chelan Ave

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Chelan Ave Alternative

DSN036-STOR-1 (KC) or WDUW-Chelan-KC-STOR 1

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DSN036-STOR-1 (KC) or WDUW-Chelan-KC-STOR 1

Alternative DSN036-STOR-1 controls King County's Chelan Ave CSOs by building a storage tank near the Chelan Ave Regulator Station and modifying the Alki Trunk. This alternative is an independent alternative and only controls King County CSOs.

Design Criteria

- King County Storage Volume Requirement: 3.85 MG (Chelan Ave)
- King County CSO Peak Flow Rate for Sizing Conveyance to Storage: 38.4 MGD (Chelan Ave)
- Storage tank is required to drain within 12 hours of event.

Description

Alternative DSN036-STOR-1 (KC) consists of a storage tank and modifications to the Alki Trunk to control King County Chelan Ave CSOs.

A CSO control volume of approximately 3.85 MG is required to reduce overflows at the Chelan Ave CSO Outfall to an average of one untreated discharge per year. Storage of this volume could be provided with an offline storage tank located within or adjacent to the approximate boundary shown in Figure G.7-1. See Section 6.1 Planning-Level Sizing Assumptions for criteria and assumptions used in establishing the approximate boundary.

The main components of this alternative would include:

- 3.85-MG offline storage tank with pumps to empty the storage tank.
- Facilities building(s) to house electrical/control/odor control equipment and a standby generator.
- Modifications to Chelan Ave Regulator Station.
- Up to approximately 775 ft of 24-inch-diameter force main, depending on the location selected for the offline storage tank within or adjacent to the approximate boundary shown in Figure G.7-1.
- Up to approximately 1,550 ft of 42-inch-diameter influent gravity sewer, depending on the location selected for the offline storage tank within or adjacent to the approximate boundary shown in Figure G.7-1.
- Modifications upstream in the Alki Trunk to control flows from the Alki CSO Basin to the West Seattle Tunnel. Modifications would include a sluice gate and flow meter.

Storage Tank

The CSO control volume for King County could be stored in a buried, rectangular structure, approximately 290 feet long and 110 feet wide with a sidewater depth of approximately 20 feet.

Flows would enter the storage tank during a wet-weather event. The tank may be configured with multiple chambers, so that only those chambers required to store the volume of the wet-weather event would be used. Storage of flows would start in the first chamber and as that chamber fills and reaches capacity, flows would be transferred into subsequent chambers until

either the wet-weather event ends or the capacity of the storage tank is reached. Each chamber would contain equipment for flushing and self-cleaning, and only chambers used in a wet-weather event would require flushing. Control of odors and sediment in the storage chambers may require regularly-scheduled cleaning between events.

Facilities Building(s)

Facilities building(s) would be located above or below ground level and would contain an odor control system, electrical controls, and a standby generator. The actual contents of the building(s) will be determined during preferred alternative development. The representative footprint shown in Figure G.7-1 for this alternative locates the facilities buildings adjacent to the storage tank for conservative purposes; however, the facilities buildings could be located above the storage tank to minimize space requirements.

Flow Diversion and Discharge

One regulator station will be required to divert King County flows (Chelan Ave CSOs) from the Chelan Ave Regulator Station to the storage tank. For this planning phase, it is assumed that the diversion would occur at the Chelan Ave Regulator Station. Evaluation of whether flows can be diverted upstream of the regulator will be completed during preferred alternative development. Diverted King County flow would discharge to the location of the storage tank via a 42-inch-diameter influent gravity sewer. The length of the influent gravity sewer will vary depending on the selected location of the offline storage tank, which will be evaluated during preferred alternative development. The influent gravity sewer can be up to 1,550 feet long based on the criteria and assumptions listed in Section 6.1.

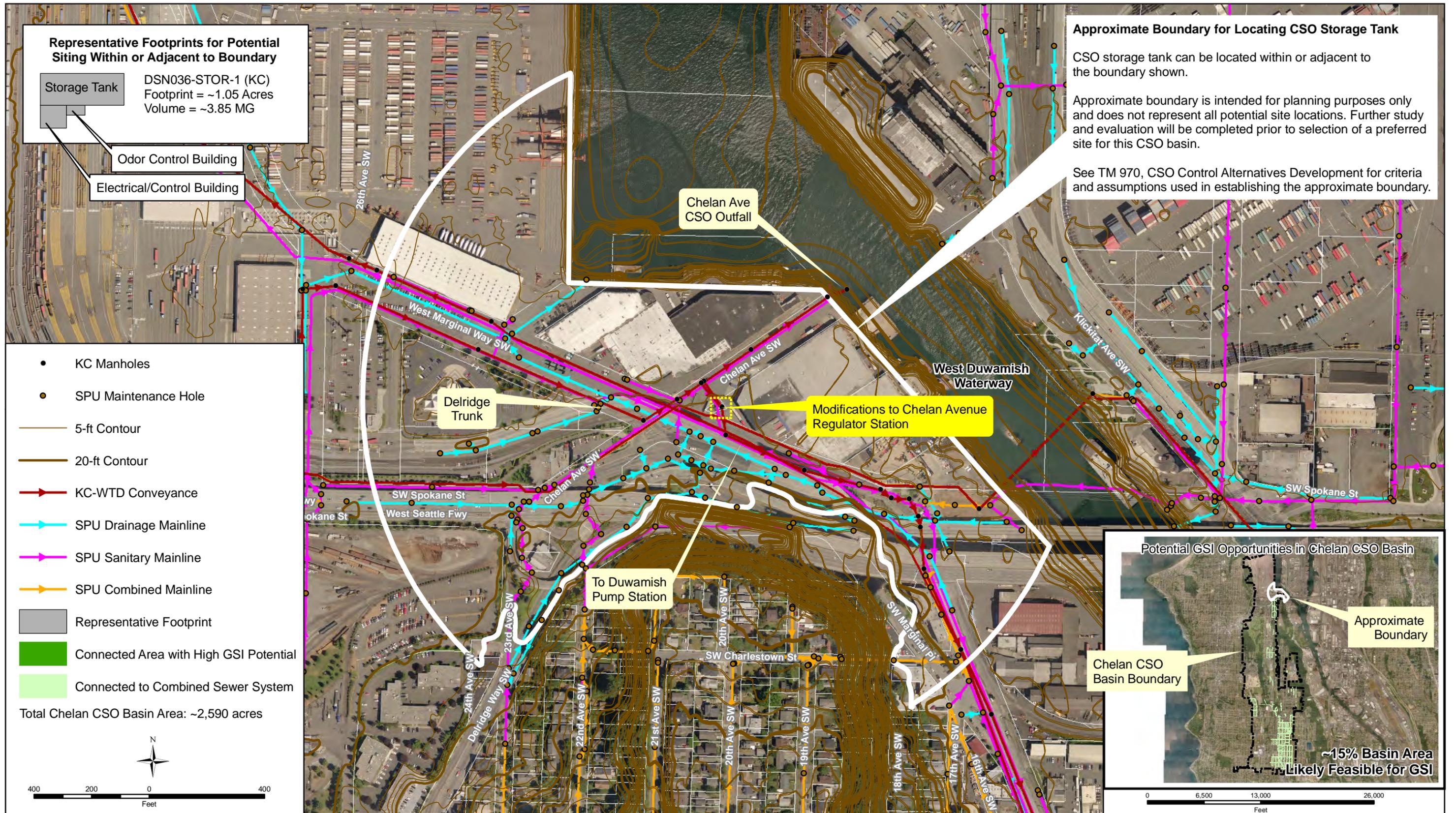
After a wet weather event, the chambers inside the storage tank would drain to a common sump. Submersible pump(s) would transfer stored sewage back into the King County West Duwamish Interceptor through a 24-inch-diameter force main that is up to approximately 775 feet in length. The length of the force main will vary depending on the selected location of the offline storage tank, which will be evaluated during preferred alternative development.

Alki Trunk Modifications

The West Seattle Tunnel receives flows from the Alki and Harbor Ave CSO Basins. Modifications are required upstream of the West Seattle Tunnel in the Alki Trunk to limit flows from the Alki CSO Basin to the West Seattle Tunnel to approximately 19 MGD. These modifications would allow the West Seattle Tunnel to operate as originally intended, providing capacity in the West Seattle Tunnel for Harbor Ave CSO Basin flows while also providing conveyance up to 19 MGD from the Alki CSO Basin to the West Seattle Pump Station. The modifications would include replacement of a modulating sluice gate and flow meter in the Alki Trunk. Restricting flows from the Alki CSO Basin will result in increased frequency of operation for the Alki Treatment Facility.

Construction Assumptions

King County's Tabula cost estimating program was used to develop a Class 5 estimate for this alternative. The attached documentation lists the construction assumptions used.



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Alternative DSN036-STOR-1 (KC)

Escalation Assumptions

Description	ENR CCI
ENR CCI (Seattle), January 2010	8645.35

Total Project Cost, 2010 Dollars

Description	Total Costs (Chelan)
3.85-MG Storage Tank Construction Cost =	\$18,500,000
Influent Gravity Sewer Construction Cost (1,550 LF of 42-inch-diameter pipe) =	\$2,260,000
Force Main Construction Cost (775 LF of 24-inch-diameter pipe) =	\$450,000
Modifications to Chelan Ave Regulator Construction Cost =	\$490,000
Alki Trunk Modifications Construction Cost =	\$450,000
SDOT Street Use Permit Fee Cost =	\$180,000
Total Construction Cost =	\$22,330,000
Sales Tax (10% of Construction Cost) =	\$2,230,000
¹ Allied Costs (46.07% of Construction Cost) =	\$10,290,000
Property Cost =	\$4,900,000
Subtotal of Project Cost =	\$39,750,000
¹ Construction Contingency (10% of Construction Cost) =	\$2,230,000
^{1, 2} Project Contingency =	\$9,700,000
Total Project Cost, 2010 Dollars =	\$51,700,000

¹ King County allied costs and contingency used. Allied cost percentage is based on the type of construction and total construction cost.

²Project Contingency = Total Contingency (30% of Subtotal of Project Costs) - Construction Contingency (10% of Construction Cost)

STORAGE TANK - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Storage Facility: Storage Facility

Printed date : 02/01/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

Construction Year: 2010
 Storage Capacity: 3.85 Mgal
 Facility Footprint: 45800 SF
 Land Acquisition: None
 Surface Restoration: Pavement
 Dewatering: Significant
 Construction Method: CastinPlace
 Outflow Operations: Pump
 Odor Control: true

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Surface Restoration	5,090.00	SY	43	219,000
Dewatering	1	LS	1,230,000	1,230,000
Odor Control	1	LS	629,000	\$629,000
Effluent Pump Station	1	LS	288,000	288,000
Construction Cost	3.8	Mgal	4,000,000	15,400,000
			Year 2008 Subtotal	\$17,800,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	\$1			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal				\$18,500,000

INFLUENT GRAVITY SEWER - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Influent Pipe
 Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

Construction Year: 2010
 Length: 1550 ft
 Conduit Type: Gravity
 Depth of Cover: 10 ft
 Trench Backfill Type: Imported
 Disposal Type: No Disposal Cost
 Manhole Spacing: Average (500 ft)
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Full Width - Arterial (44 ft)
 Traffic: Heavy
 Land Acquisition: None
 Required Easements: None
 Land Adjustment Factor: Seattle
 Trench Safety: Special Shoring
 Pipe Diameter: 42 in.

Geometry

Outer Diameter	4.25 ft
Trench Width	8.03 ft
Excavation Depth	15.3 ft
Complete Surface Rest. Width	10 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	7,030.00	CY	\$13	\$91,300
Backfill	4,150.00	CY	\$34	\$141,000
Complete Pavement Restoration	1,730.00	SY	\$86	\$148,000
Overlay Pavement Restoration	5,850.00	SY	\$28	\$164,000
Trench Safety	47,300.00	SF	\$17	\$804,000
Spoil Load and Haul	7,030.00	CY	\$16	\$112,000
Pipe Unit Material Cost	1,550.00	If	\$86	\$133,000
Pipe Installation	1,550.00	If	\$52	\$80,600
Place Pipe Zone Fill	2,060.00	CY	\$34	\$70,200
Manholes	4	MH	\$9,720	\$38,900
Existing Utilities	1,550.00	If	\$120	\$186,000
Dewatering	1,550.00	If	\$107	\$166,000
Traffic Control	1,550.00	If	\$24	\$37,200
			Year 2008 Subtotal	\$2,170,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal				\$2,260,000

Year 2010 Total: \$2,260,000

FORCE MAIN - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Forcemain
 Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

Construction Year: 2010
 Length: 775 ft
 Conduit Type: Force Main
 Depth of Cover: 6 ft
 Trench Backfill Type: Imported
 Disposal Type: No Disposal Cost
 Manhole Spacing: None
 Existing Utilities: Complex
 Dewatering: Significant
 Pavement Restoration: Half Width - Arterial (22 ft)
 Traffic: Heavy
 Land Acquisition: None
 Required Easements: None
 Land Adjustment Factor: Seattle
 Trench Safety: Standard
 Pipe Diameter: 24 in.

Geometry

Outer Diameter	2.15 ft
Trench Width	5.3 ft
Excavation Depth	9.15 ft
Complete Surface Rest. Width	7.3 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	1,390.00	CY	\$13	\$18,100
Backfill	760.00	CY	\$34	\$25,800
Complete Pavement Restoration	628.00	SY	\$86	\$54,000
Overlay Pavement Restoration	1,270.00	SY	\$28	\$35,500
Trench Safety	14,200.00	SF	\$1	\$7,520
Spoil Load and Haul	1,390.00	CY	\$16	\$22,300
Pipe Unit Material Cost	775.00	lf	\$114	\$88,400
Pipe Installation	775.00	lf	\$33	\$25,600
Place Pipe Zone Fill	527.00	CY	\$34	\$17,900
Existing Utilities	775.00	lf	\$58	\$45,000
Dewatering	775.00	lf	\$100	\$77,500
Traffic Control	775.00	lf	\$24	\$18,600
			Year 2008 Subtotal	\$436,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal			\$453,000	

Year 2010 Total: \$453,000

MODIFICATIONS TO CHELAN AVE REGULATOR STATION - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Regulator Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		\$1		
Construction Year 2010 Subtotal			\$485,000	

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ALKI TRUNK MODIFICATIONS

Purpose:

Modifications upstream in the Alki Trunk to control flows and allow only 19 mgd or less to pass through the West Seattle Tunnel and provide capacity for storage of Harbor CSOs. Upgrades require:

- a) Regulator Gate - Sluice gate in Alki Trunk (30" x 42")
- b) Actuator - Explosion-proof actuator with power failure feature to shut closed upon power failure
- c) Flow Meter - Cross-correlation velocity sensor

Unit Costs (Basis 2010)

Item	Quantity	Unit	Unit Cost	Item Cost	Source of Costs
Regulator Gate & Actuator	1	LS	\$150,000	\$150,000	Vendor price quote from Rodney Hunt
Flow Meter	1	LS	\$60,000	\$60,000	Vendor price quote from ADS
Electrical/Instrumentation	1	LS	\$195,000	\$195,000	Lump sum estimate.
Architectural/Structural	1	LS	\$40,000	\$40,000	Lump sum estimate.

Year 2010 Subtotal \$445,000

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PROPERTY AND PERMITTING COSTS

Land and Building Cost, Average Cost per Square Foot (January 2007 to August 2010)

Uncontrolled CSO Basin	Average Cost per Square Foot for Industrial Land and Building (\$/SF)	Average Cost per Square Foot for Industrial Land (\$/SF)
DSN036 Chelan Regulator	\$106.94	\$24.12

Land Costs, 2010 Dollars

Description	Footprint (SF)	Land Cost Assumption (\$/SF)	Assumed Percentage of Market Value (%)	Estimated Land Costs (\$)
Storage Tank	36,000	\$106.94	100%	\$3,849,840
Ancillary Facilities (Electrical/Controls/Standby Generator, Odor Control, etc.)	9,800	\$106.94	100%	\$1,048,012
Total Land Costs				\$4,897,852

SDOT Street Use Permit Fee Assumptions

Construction is located on arterial.

Closure of construction area will occur in phases. Assumed construction phasing in:

Assumed production rate during working days =

For pipe diameters less than or equal to 36 inches, assume half width of road will be closed during construction. Width is based on the half width for arterial pavement restoration in Tabula.

For pipe diameters greater than 36 inches, assume full width of road will be closed during construction. Width is based on the full width for arterial pavement restoration in Tabula.

1,000 ft segments
15 LF/d
22 ft
44 ft

Source of methodology for estimating permit fees: <http://www.seattle.gov/transportation/cams/CAM2115.pdf>

SDOT Street Use Permit Fee Estimation, 2010 Dollars

Description	Diameter of Pipe (in)	Length (ft)	Width of Construction Area (ft)	Estimated Construction Area (SF)	Construction Duration (Calendar Days)	Number of 10-Day Periods	Use Fee (\$/SF)	Estimated Permit Costs
Upgrade to Chelan Ave Regulator Station	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Installation of Influent Gravity Sewer, First Phase of Construction	42	1,000	44	44,000	93.3	10	\$2.90	\$127,600
Installation of Influent Gravity Sewer, Second Phase of Construction	42	550	44	24,200	51.3	6	\$0.90	\$21,780
Installation of Forcemain, First Phase of Construction	24	775	22	17,050	72.3	8	\$1.70	\$28,985
Total SDOT Street Use Fee Estimation:								\$184,865

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Operations and Maintenance Cost Estimate Summary

Basin Name: Chelan

Alternative Name: WDUW-Chelan-KC-STOR 1

		<i>ENR 1994</i>	5747		
		<i>Current ENR</i>	8654.4	<i>Acres of Raingarden for GSI</i>	0.00
		<i>Power Cost (per kwh)</i>	0.065	<i>Annual Overflow Vol (MG)</i>	17.20
		<i>Labor rate (loaded) /hr</i>	51.17	<i>Annual Vol Capture</i>	13.10
		<i>SPU Water Cost \$/CCF</i>	4.50	<i>Annual Events</i>	25
				<i>Stor Vol</i>	3.85
				<i>Peak Flow Rate</i>	38.40
				<i>Peak Flow Rate w/Equal</i>	
		<i>Carbon Cost/Lb</i>	2.00		

Annual Costs

Components	Annual Maintenance & Inspection Cost	Annual Operation Cost	Annual Energy Cost	Annual Chemical Cost
Gravity Sewer/Combined Sewers	\$2,341			
Force Mains	\$28			
Regulator/Flow Control Structures	\$0			
Deep/Shallow Tunnels	\$0			
Off-Line Storage Pipes	\$0			
River Outfalls	\$0			
Pump Stations	\$0	\$0	\$0	
Rectangular Storage Facilities	\$80,748	\$53,052	\$22,519	\$72,059
High Rate Treatment	\$0	\$0	\$0	\$0
Additional Secondary Treatment	NA	\$8,604	NA	NA
Green Stormwater Infrastructure	\$0			
Annual Cost Subtotals:	\$83,117	\$61,656	\$22,519	\$72,059
Total Annual O&M				
			General	\$216,831
			Energy	\$22,519
			Total	\$239,350

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WTD BUSINESS CASE EVALUATION RESULTS

CHELAN CSO CONTROL ALTERNATIVES

Lower Bound Discount Rate (WTD Borrowing Cost) (1)

Scenario	Lifetime	Initial Capital Outlay	Total Project Life Costs (2)	Total Project Life Benefits	Net Project Life Costs	Average Project Annual Cost	Annual Costs over(under) Status quo
Alternatives							
1 Chelan Stor 1	50	\$51,700,000	\$60,028,303	\$0	\$60,028,303	\$1,985,114	\$1,985,114

Upper Bound Discount Rate (OMB, Private Rate of Return) (3)

Scenario	Lifetime	Initial Capital Outlay	Total Project Life Costs (2)	Total Project Life Benefits	Net Project Life Costs	Average Project Annual Cost	Annual Costs over(under) Status quo
Alternatives							
1 Chelan Stor 1	50	\$51,700,000	\$43,421,754	\$0	\$43,421,754	\$1,435,942	\$1,435,942

First Year of Construction	2010	Additional inflation rate > 3%	1.00%
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Notes:

- (1) WTD Discount rate based on recent WTD borrowing costs net of 3% annual inflation. 2.18%
 - (2) Costs include risk and uncertainty, if estimated.
 - (3) Discount rate net of inflation, per the King County Budget Office. 7.00%
- The option with the largest net equivalent annualized cost is the financially preferred option.

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Chelan Ave Alternative

DSN036-STOR-2 (KC) or WDUW-Chelan-KC-STOR 2

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DSN036-STOR-2 (KC) or WDUW-Chelan-KC-STOR 2

Alternative DSN036-STOR-2 (KC) controls King County's Chelan Ave CSOs by building two 90-ft-diameter caissons adjacent to the West Seattle Pump Station and modifying the Alki Trunk. This alternative is an independent alternative and only controls King County CSOs.

Design Criteria

- King County Storage Volume Requirement: 3.85 MG¹ (Chelan Ave)
- King County CSO Peak Flow Rate for Sizing Conveyance to Storage: 38.4 MGD¹ (Chelan Ave)
- Storage is required to drain within 12 hours of event.

Description

Flows from the Chelan Ave CSO Basin would be diverted from the Delridge Trunk to two caissons located adjacent to the West Seattle Pump Station. Alternative DSN036-STOR-2 (KC) consists of conveyance improvements, two caissons, and modifications to the Alki Trunk to control King County Chelan Ave CSOs.

A CSO control volume of approximately 3.85 MG¹ is required to reduce overflows at the Chelan Ave CSO Outfall to an average of one untreated discharge per year. Storage of this volume could be provided with two 90-ft-diameter caissons located immediately adjacent to the West Seattle Pump Station, as shown in Figure G.7-2.

The main components of this alternative would include:

- Two 90-ft-diameter caissons that provide 3.85 MG of storage with pumps to empty the caissons.
- Facilities building(s) to house electrical/control/odor control equipment and a standby generator.
- Three new regulator stations (diversion structures) referred to as the Diversion Structure, Delridge Diversion Structure, and Diversion Structure to Storage in Figure G.7-2.
- One drain structure to allow draining of the 36-inch-diameter pressure pipe after wet-weather events when not in use.
- Modifications to the Harbor Ave Regulator Station.
- Approximately 530 ft of 12-inch-diameter pipe to convey flows from Delridge Way SW to the new 36-inch-diameter pressure pipe located parallel to the Delridge Trunk (see Figure G.7-2 for proposed alignment).
- Approximately 3,270 ft of 36-inch-diameter pressure pipe to convey flows from the Delridge Diversion Structure to the Harbor Ave Regulator Station (see Figure G.7-2 for proposed alignment).

¹ This alternative assumes that flows are diverted upstream of the Chelan Ave Regulator Station along the Delridge Trunk. It has not been confirmed by modeling that diverting from this location would control Chelan Ave CSOs. Refined modeling may indicate an increase in storage volume and conveyance size to control Chelan Ave CSOs.

- Approximately 200 ft of 42-inch-diameter influent gravity sewer to convey CSOs from the Harbor CSO Pipeline to the two new caissons located immediately adjacent to the West Seattle Pump Station (see Figure G.7-2 for proposed alignment).
- Approximately 250 ft of 24-inch-diameter force main to drain the two caissons after a wet-weather event (see Figure G.7-2 for proposed alignment).
- Modifications upstream in the Alki Trunk to control flows from the Alki CSO Basin to the West Seattle Tunnel. Modifications would include a sluice gate and flow meter.

Caisson Structures

The CSO control volume for King County could be stored in two 90-ft-diameter caissons with a sidewater depth of approximately 42 feet. The two caissons would be approximately 70 feet deep. For this alternative, it is assumed that the two caissons are located immediately adjacent to the West Seattle Pump Station on property owned by the King County Wastewater Treatment Division.

Facilities Building(s)

Facilities building(s) would be located above or below ground level and would contain an odor control system, electrical controls, and a standby generator. The actual contents of the building(s) will be determined during preferred alternative development. The representative footprint shown in Figure G.7-2 for this alternative locates the facilities buildings adjacent to the caissons for conservative purposes; however, the facilities buildings could be located above the caissons to minimize space requirements.

Flow Diversion and Discharge

The caissons are located immediately adjacent to the West Seattle Pump Station on property owned by the King County Wastewater Treatment Division.

Three regulator stations, along with approximately 530 ft of 12-inch-diameter pipe and 3,270 ft of 36-inch-diameter pressure pipe, will be required to divert King County flows (Chelan Ave CSOs) from the Delridge Trunk and existing sanitary sewer on Delridge Way SW to the Harbor CSO Pipeline at the Harbor Ave Regulator Station during wet-weather events as shown in Figure G.7-2. A new drain structure will also be required on the pressure pipe near the intersection of the Delridge Trunk and SW Spokane St to allow the pressure pipe to be drained after a wet-weather event when not in use. CSOs would then be conveyed to the new diversion structure (Diversion Structure to Storage) at the West Seattle Pump Station site via the existing Harbor CSO Pipeline. The new diversion structure will be required near the West Seattle Pump Station to divert King County flows (Chelan Ave CSOs) to the two caissons. Diverted King County flow would discharge to the location of the two caissons via a 42-inch-diameter influent gravity sewer that is approximately 200 ft in length, as shown in Figure G.7-2.

After a wet-weather event, the two caissons would drain to a common sump. Submersible pump(s) would transfer stored sewage back into the King County system through approximately 250 ft of 24-inch-diameter force main as shown in Figure G.7-2.

Alki Trunk Modifications

The West Seattle Tunnel receives flows from the Alki and Harbor Ave CSO Basins. Modifications are required upstream of the West Seattle Tunnel in the Alki Trunk to limit flows

from the Alki CSO Basin to the West Seattle Tunnel to approximately 19 MGD. These modifications would allow the West Seattle Tunnel to operate as originally intended, providing capacity in the West Seattle Tunnel for Harbor Ave CSO Basin flows while also providing conveyance up to 19 MGD from the Alki CSO Basin to the West Seattle Pump Station. The modifications would include replacement of a modulating sluice gate and flow meter in the Alki Trunk. Restricting flows from the Alki CSO Basin will result in increased frequency of operation for the Alki Treatment Facility.

Construction Assumptions

King County's Tabula cost estimating program was used to develop a Class 5 estimate for this alternative. The attached documentation lists the construction assumptions used.

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Alternative DSN036-STOR-2 (KC)

Escalation Assumptions

Description	ENR CCI
ENR CCI (Seattle), January 2010	8645.35

Total Project Cost, 2010 Dollars

Description	Total Costs (Chelan)
3.85-MG Storage Construction Cost (Two 90-Ft-Diameter Caissons) =	\$18,500,000
Diversion Pipe Construction Cost (530 LF of 12-inch-diameter pipe) =	\$470,000
Pressure Pipe Construction Cost (3,270 LF of 36-inch-diameter pipe) =	\$4,200,000
Influent Gravity Sewer Construction Cost (200 LF of 42-inch diameter pipe) =	\$300,000
Force Main Construction Cost (250 LF of 24-inch-diameter pipe) =	\$150,000
Diversion Structure Construction Cost =	\$490,000
Delridge Diversion Structure Construction Cost =	\$490,000
Drain Structure Construction Cost =	\$490,000
Modifications to Harbor Regulator Construction Cost =	\$490,000
Diversion Structure to Storage Construction Cost =	\$490,000
Alki Trunk Modifications Construction Cost =	\$450,000
SDOT Street Use Permit Fee Cost =	\$220,000
Total Construction Cost =	\$26,740,000
Sales Tax (10% of Construction Cost) =	\$2,670,000
¹ Allied Costs (46.07% of Construction Cost) =	\$12,320,000
Property Cost =	\$0
Subtotal of Project Cost =	\$41,730,000
¹ Construction Contingency (10% of Construction Cost) =	\$2,670,000
^{1,2} Project Contingency =	\$9,850,000
Total Project Cost, 2010 Dollars =	\$54,300,000

¹ King County allied costs and contingency used. Allied cost percentage is based on the type of construction and total

²Project Contingency = Total Contingency (30% of Subtotal of Project Costs) - Construction Contingency (10% of Construction Cost)

TWO CAISSONS FOR STORAGE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Storage Facility: Storage Facility

Printed date : 02/01/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

Construction Year: 2010
 Storage Capacity: 3.85 Mgal
 Facility Footprint: 45800 SF
 Land Acquisition: None
 Surface Restoration: Pavement
 Dewatering: Significant
 Construction Method: CastinPlace
 Outflow Operations: Pump
 Odor Control: true

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Surface Restoration	5,090.00	SY	43	219,000
Dewatering	1	LS	1,230,000	1,230,000
Odor Control	1	LS	629,000	\$629,000
Effluent Pump Station	1	LS	288,000	288,000
Construction Cost	3.8	Mgal	4,000,000	15,400,000
			Year 2008 Subtotal	\$17,800,000
Mobilization/Demobilization at 6%		1.06		
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		\$0.98		
Effective Multiplier		1.04		
Construction Year 2010 Subtotal				\$18,500,000

DIVERSION PIPE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Diversion Pipe_12"
 Printed date : 02/01/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 530 ft
- Conduit Type: Gravity
- Depth of Cover: 10 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: Average (500 ft)
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Half Width - Arterial (22 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Special Shoring
- Pipe Diameter: 12 in.

Geometry

Outer Diameter	1.42 ft
Trench Width	4.34 ft
Excavation Depth	12.4 ft
Complete Surface Rest. Width	6.34 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	1,060.00	CY	\$13	\$13,800
Backfill	767.00	CY	\$34	\$26,100
Complete Pavement Restoration	373.00	SY	\$86	\$32,100
Overlay Pavement Restoration	922.00	SY	\$28	\$25,800
Trench Safety	13,200.00	SF	\$17	\$224,000
Spoil Load and Haul	1,060.00	CY	\$16	\$16,900
Pipe Unit Material Cost	530.00	lf	\$17	\$9,010
Pipe Installation	530.00	lf	\$25	\$13,300
Place Pipe Zone Fill	260.00	CY	\$34	\$8,850
Manholes	2	MH	\$8,330	\$16,700
Existing Utilities	530.00	lf	\$32	\$17,000
Dewatering	530.00	lf	\$80	\$42,400
Traffic Control	530.00	lf	\$16	\$8,480
			Year 2008 Subtotal	\$454,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal				\$472,000

Year 2010 Total: \$472,000

PRESSURE PIPE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Pressure Pipe_36"
 Printed date : 02/01/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 3270 ft
- Conduit Type: Gravity
- Depth of Cover: 10 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: None
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Half Width - Arterial (22 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Special Shoring
- Pipe Diameter: 36 in.

Geometry

Outer Diameter	3.67 ft
Trench Width	7.27 ft
Excavation Depth	14.7 ft
Complete Surface Rest. Width	9.27 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	12,900.00	CY	\$13	\$168,000
Backfill	7,920.00	CY	\$34	\$269,000
Complete Pavement Restoration	3,370.00	SY	\$86	\$290,000
Overlay Pavement Restoration	4,630.00	SY	\$28	\$130,000
Trench Safety	95,900.00	SF	\$17	\$1,630,000
Spoil Load and Haul	12,900.00	CY	\$16	\$207,000
Pipe Unit Material Cost	3,270.00	lf	\$77	\$252,000
Pipe Installation	3,270.00	lf	\$45	\$147,000
Place Pipe Zone Fill	3,710.00	CY	\$34	\$126,000
Existing Utilities	3,270.00	lf	\$120	\$392,000
Dewatering	3,270.00	lf	\$107	\$350,000
Traffic Control	3,270.00	lf	\$24	\$78,500
			Year 2008 Subtotal	\$4,040,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal	\$4,200,000			

Year 2010 Total: \$4,200,000

INFLUENT GRAVITY SEWER - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Influent Pipe_42"
 Printed date : 02/02/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 200 ft
- Conduit Type: Gravity
- Depth of Cover: 10 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: Average (500 ft)
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Full Width - Arterial (44 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Special Shoring
- Pipe Diameter: 42 in.

Geometry

Outer Diameter	4.25 ft
Trench Width	8.03 ft
Excavation Depth	15.3 ft
Complete Surface Rest. Width	10 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	907.00	CY	\$13	\$11,800
Backfill	535.00	CY	\$34	\$18,200
Complete Pavement Restoration	223.00	SY	\$86	\$19,200
Overlay Pavement Restoration	755.00	SY	\$28	\$21,100
Trench Safety	6,100.00	SF	\$17	\$104,000
Spoil Load and Haul	907.00	CY	\$16	\$14,500
Pipe Unit Material Cost	200.00	lf	\$86	\$17,200
Pipe Installation	200.00	lf	\$52	\$10,400
Place Pipe Zone Fill	266.00	CY	\$34	\$9,060
Manholes	1	MH	\$9,720	\$9,720
Existing Utilities	200.00	lf	\$120	\$24,000
Dewatering	200.00	lf	\$107	\$21,400
Traffic Control	200.00	lf	\$24	\$4,800
			Year 2008 Subtotal	\$285,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal	\$296,000			

Year 2010 Total: \$296,000

FORCE MAIN - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Forcemain
 Printed date : 02/02/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 250 ft
- Conduit Type: Force Main
- Depth of Cover: 6 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: None
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Half Width - Arterial (22 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Standard
- Pipe Diameter: 24 in.

Geometry

Outer Diameter	2.15 ft
Trench Width	5.3 ft
Excavation Depth	9.15 ft
Complete Surface Rest. Width	7.3 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	449.00	CY	\$13	\$5,830
Backfill	245.00	CY	\$34	\$8,340
Complete Pavement Restoration	203.00	SY	\$86	\$17,400
Overlay Pavement Restoration	408.00	SY	\$28	\$11,400
Trench Safety	4,580.00	SF	\$1	\$2,430
Spoil Load and Haul	449.00	CY	\$16	\$7,180
Pipe Unit Material Cost	250.00	lf	\$114	\$28,500
Pipe Installation	250.00	lf	\$33	\$8,250
Place Pipe Zone Fill	170.00	CY	\$34	\$5,780
Existing Utilities	250.00	lf	\$58	\$14,500
Dewatering	250.00	lf	\$100	\$25,000
Traffic Control	250.00	lf	\$24	\$6,000
			Year 2008 Subtotal	\$141,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal				\$146,000

Year 2010 Total: \$146,000

DIVERSION STRUCTURE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Delridge Diversion Structure

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		0.98		
Construction Year 2010 Subtotal				\$485,000

DELRIDGE DIVERSION STRUCTURE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Delridge Diversion Structure

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		0.98		
Construction Year 2010 Subtotal			\$485,000	

DRAIN STRUCTURE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Drain Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		0.98		
Construction Year 2010 Subtotal				\$485,000

MODIFICATIONS TO HARBOR REGULATOR STATION - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Regulator Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		\$1		
Construction Year 2010 Subtotal			\$485,000	

DIVERSION STRUCTURE TO STORAGE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: West Seattle PS Regulator Structure
 Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010
 Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		0.98		
Construction Year 2010 Subtotal				\$485,000

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ALKI TRUNK MODIFICATIONS

Purpose:

Modifications upstream in the Alki Trunk to control flows and allow only 19 mgd or less to pass through the West Seattle Tunnel and provide capacity for storage of Harbor CSOs. Upgrades require:

- a) Regulator Gate - Sluice gate in Alki Trunk (30" x 42")
- b) Actuator - Explosion-proof actuator with power failure feature to shut closed upon power failure
- c) Flow Meter - Cross-correlation velocity sensor

Unit Costs (Basis 2010)

Item	Quantity	Unit	Unit Cost	Item Cost	Source of Costs
Regulator Gate & Actuator	1	LS	\$150,000	\$150,000	Vendor price quote from Rodney Hunt
Flow Meter	1	LS	\$60,000	\$60,000	Vendor price quote from ADS
Electrical/Instrumentation	1	LS	\$195,000	\$195,000	Lump sum estimate.
Architectural/Structural	1	LS	\$40,000	\$40,000	Lump sum estimate.

Year 2010 Subtotal \$445,000

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PROPERTY AND PERMITTING COSTS

Land and Building Cost, Average Cost per Square Foot (January 2007 to August 2010)

Uncontrolled CSO Basin	Average Cost per Square Foot for Industrial Land and Building (\$/SF)	Average Cost per Square Foot for Industrial Land (\$/SF)
DSN036 Chelan	\$106.94	\$24.12

Land Costs, 2010 Dollars - N/A, located on King County-owned property

SDOT Street Use Permit Fee Assumptions

Construction is located on arterial.

Closure of construction area will occur in phases. Assumed construction phasing in:

Assumed production rate during working days =

For pipe diameters less than or equal to 36 inches, assume half width of road will be closed during construction. Width is based on the half width for arterial pavement restoration in Tabula.

For pipe diameters greater than 36 inches, assume full width of road will be closed during construction. Width is based on the full width for arterial pavement restoration in Tabula.

1,000 ft segments

15 LF/d

22 ft

44 ft

Source of methodology for estimating permit fees: <http://www.seattle.gov/transportation/cams/CAM2115.pdf>

SDOT Street Use Permit Fee Estimation, 2010 Dollars

Description	Diameter of Pipe (in)	Length (ft)	Width of Construction Area (ft)	Estimated Construction Area (SF)	Construction Duration (Calendar Days)	Number of 10-Day Periods	Use Fee (\$/SF)	Estimated Permit Costs
Delridge Diversion Structure	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Drain Structure	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Upgrade to Harbor Regulator Station	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Installation of Diversion Pipe, First Phase of Construction	12	530	22	11,660	49.5	5	\$0.70	\$8,162
Installation of Pressure Pipe, First Phase of Construction	36	1,000	22	22,000	93.3	10	\$2.90	\$63,800
Installation of Pressure Pipe, Second Phase of Construction	36	1,000	22	22,000	93.3	10	\$2.90	\$63,800
Installation of Pressure Pipe, Third Phase of Construction	36	1,000	22	22,000	93.3	10	\$2.90	\$63,800
Installation of Pressure Pipe, Fourth Phase of Construction	36	270	22	5,940	25.2	3	\$0.30	\$1,782

Total SDOT Street Use Fee Estimation: \$220,844

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Operations and Maintenance Cost Estimate Summary

Basin Name: Chelan

Alternative Name: WDUW-Chelan-KC-STOR 2

ENR 1994	5747	Acres of Raingarden for GSI	0.00	
Current ENR	8654.4	Annual Overflow Vol (MG)	17.20	
Power Cost (per kwh)	0.065	Annual Vol Capture	13.10	
Labor rate (loaded) /hr	51.17	Annual Events	25	
SPU Water Cost \$/CCF	4.50	Stor Vol	3.85	
		Peak Flow Rate	38.40	
		Peak Flow Rate w/Equal		
Carbon Cost/Lb	2.00			

Annual Costs

Components	Annual Maintenance & Inspection Cost	Annual Operation Cost	Annual Energy Cost	Annual Chemical Cost
Gravity Sewer/Combined Sewers	\$1,102			
Force Mains	\$127			
Regulator/Flow Control Structures	\$115,376			
Deep/Shallow Tunnels	\$0			
Off-Line Storage Pipes	\$0			
River Outfalls	\$0			
Pump Stations	\$0	\$0	\$0	
Rectangular Storage Facilities	\$102,683	\$53,052	\$28,743	\$72,059
High Rate Treatment	\$0	\$0	\$0	\$0
Additional Secondary Treatment	NA	\$8,604	NA	NA
Green Stormwater Infrastructure	\$0			
Annual Cost Subtotals:	\$219,288	\$61,656	\$28,743	\$72,059
Total Annual O&M				
			\$353,003	
			\$28,743	
			\$381,746	

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WTD BUSINESS CASE EVALUATION RESULTS

CHELAN CSO CONTROL ALTERNATIVES

Lower Bound Discount Rate (WTD Borrowing Cost) (1)

Scenario	Lifetime	Initial Capital Outlay	Total Project Life Costs (2)	Total Project Life Benefits	Net Project Life Costs	Average Project Annual Cost	Annual Costs over(under) Status quo
Alternatives							
2 Chelan Stor 2	50	\$54,300,000	\$70,383,143	\$0	\$70,383,143	\$2,327,545	\$2,327,545

Upper Bound Discount Rate (OMB, Private Rate of Return) (3)

Scenario	Lifetime	Initial Capital Outlay	Total Project Life Costs (2)	Total Project Life Benefits	Net Project Life Costs	Average Project Annual Cost	Annual Costs over(under) Status quo
Alternatives							
2 Chelan Stor 2	50	\$54,300,000	\$47,649,150	\$0	\$47,649,150	\$1,575,740	\$1,575,740

First Year of Construction	2010	Additional inflation rate > 3%	1.00%
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Notes:

- (1) WTD Discount rate based on recent WTD borrowing costs net of 3% annual inflation. 2.18%
 - (2) Costs include risk and uncertainty, if estimated.
 - (3) Discount rate net of inflation, per the King County Budget Office. 7.00%
- The option with the largest net equivalent annualized cost is the financially preferred option.

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Chelan Ave Alternative

DSN036-CON-1 (KC) or WDUW-Chelan-KC-CONV

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DSN036-CON-1 (KC) or WDUW-Chelan-KC-CONV

Alternative DSN036-CON-1 controls King County's Chelan Ave CSOs by transferring flow to the Alki Treatment Facility. This alternative is an independent alternative and only controls King County CSOs.

Design Criteria

- King County Chelan Ave CSO Peak Flow Rate for Sizing Conveyance to Alki Treatment Facility: 25.7 MGD¹
- King County Harbor Ave CSO Peak Flow Rate for Sizing Conveyance to Alki Treatment Facility: 20.3 MGD

Description

Flows from the Chelan Ave CSO Basin would be diverted from the Delridge Trunk and routed to the Harbor Ave Regulator Station and Harbor CSO Pipeline. Combined Chelan Ave and Harbor Ave CSOs would be routed to the Alki Treatment Plant for treatment via the West Seattle Tunnel.

Alternative DSN036-CON-1 (KC) consists of conveyance improvements and upgrades to the 63rd Pump Station, Alki Treatment Facility, and outfall to control King County Chelan Ave CSOs.

The main components of this alternative would include:

- 46-MGD upgrade to 63rd Ave Pump Station.
- 46-MGD upgrade to Alki Treatment Facility
- Two new regulator stations (diversion structures) referred to as the Diversion Structure and Delridge Diversion Structure in Figure G.7-3.
- One drain structure to allow draining of the 36-inch-diameter pressure pipe after wet-weather events when not in use.
- Modifications to the Harbor Ave Regulator Station.
- Approximately 530 ft of 12-inch-diameter pipe to convey flows from Delridge Way SW to the new 36-inch-diameter pressure pipe located parallel to the Delridge Trunk (see Figure G.7-3 for proposed alignment).
- Approximately 3,270 ft of 36-inch-diameter pressure pipe to convey flows from the Delridge Diversion Structure to the Harbor Ave Regulator Station (see Figure G.7-3 for proposed alignment).
- Approximately 1,350 feet of 42-inch-diameter force main pipe to convey 46 MGD from 63rd Ave Pump Station to Alki Treatment Facility.
- Approximately 2,000 ft of 42-inch-diameter outfall pipe

¹ This alternative assumes that flows are diverted upstream of the Chelan Ave Regulator Station along the Delridge Trunk. It has not been confirmed by modeling that diverting from this location would control Chelan Ave CSOs. Refined modeling may indicate an increase in storage volume and conveyance size to control Chelan Ave CSOs.

63rd Ave Pump Station Upgrade

The existing 63rd Ave Pump Station, located at the intersection of SW Spokane St and Beach Dr SW, is rated for an existing pumping capacity of 65 MGD. The 63rd Ave Pump Station transfers flows above base sanitary flows to the Alki Treatment Facility via 24- and 42-inch-diameter force mains. This alternative requires that the pump station be upgraded for an additional 46 MGD to handle Harbor Ave and Chelan Ave CSOs conveyed via the West Seattle Tunnel. This alternative assumes that the pump station upgrades would require new pumps retrofitted within the wet well of the existing pump station, and additional property would not be acquired. A new 42-inch-diameter force main would be required to convey the additional flows to the Alki Treatment Facility.

Alki Treatment Facility Upgrade

Flows to the Alki Treatment Facility are pumped from 63rd Ave Pump Station to the Alki Treatment Facility located at the intersection of Benton Place SW and Beach Drive SW. The current treatment capacity is limited by the hydraulic capacity, which varies between approximately 45 MGD and 67 MGD depending on the tide level. Flows to the Alki Treatment Facility are routed through bar screens and parshall flumes, and then split between the six primary clarifiers. The six primary clarifiers provide settling of the solids, and flows are sent to the chlorine contact tank for disinfection prior to discharge. The primary sedimentation tanks were designed at a surface overflow rate of 3,950 gpd/sf at peak design flows of 65 MGD. This alternative requires that the capacity of the Alki Treatment Facility be increased by 46 MGD to treat Chelan Ave and Harbor Ave CSOs. Modifications to the headworks, primary clarifiers, and chlorine contact tank would be required to accommodate the additional flows. This alternative assumes that the upgrades will occur within the existing footprint of the Alki Treatment Facility, and additional property would not be acquired.

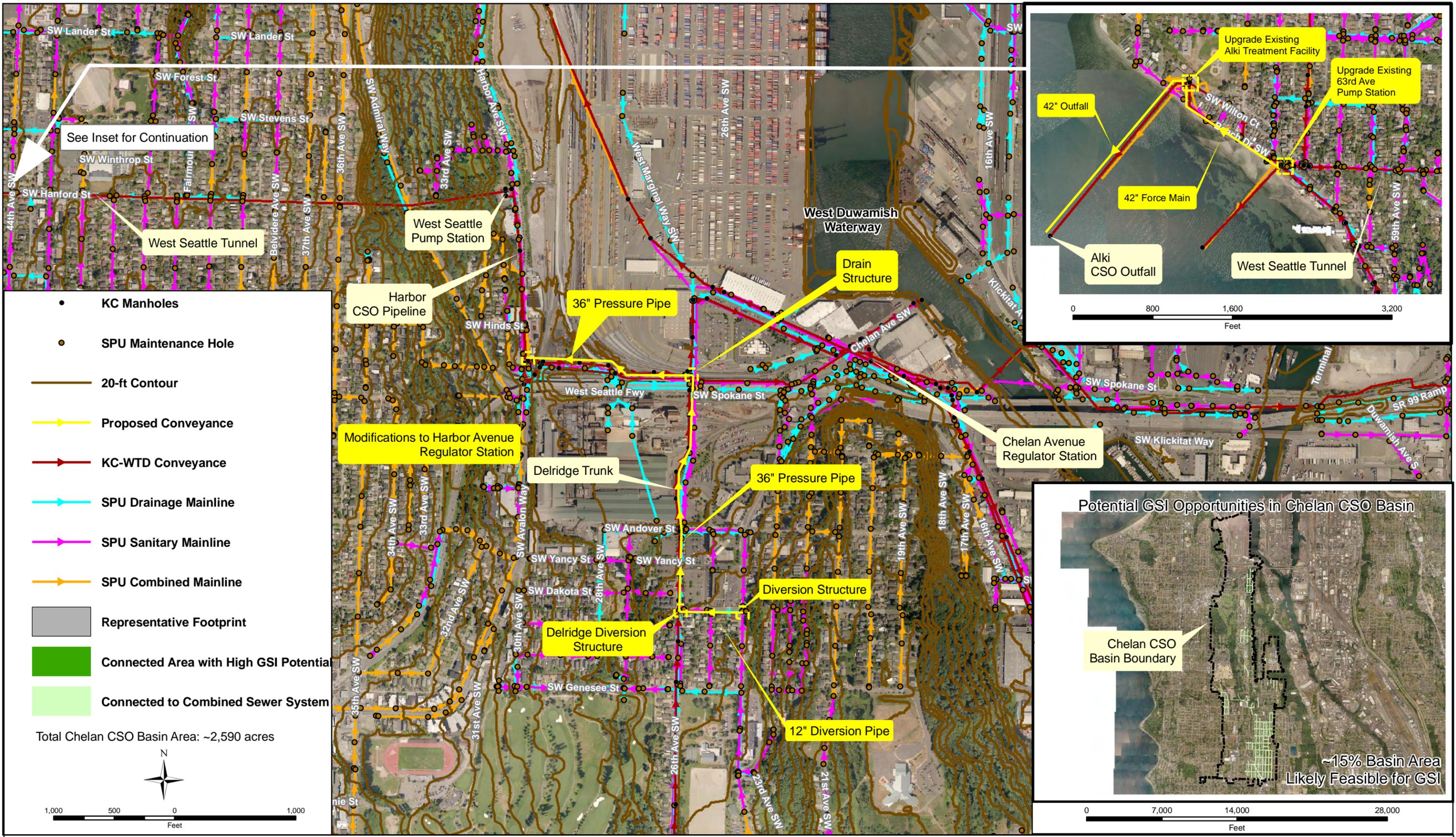
Treated CSO effluent from the Alki Treatment Facility would be conveyed via a new outfall to Puget Sound. For planning purposes, the new outfall would be approximately 2,000 feet long and 42 inches in diameter to match the capacity of the existing outfall.

Flow Diversion and Discharge

Three regulator stations, along with approximately 530 ft of 12-inch-diameter pipe and 3,270 ft of 36-inch-diameter pressure pipe, will be required to divert King County flows (Chelan Ave CSOs) from the Delridge Trunk and existing sanitary sewer on Delridge Way SW to the Harbor CSO Pipeline at the Harbor Ave Regulator Station during wet-weather events as shown in Figure G.7-3. A new drain structure will also be required on the pressure pipe near the intersection of the Delridge Trunk and SW Spokane St to allow the pressure pipe to be drained after a wet-weather event when not in use. Chelan Ave and Harbor Ave CSOs would then be conveyed to the West Seattle Tunnel via the existing Harbor CSO Pipeline. Diverted King County flow would discharge to the 63rd Ave Pump Station where flows would be conveyed to the Alki Treatment Facility.

Construction Assumptions

King County's Tabula cost estimating program was used to develop a Class 5 estimate for this alternative. The attached documentation lists the construction assumptions used.

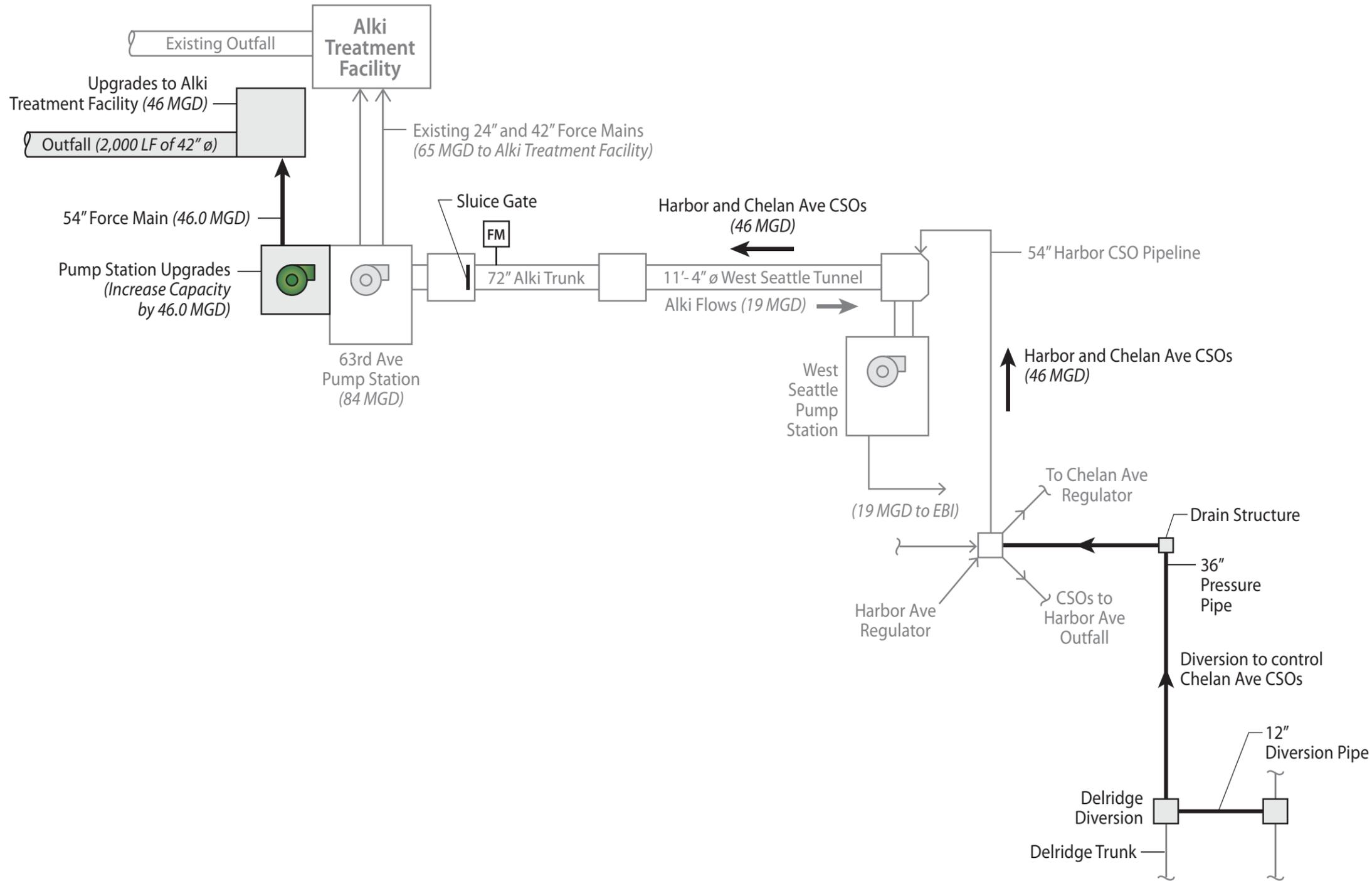


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File Name:
Data Source:

TRANSFER FLOWS TO ALKI TREATMENT PLANT

DSN036-CON-1 (KC), PROPOSED IMPROVEMENTS AND FLOW SCHEMATIC DIAGRAM



Legend

- Existing Conveyance
- New Conveyance
- Diversion Structure
- ⊙ Pump Station
- FM Flow Meter

Alternative DSN036-CON-1 (KC)

Escalation Assumptions

Description	ENR CCI
ENR CCI (Seattle), January 2010	8645.35

Total Project Cost, 2010 Dollars

Description	Total Costs (Chelan)
46-MGD Upgrade to 63rd Pump Station Construction Cost =	\$15,200,000
³ Upgrade to Alki Treatment Plant Construction Cost (Additional 46-MGD Capacity)=	\$13,800,000
Diversion Pipe Construction Cost (530 LF of 12-inch-diameter pipe) =	\$470,000
Pressure Pipe Construction Cost (3,270 LF of 36-inch-diameter pipe) =	\$4,200,000
Force Main Construction Cost (1,350 LF of 42-inch-diameter pipe) =	\$1,380,000
Diversion Structure Construction Cost =	\$490,000
Delridge Diversion Structure Construction Cost =	\$490,000
Drain Structure Construction Cost =	\$490,000
Modifications to Harbor Ave Regulator Construction Cost =	\$490,000
⁴ Outfall Construction Cost 2000 LF of 42-inch-diameter pipe) =	\$5,040,000
SDOT Street Use Permit Fee Cost =	\$370,000
Total Construction Cost =	\$42,420,000
Sales Tax (10% of Construction Cost) =	\$4,240,000
¹ Allied Costs (46.07% of Construction Cost) =	\$19,540,000
Property Costs =	\$0
Subtotal of Project Costs =	\$66,200,000
¹ Construction Contingency (10% of Construction Cost) =	\$4,240,000
^{1,2} Project Contingency =	\$15,620,000
Total Project Cost, 2010 Dollars =	\$86,100,000

¹ King County allied costs and contingency used. Allied cost percentage is based on the type of construction and total construction cost.

²Project Contingency = Total Contingency (30% of Subtotal of Project Costs) - Construction Contingency (10% of Construction Cost)

³CSO Treatment Upgrade Costs: Assume \$0.30/gpd

⁴Placeholder Costs for CSO Outfall: Assume new CSO outfall at \$60/in/LF.

UPGRADE TO 63RD PUMP STATION - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pump Station: 63rd Pump Station

Printed date : 01/31/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010
 Capacity: 46 mgd
 Total Dynamic Head: 50 ft
 Excavation Depth: 40 ft

Calculated Parameters

Required Pump Power	792 Hp
Base Architectural/Structural Unit Cost	127,000.00 \$/mgd
Architectural/Structural Unit Cost Adjustment	89,100 \$/mgd
Base Mechanical Unit Cost	51,300 \$/mgd
Mechanical Unit Cost Adjustment	-15,400.00 \$/mgd

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil		1 LS	2,430,000	\$2,430,000
Electrical/Instrumentation		1 LS	1,500,000	\$1,500,000
Architectural/Structural		46 mgd	217,000	\$9,960,000
Mechanical		46 mgd	35,900	\$1,650,000
			Year 2008 Subtotal	\$15,500,000

Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98
Effective Multiplier	0.98

Construction Year 2010 Subtotal	\$15,200,000
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DIVERSION PIPE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Diversion Pipe_12"
 Printed date : 02/01/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 530 ft
- Conduit Type: Gravity
- Depth of Cover: 10 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: Average (500 ft)
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Half Width - Arterial (22 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Special Shoring
- Pipe Diameter: 12 in.

Geometry

Outer Diameter	1.42 ft
Trench Width	4.34 ft
Excavation Depth	12.4 ft
Complete Surface Rest. Width	6.34 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	1,060.00	CY	\$13	\$13,800
Backfill	767.00	CY	\$34	\$26,100
Complete Pavement Restoration	373.00	SY	\$86	\$32,100
Overlay Pavement Restoration	922.00	SY	\$28	\$25,800
Trench Safety	13,200.00	SF	\$17	\$224,000
Spoil Load and Haul	1,060.00	CY	\$16	\$16,900
Pipe Unit Material Cost	530.00	lf	\$17	\$9,010
Pipe Installation	530.00	lf	\$25	\$13,300
Place Pipe Zone Fill	260.00	CY	\$34	\$8,850
Manholes	2	MH	\$8,330	\$16,700
Existing Utilities	530.00	lf	\$32	\$17,000
Dewatering	530.00	lf	\$80	\$42,400
Traffic Control	530.00	lf	\$16	\$8,480
			Year 2008 Subtotal	\$454,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal			\$472,000	

Year 2010 Total: \$472,000

PRESSURE PIPE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Pressure Pipe_36"
 Printed date : 02/01/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 3270 ft
- Conduit Type: Gravity
- Depth of Cover: 10 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: None
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Half Width - Arterial (22 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Special Shoring
- Pipe Diameter: 36 in.

Geometry

Outer Diameter	3.67 ft
Trench Width	7.27 ft
Excavation Depth	14.7 ft
Complete Surface Rest. Width	9.27 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	12,900.00	CY	\$13	\$168,000
Backfill	7,920.00	CY	\$34	\$269,000
Complete Pavement Restoration	3,370.00	SY	\$86	\$290,000
Overlay Pavement Restoration	4,630.00	SY	\$28	\$130,000
Trench Safety	95,900.00	SF	\$17	\$1,630,000
Spoil Load and Haul	12,900.00	CY	\$16	\$207,000
Pipe Unit Material Cost	3,270.00	lf	\$77	\$252,000
Pipe Installation	3,270.00	lf	\$45	\$147,000
Place Pipe Zone Fill	3,710.00	CY	\$34	\$126,000
Existing Utilities	3,270.00	lf	\$120	\$392,000
Dewatering	3,270.00	lf	\$107	\$350,000
Traffic Control	3,270.00	lf	\$24	\$78,500
			Year 2008 Subtotal	\$4,040,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal	\$4,200,000			

Year 2010 Total: \$4,200,000

FORCE MAIN - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Pipe: Forcemain
 Printed date : 02/15/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.).

Assumptions

- Construction Year: 2010
- Length: 1350 ft
- Conduit Type: Force Main
- Depth of Cover: 6 ft
- Trench Backfill Type: Imported
- Disposal Type: No Disposal Cost
- Manhole Spacing: None
- Existing Utilities: Complex
- Dewatering: Significant
- Pavement Restoration: Full Width - Arterial (44 ft)
- Traffic: Heavy
- Land Acquisition: None
- Required Easements: None
- Land Adjustment Factor: Seattle
- Trench Safety: Standard
- Pipe Diameter: 42 in.

Geometry

Outer Diameter	3.71 ft
Trench Width	7.32 ft
Excavation Depth	10.7 ft
Complete Surface Rest. Width	9.32 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Excavation	3,920.00	CY	\$13	\$51,000
Backfill	1,830.00	CY	\$34	\$62,200
Complete Pavement Restoration	1,400.00	SY	\$86	\$120,000
Overlay Pavement Restoration	5,200.00	SY	\$28	\$146,000
Trench Safety	28,900.00	SF	\$1	\$15,300
Spoil Load and Haul	3,920.00	CY	\$16	\$62,700
Pipe Unit Material Cost	1,350.00	lf	\$300	\$405,000
Pipe Installation	1,350.00	lf	\$52	\$70,200
Place Pipe Zone Fill	1,550.00	CY	\$34	\$52,700
Existing Utilities	1,350.00	lf	\$120	\$162,000
Dewatering	1,350.00	lf	\$107	\$144,000
Traffic Control	1,350.00	lf	\$24	\$32,400
			Year 2008 Subtotal	\$1,320,000
Mobilization/Demobilization at 6%	1.06			
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)	0.98			
Effective Multiplier	1.04			
Construction Year 2010 Subtotal	\$1,380,000			

Year 2010 Total: \$1,380,000

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DIVERSION STRUCTURE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Regulator Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		\$1		
Construction Year 2010 Subtotal				\$485,000

DELRIDGE DIVERSION STRUCTURE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Regulator Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		\$1		
Construction Year 2010 Subtotal				\$485,000

DRAIN STRUCTURE - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Drain Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		\$1		
Construction Year 2010 Subtotal				\$485,000

UPGRADE TO HARBOR AVE REGULATOR - OUTPUT FROM TABULA 3.1.2

Cost Calculations for Regulator Station: Regulator Station

Printed date : 01/04/2011

Project year: 2010

The estimated construction cost below, which includes contractor overhead and profit, is for planning purposes only. The output does NOT include contingency, sales tax, or allied costs (design, permitting, construction management, etc.). Unless added as an Additional Costs item in the estimate, this cost does NOT include land acquisition costs.

Assumptions

Construction Year: 2010

Excavation Depth: 30 ft

Unit Costs (Basis 2008)

Item	Quantity	Unit	Unit Cost	Item Cost
Site/Civil	1	LS	180,000	180,000
Electrical/Instrumentation	1	LS	195,000	195,000
Architectural/Structural	1	LS	40,000	\$40,000
Mechanical	1	LS	80,000	80,000
			Year 2008 Subtotal	\$495,000
Multiplier from ENRCCI 8815 (2008) to 8645 (2010)		0.98		
Effective Multiplier		\$1		
Construction Year 2010 Subtotal				\$485,000

PROPERTY AND PERMITTING COSTS

Land and Building Cost, Average Cost per Square Foot (January 2007 to August 2010)

Uncontrolled CSO Basin	Average Cost per Square Foot for Industrial Land and Building (\$/SF)	Average Cost per Square Foot for Industrial Land (\$/SF)
DSN036 Chelan Regulator	\$106.94	\$24.12

Land Costs - N/A, located on King County-owned property

SDOT Street Use Permit Fee Assumptions

Construction is located on arterial.

Closure of construction area will occur in phases. Assumed construction phasing in:

Assumed production rate during working days =

For pipe diameters less than or equal to 36 inches, assume half width of road will be closed during construction. Width is based on the half width for

For pipe diameters greater than 36 inches, assume full width of road will be closed during construction. Width is based on the full width for arterial

1,000 ft segments

15 LF/d

22 ft

44 ft

Source of methodology for estimating permit fees: <http://www.seattle.gov/transportation/cams/CAM2115.pdf>

SDOT Street Use Permit Fee Estimation, 2010 Dollars

Description	Diameter of Pipe (in)	Length (ft)	Width of Construction Area (ft)	Estimated Construction Area (SF)	Construction Duration (Calendar Days)	Number of 10-Day Periods	Use Fee (\$/SF)	Estimated Permit Costs
Diversion Structure	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Delridge Diversion Structure	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Drain Structure	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Upgrade to Harbor Ave Regulator Station	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Upgrade to 63rd Pump Station	NA	NA	NA	5,000	60.2	7	\$1.30	\$6,500
Installation of Diversion Pipe	12	530	22	11,660	49.5	5	\$0.70	\$8,162
Installation of Pressure Pipe, First Phase of Construction	36	1,000	22	22,000	93.3	10	\$2.90	\$63,800
Installation of Pressure Pipe, Second Phase of Construction	36	1,000	22	22,000	93.3	10	\$2.90	\$63,800
Installation of Pressure Pipe, Third Phase of Construction	36	1,000	22	22,000	93.3	10	\$2.90	\$63,800
Installation of Pressure Pipe, Fourth Phase of Construction	36	270	22	5,940	25.2	3	\$0.30	\$1,782
Installation of Force Main, First Phase of Construction	42	1,000	44	44,000	93.3	10	\$2.90	\$127,600
Installation of Force Main, Second Phase of Construction	42	350	44	15,400	32.7	4	\$0.50	\$7,700
Total SDOT Street Use Fee Estimation:								\$369,144

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Operations and Maintenance Cost Estimate Summary

Basin Name: Chelan

Alternative Name:

WDUW-Chelan-KC-CONV (Convey to Alki)

		<i>Acres of</i>			
		<i>Raingarden for</i>			
		<i>GSI</i>		0.00	
<i>ENR 1994</i>	5747	<i>Annual Overflow</i>			
<i>Current ENR</i>	8654.4	<i>Vol (MG)</i>		161.20	
<i>Power Cost (per kwh)</i>	0.065	<i>Annual Vol Capture</i>		48.10	
<i>Labor rate (loaded) /hr</i>	51.17	<i>Annual Events</i>		61	
<i>SPU Water Cost \$/CCF</i>	4.50	<i>Stor Vol</i>		0.00	
		<i>Peak Flow Rate</i>		151.30	
		<i>Peak Flow Rate</i>			
		<i>w/Equal</i>			
<i>Carbon Cost/Lb</i>	2.00				

Annual Costs

Components	Annual Maintenance & Inspection Cost	Annual Operation Cost	Annual Energy Cost	Annual Chemical Cost
Gravity Sewer/Combined Sewers	\$800			
Force Mains	\$166			
Regulator/Flow Control Structures	\$115,376			
Deep/Shallow Tunnels	\$0			
Off-Line Storage Pipes	\$0			
River Outfalls	\$0			
Pump Stations	\$0	\$0	\$0	
Rectangular Storage Facilities	\$0	\$0	\$0	\$0
Additional Treatment at Alki*		\$486,002		
High Rate Treatment	\$0	\$0	\$0	\$0
Additional Secondary Treatment	NA	\$4,164	NA	NA
Green Stormwater Infrastructure	\$0			
Annual Cost Subtotals:	\$116,343	\$490,167	\$0	\$0
Total Annual O&M				
	General		\$606,509	
	Energy		\$0	
	Total		\$606,509	

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WTD BUSINESS CASE EVALUATION RESULTS

CHELAN CSO CONTROL ALTERNATIVES

Lower Bound Discount Rate (WTD Borrowing Cost) (1)

Scenario	Lifetime	Initial Capital Outlay	Total Project Life Costs (2)	Total Project Life Benefits	Net Project Life Costs	Average Project Annual Cost	Annual Costs over(under) Status quo
Alternatives							
3 Convey to WSEA Tunnel	50	\$86,100,000	\$111,666,407	\$0	\$111,666,407	\$3,692,767	\$3,692,767

Upper Bound Discount Rate (OMB, Private Rate of Return) (3)

Scenario	Lifetime	Initial Capital Outlay	Total Project Life Costs (2)	Total Project Life Benefits	Net Project Life Costs	Average Project Annual Cost	Annual Costs over(under) Status quo
Alternatives							
3 Convey to WSEA Tunnel	50	\$86,100,000	\$75,572,369	\$0	\$75,572,369	\$2,499,151	\$2,499,151

First Year of Construction	2010	Additional inflation rate > 3%	1.00%
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Notes:

- (1) WTD Discount rate based on recent WTD borrowing costs net of 3% annual inflation. 2.18%
 - (2) Costs include risk and uncertainty, if estimated.
 - (3) Discount rate net of inflation, per the King County Budget Office. 7.00%
- The option with the largest net equivalent annualized cost is the financially preferred option.

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