# Evans Creek Tributary 108 Basin-Wide Retrofitting Vault on Northeast 76th Place near 208th Avenue Northeast

# Grant No. G1400026

## 2009 King County Surface Water Design Manual
## Preliminary Technical Information Report


**Prepared By:**

**Scott Miller and Dale Nelson, Engineers**
**Stormwater Services Section**

**Reviewed By:**

**Rachel Berryessa, P.E.**
**Stormwater Services Section**
**Capital Projects Unit**

**Approved By:**

**Claire Jonson, Project Manager, P.E.**
**Stormwater Services Section**
**Capital Projects Unit**



**December 2014**

# SECTION I: PROJECT OVERVIEW

## Project Description

Theproject proposes to install a stormwater detention vault in a suburban neighborhood where no stormwater controls presently exist.

The Ecology Stormwater Grant G1400026 funded the systematic design approach of basin wide stormwater controls in Evans Creek Tributary 108. This suburban basin within the Bear-Evans Creek watershed was selected because stream health in the basin has been degraded by development, but not to the point that restoration is impossible or improbable.

Basin wide stormwater facilities were sized based on the Ecology 8% Proposed Standard (ECY08) design scenario described in *The Stormwater Retrofit Analysis and Recommendations for Juanita Creek Basin in the Lake Washington Watershed*[1]. This design scenario uses bioretention facilities sized per the *2009 King County Surface Water Design Manual* (KCSWDM), to handle 80 percent of runoff from impervious surfaces. Overflow from the bioretention facilities along with all runoff from the remaining impervious and pervious surfaces is then routed through stormwater detention facilities.

The delineation of subbasins in the Evans Creek Tributary 108 basin and the potential volumes of stormwater facilities in the basin wide retrofit were described in an email dated January 16, 2014 to Doug Howie, Ecology Engineer. The preliminary facility sizing was based on unit volumes developed for Appendix F of the Juanita Creek study.[1] Items sent to Doug Howie in a technical memorandum dated October 13, 2014 include methods of site prioritization for facility construction; a map of the modeled system design, which shows the location of all retrofits facilities and Low Impact Development Best Management Practices; and a spreadsheet summarizing the design specifics and planning level project costs for each site.

The project proposed in this preliminary technical information report is one of three vaults that were the highest priority and most feasible in the site prioritization.

The vault is proposed in existing right of way. The detention vault dimensions are 20.1 feet long x 50.2 feet wide x 5 feet deep. The impervious area footprint of the vault is 1,009 square feet.

[1] http://www.kingcounty.gov/environment/watersheds/cedar-river-lake-wa/documents/juanita-creek-stormwater-retrofit.aspx

## Project Location

The project is sited on Northeast 76th Place near 208th Avenue Northeast, in between house addresses 20620 and 20626 on NE 76th Place. Refer to Appendix A for a map. Construction work will be contained within the right of way. The impervious area footprint of the vault is 1,009 square feet. The project is within unincorporated King County, near Redmond, Washington.

Tributary 108 is considered an "F" type stream (formerly type 2 or 3), by the Washington State Department of Natural Resources. This classification is assigned to "streams and water bodies that are known to be used by fish, or meet the physical criteria to be potentially used by fish. Fish streams may or may not have flowing water all year; they may be perennial or seasonal" (WAC-222-16-030 2001). There are no critical areas on or near the site.

### Pre-developed Conditions

The road in between house addresses 20620 and 20626 on NE 76th Place is an existing paved right of way with minimal utilities. The existing drainage system is composed of curb and gutter, catch basins and a pipe system that discharges to surface in a ravine. The existing drainage system in the right-of-way is in good condition. Conveyance through an easement on private property has not been inspected. See Appendix B for the record drawings for this subdivision.

The site is within an area considered by the 2009 King County Surface Water Design Manual as a Basic Water Quality Treatment Area and as a Conservation Flow Control Area.

The Natural Resources Conservation Service mapped the project site as Everett gravelly sandy loam 5 to 15 percent slopes. Inclusions also make up as much as 15 percent of this type of soil map unit, including Norma, Bellingham, Tukwila, and Shalcar soils, all of which are poorly drained.

### Developed Conditions

The detention vault dimensions are 50.1 feet long x 20.2 feet wide x 5 feet deep. The impervious area footprint of the vault is 1,009 square feet. Drainage discharge from the project will remain to be directed to surface in a ravine. Refer to Appendix C for engineering plans

# SECTION II: CONDITIONS AND REQUIREMENTS SUMMARY

This section will address the requirements set forth by King County's 2009 Surface Water Management Design Manual (KCSWDM) Core and Special Requirements listed in Chapter 1 for Targeted Drainage Review. The project is a retrofit project that results in less than 2,000 square feet of replaced impervious surface and is proposing to construct or modify a drainage pipe that is 12 inches or larger. SWDM Section 1.1.2.2, Targeted drainage review project category #2 applies to this project.

## Core Requirements

**Core Requirement #1 Discharge at the natural location (1.2.1):** The proposed stormwater detention vault would be installed in-line with the existing stormwater conveyance system, and the discharge location will not be changed.

**Core Requirement #2 Offsite Analysis (1.2.2):** Analysis is addressed in the Offsite Analysis Section III. A downstream qualitative analyses of the project was conducted.

**Core Requirement #4 Conveyance System (1.2.4):** Design and analysis is addressed in Section V.

**Core Requirement #5 Erosion and Sedimentation Control Plan (1.2.5):** The project will need to construct a series of sediment controls related to specific conditions on the site.

**Core Requirement #6 Maintenance and Operations (1.2.6):** This is a drainage improvement project within the public right-of-way in unincorporated King County. King County will assume maintenance of all drainage facilities and systems.

**Core Requirement #7 Financial Guarantees and Liability (1.2.7):** Not applicable because King County is responsible for construction of the drainage project.

## Special Requirements

**Special Requirement #4 Source Control (1.3.4):** Not applicable because this project does not require a commercial building or commercial site development permit.

## Critical Areas Ordinance Requirements

1. **Wetlands:** Not applicable because the project is not located within or adjacent to wetlands. Wetland indicators are absent from the site.
2. **Streams and Flood Hazard Areas:** The pipe that conveys stormwater north from the project site discharges near a stream. This pipe may need to be lowered to match vault design, pending survey results. The project is otherwise not located within or adjacent to a Stream and Flood Hazard area.

3. **Erosion Hazard Areas:** The project is not located within or adjacent to an erosion hazard area.
4. **Landslide Hazard Areas:** The project is not located within or adjacent to a landslide area.
5. **Seismic Hazard Areas:** The project is not located within or adjacent to a seismic area.
6. **Coal Mine Hazard Areas:** The project is not located within or adjacent to a coal mine area.

All applicable core and special requirements from the 2009 KCSWDM have been complied with. Exemptions and exceptions regarding flow control and water quality treatment for the site are discussed in the "Flow Control and Water Quality Facility Analysis and Design" Section. IV.

# SECTION III: OFFSITE ANALYSIS

This section identifies the tributary basin areas downstream of the project site and evaluates the downstream drainage system problems. The intent of this section is to demonstrate that the proposed project will not create new drainage problems.

## Basin Downstream Information

There is one project threshold drainage basin within the project limits. See Appendix D for the drainage basin area that contributes to the detention vault. The road in between house addresses 20620 and 20626 on NE 76th Place is an existing paved right of way with minimal utilities.. The existing drainage system is composed of curb and gutter, catch basins and a pipe system that discharges to surface in a ravine. The existing drainage system in the right-of-way is in good condition. Conveyance through an easement on private property has not been inspected.

## Resource Review

The following documents and resources were reviewed and researched for existing and/or potential drainage problems. The findings of each are listed as follows:

1. FEMA maps indicated that the project is not within a Federal Emergency Management Agency (FEMA)-designated floodplain.
2. The project drains to Evans Creek Tributary 108, considered an "F" type stream (formerly type 2 or 3), by the Washington State Department of Natural Resources.
3. Analysis of King County Drainage Service Section complaints revealed no significant flooding or erosion problems in the ¼ mile downstream path.

## Field Inspection

A field inspection for drainage and erosion problems revealed no drainage or erosion problems within ¼ mile downstream of the site.

# SECTION IV: FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

## Basin Description-Existing and Developed Site Hydrology

There is one project threshold drainage basin within the project limits. See Appendix D for the drainage basin area that contributes to the detention vault. Existing and Developed drainage basin is the same.

This project will replace existing impervious surface during installation of a detention vault. No new impervious surface will be added.

## Flow Control

The retrofit project is in the Evans Creek drainage basin and within an area considered by the 2009 King County Surface Water Design Manual (KCSWDM) as a Conservation Flow Control Area. This retrofit project does not require Flow Control because it results in less than 2,000 square feet of replaced impervious. This retrofit project is installation of a new stormwater detention vault where none currently exists.

Flow control for this project was sized to meet Minimum Requirements in the 2012 Washington Department of Ecology Stormwater Management Manual for Western Washington (SMMWW). Minimum Requirements No. 5 and No. 7 were applied to detention sizing, matching mitigated flow durations to flows from 8 percent of the predeveloped 2-year flow to 100 percent of the predeveloped 50-year flow.

The Western Washington Continuous Simulation Hydrology Model (WWHM) was used to match duration curves. The predeveloped land segments used in the model are shown in Table 1.

**Table 1. Predeveloped land segments.**

| Regional Calibration Segment Type | Acreage |
|---|---|
| Till Forest 0% to 5% slope | 0.74645 |
| Till Forest 5% to 15% slope | 0.66501 |
| Till Forest, greater than 15% slope | 0.04701 |
| Total | 1.45847 |

In the mitigated developed condition, the drainage basin that drains to this facility is assumed to implement low impact development best management practices (LID BMPs). Soil amendments per SMMWW BMP T5.13, Post-Construction Soil Quality and Depth, are assumed to be applied

to residential landscaping, and these areas are modeled as pasture per guidance in Appendix III-C of the SMMWW.

Eighty percent of the runoff from impervious surface in the basin is assumed to be routed through a bioretention facility sized per the KCSWDM. The hydrologic simulation model – FORTRAN (HSPF) was used to generate a flow time series for inflows to the detention vault. With the exception of the WWHM parameters for pasture, parameters from the US Geological Survey (USGS) Regional Calibration for HSPF were used for the developed condition modeling. HSPF was used for its capability to model the entire Evans Creek Tributary 108 complex of subwatersheds. Mitigated developed land segments used for the project catchment are shown in Table 2.

**Table 2. Developed land segments.**

| Regional Calibration Segment Type | Acreage |
|---|---|
| Till Forest 0% to 5% slope | 0.00214 |
| Till Forest 5% to 15% slope | 0.00793 |
| Till Forest, greater than 15% slope | 0.00000 |
| Till Pasture 0% to 5% slope | 0.37869 |
| Till Pasture 5% to 15% slope | 0.34961 |
| Till Pasture, greater than 15% slope | 0.04290 |
| Impervious | 0.67719 |
| Total | 1.45847 |

The HSPF model consisted of these land segments with 80 percent of the impervious runoff passing through a 0.21 acre bioretention facility sized per KCSWDM standards to accommodate 3 inches of the impervious runoff while infiltrating a at rate of 0.18 inches/hour in disturbed till soil. Overflows from the bioretention facility were routed with runoff from the pervious land and from the rest of the impervious land to an output time series. This time series was used in WWHM along with the predeveloped land segment acreages to optimize the size of the stormwater detention vault.

Modeled peak inflows to the detention vault are shown in Table 3. These flow rates reflect reduced runoff due to infiltration in bioretention facilities. The result of the WWHM retrofit detention vault sizing can be found in Appendix E.

**Table 3. Peak inflows to detention vault.**

| Recurrence Interval (yr) | Inflow rate (cfs) |
|---|---|
| 2 | 0.065 |
| 5 | 0.096 |
| 10 | 0.120 |
| 25 | 0.153 |
| 50 | 0.179 |
| 100 | 0.207 |

## Water Quality

The retrofit project is in the Evans Creek drainage basin and within an area considered by the 2009 King County Surface Water Design Manual (KCSWDM) as a as a Basic Water Quality Treatment Area. This retrofit project does not require Water Quality because it results in less than 2,000 square feet of replaced impervious surface.

# SECTION V: CONVEYANCE SYSTEM ANALYSIS AND DESIGN

The existing drainage system is shown in the Record Drawings as Appendix B. The retrofit detention vault will be placed to convey flows and match to the existing drainage system.

# SECTION VI: SPECIAL REPORTS AND STUDIES

Critical areas within, adjacent to, or affected by a project require a special study unless there is a substantial showing that the project will not affect the area contrary to the goals of Critical Areas Ordinance 9614 [8(5)] and the Environmentally Critical Areas Code (KCC 21A.24).

The project is not within critical areas and is not proposing to affect a critical area.

# SECTION VII: OTHER PERMITS

This will require the following permit.

1. **Clearing and Grading Permit** from the King County Department of Permitting and Environmental Review is required for work that includes clearing and removal of vegetation, excavation, grading, and earthwork construction.
2. **Right of Way Special Use Permit** from the King County Department of Transportation is required for working in the right of way.

# SECTION VIII: CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN ANALYSIS AND DESIGN

## Erosion and Sediment Control Analysis and Design (Part A)

The intent of the Erosion and Sedimentation Control (ESC) Plan is to minimize, to the maximum extent possible, the transport of sediment from the project site downstream to Evans Creek or any adjacent properties. The project proposes to implement all appropriate and necessary measures to minimize the extent and duration of erosion and sediment transport. ESC measures will be inspected and monitored to ensure continued performance of their intended function. Facilities and measures shall be maintained and repaired as needed.

Erosion and sediment control measures were chosen to fit the proposed condition and topography of the site. The area of the project site is a paved subdivision road.

ESC measures within the project site were chosen to emphasize erosion control rather than treatment of sediment.

### *Erosion and Sediment Control Standard Measures*

The following measures were selected to fit the site conditions. Selection was based on meeting the criteria set forth in the 2009 King County *Surface Water Design Manual*, Appendix D (Erosion and Sediment Control Standards). During construction, ESC plans will be revised as necessary to address changing site conditions so as to maintain the minimal extent and duration of erosion and sediment transport.

1. **Clearing Limits:** Prior to any land-disturbing activities, including clearing or grading, all clearing limits, critical areas and their buffers, and trees that are to be preserved within the construction area will be clearly marked with the use of plastic, metal, or stake wire fencing. The project also proposes to phase land-disturbing activities and work progressively from section to section, rather than clearing and grubbing the entire length of the project.
2. **Cover Measures:** Temporary and permanent cover measures will be used to protect disturbed areas that are to remain unworked for more than 7 days during the dry season and 12 hours during the wet season. The use of mulch and plastic will be extensive in that they are temporary protective devices where the intent is to minimize the extent and duration of such areas exposed. Cleared areas will be revegetated as soon as practical after grading.
3. **Perimeter Protection:** The project will install silt fencing and other types of perimeter protection measures around the site so as to minimize, to the maximum extent possible, the transport of sediment from the project site downstream to Evans Creek or any adjacent properties.

4. **Traffic Area Stabilization:** The unsurfaced entrances and roads shall be stabilized by construction of a stabilized construction entrance.
5. **Sediment Retention:** Within the project site, the chosen methods focus on collecting and conveying sediment-laden runoff to treatment facilities. The project also proposes to use filter fabric protection on storm drain inlets in support of the treatment facilities.
6. **Surface Water Controls:** At the perimeter of the site, drainage areas will be treated with perimeter protection measures.
7. **Wet Season Requirements:** Temporary and permanent cover measures will be used to protect disturbed areas that are to remain un-worked for more than 12 hours during the wet season. The wet season is from October 1 to April 30.
8. **Critical Areas Restrictions:** Critical areas and their buffers, and trees that are to be preserved within the construction area will be delineated and clearly marked with the use of plastic, metal, or stake wire fencing.
9. **Dust Control:** Water is to be used when a traffic hazard may be created or when wind-transported sediment is likely to be deposited in Evans Creek. Care will be taken to ensure that runoff will not be generated.

## Stormwater Pollution Prevention and Spill Plan Design (Part B)

The intent of the Stormwater Pollution Prevention and Spill (SWPPS) Plan is to identify, to the maximum extent possible, activities that could contribute pollutants to surface and storm water, Evans Creek and any adjacent properties during construction. The project proposes to implement all appropriate and necessary measures to minimize the potential of pollutants to surface and stormwater. SWPPS Plan measures will be monitored to ensure continued performance of their intended function. Activities measured shall be maintained and revised as needed to address changing site conditions.

### *Stormwater Pollution Prevention and Spill Activity Measures*

The following activities are typically associated with construction and are addressed to the maximum extent possible herein. The bid-winning contractor will be required to develop a more in-depth SWPPS that is specific to his/her construction method or procedures and equipment. During construction, SWPPS plans will be revised as necessary to address changing site conditions so as to maintain the minimal contribution of pollutants.

1. **Storage and Handling of Liquids:** The Contractor will identify liquids he/she and his subcontractors will or intend to handle or store on the site.
2. **Storage and Stockpiling of Construction Materials and Wastes:** The Contractor will identify construction materials stockpiled and wastes that may be generated on-site. This will include the type of cover measure used to keep rainwater from contacting the materials and wastes.
3. **Fueling**: The Contractor will specify method of onsite fueling and provide a descriptive of containment methods for fuel spills.

4. **Maintenance, Repairs, and Storage of Vehicles and Equipment:** It is not anticipated that the Contractor will have maintenance and repair area. In any event of equipment failure that raises the potential of pollutant contamination, methods for containment will be employed.
5. **Concrete Saw Cutting, Slurry, and Washwater Disposal:** No truck washouts will be located in critical delineated and marked areas.
6. **Handling of pH Elevated Water:** The Contractor will provide details for treating and neutralizing water.
7. **Application of Chemicals, including Pesticides and Fertilizers:** The Contractor will provide a list of chemicals that will be used or stored on the site.

# SECTION IX: BOND, QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

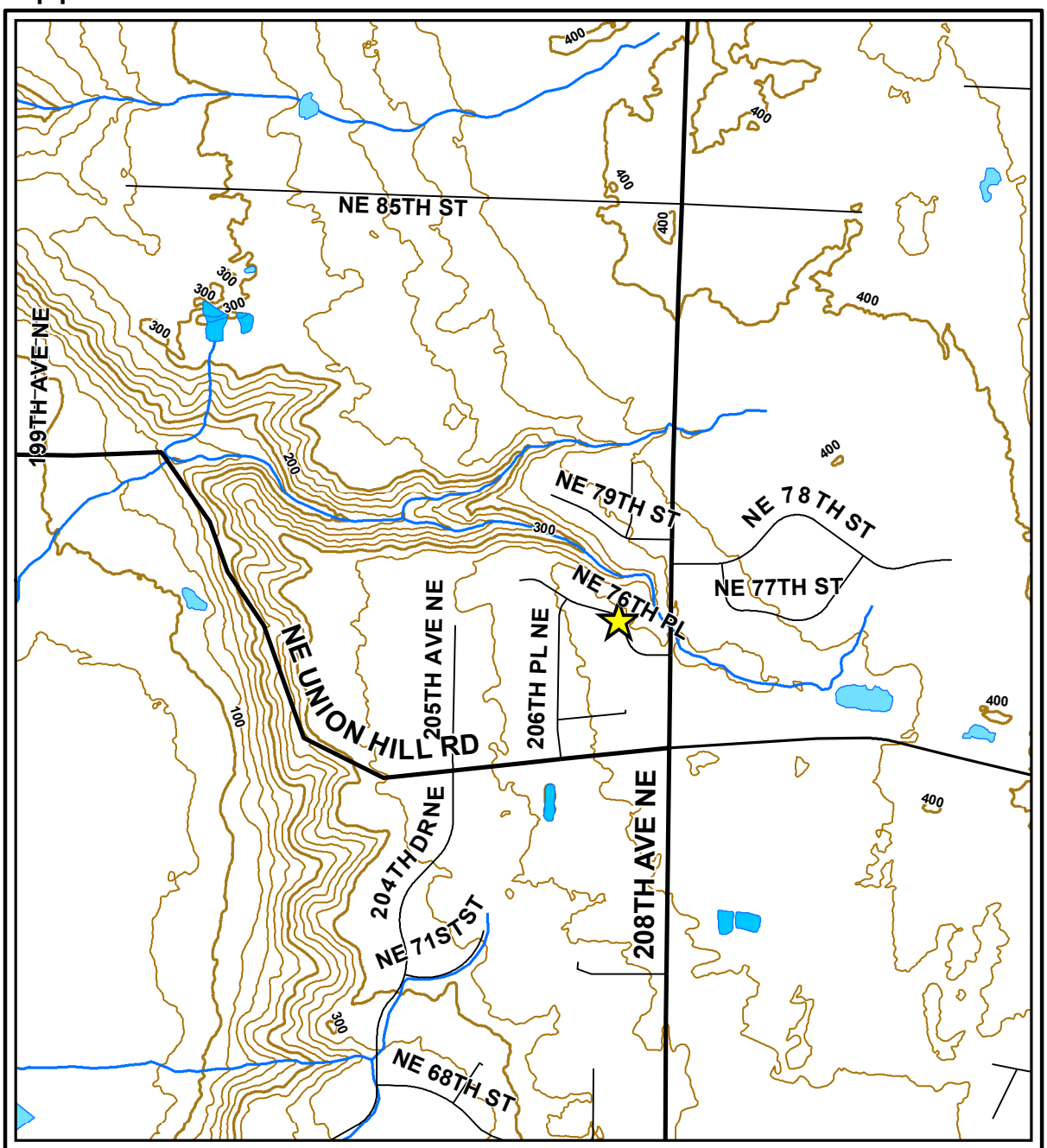
Facilities are being constructed by and for King County; therefore, no bonds will be required. See Appendix F for the preliminary total project cost estimate of $195,176.54. This includes project management, design and procurement, construction and close out, and public involvement. See Appendix F-1 for the construction costs.

# SECTION X: OPERATIONS AND MAINTENANCE MANUAL

## Standard Maintenance

The proposed detention vault will be maintained by King County in accordance with the standards described in King County's 2009 *Surface Water Design Manual,* Appendix A, No. 3, Detention Vaults.

# Appendix A




## Site Location

Subbasin C6

0 400 800 1,200 Feet

N

The information included on this map has been compiled by King County staff from a variety of sources and is subject to change without notice. King County makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a survey product. King County shall not be liable for any general, special, indirect, incidental, or consequential damages including, but not limited to, lost revenues or lost profits resulting from the use or misuse of the information contained on this map. Any sale of this map or information on this map is prohibited except by written permission of King County.

October 23, 2014

scott.miller@kingcounty.gov \\dnrp.kingcounty.lcl\wlrksc\CIP\Share\SWS CAPITAL PROJECTS\Small Stream Basin Retrofit Siting 1117558\Evans Creek Retrofit Siting 1121161\TIR Predesign Reports\E108_C6_SiteLx.pdf

King County

Department of Natu ral Resources and Parks

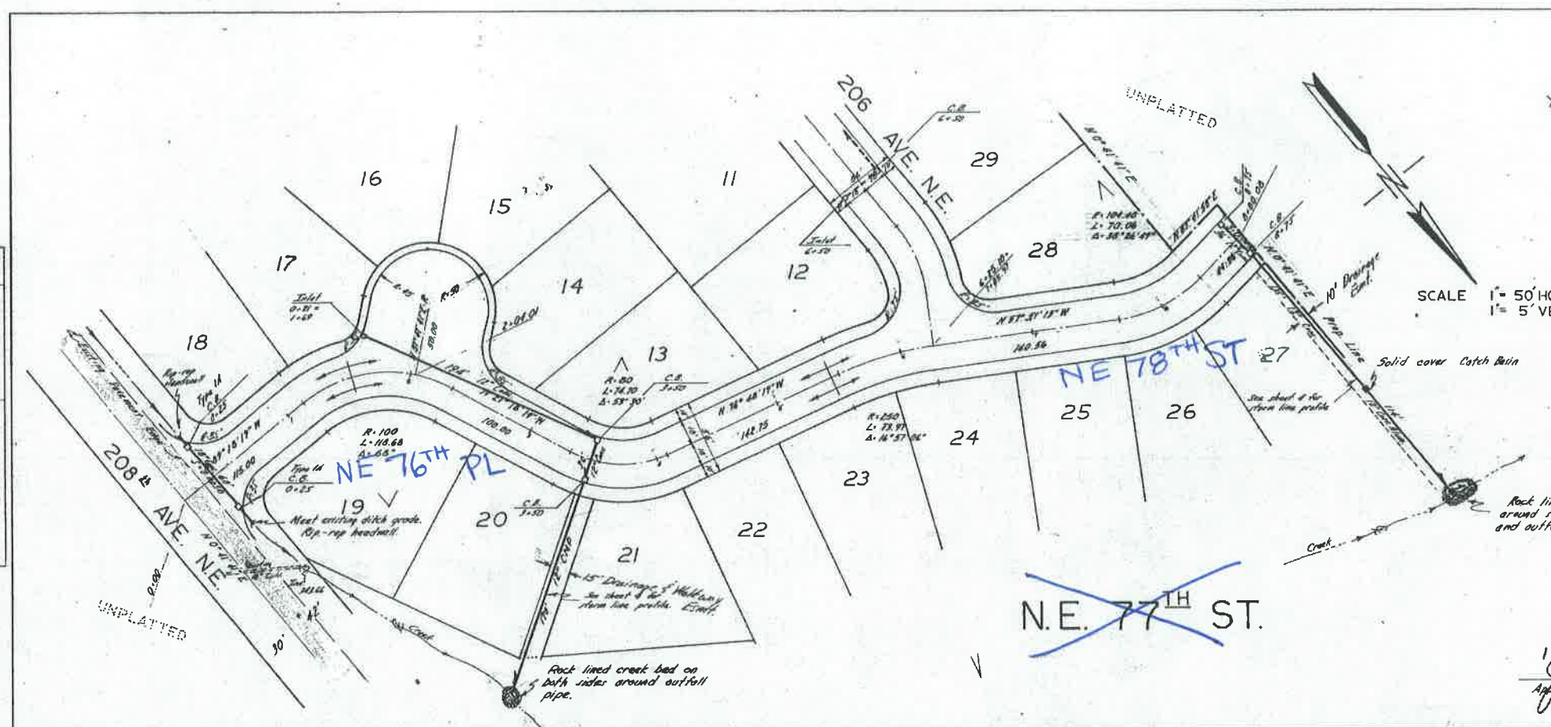
**Water and Land Resources Division**

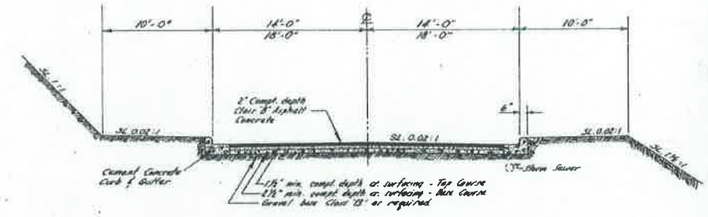
# Evans Creek Tributary 108

# Preliminary Technical Information Report

# Appendix B

# Record Drawings




Typical Street Section
no scale

NOTES:

1. All work shall comply with King County standards and be subject to their approval.
2. Manholes, Catch Basins, and Curb Inlet covers shall be adjusted at time of paving roadway.
3. Curb returns shall have a minimum radius of 35 feet.
4. Cul-de-Sacs shall be paved to face of curb having a 45' radius.
5. Inlet and Outlet pipe crowns shall match in elevation.
6. All pipe shall be Concrete, except it shall be Corrugated Aluminum for excessively steep grades.

10/10/68
Approved: King County Engineer

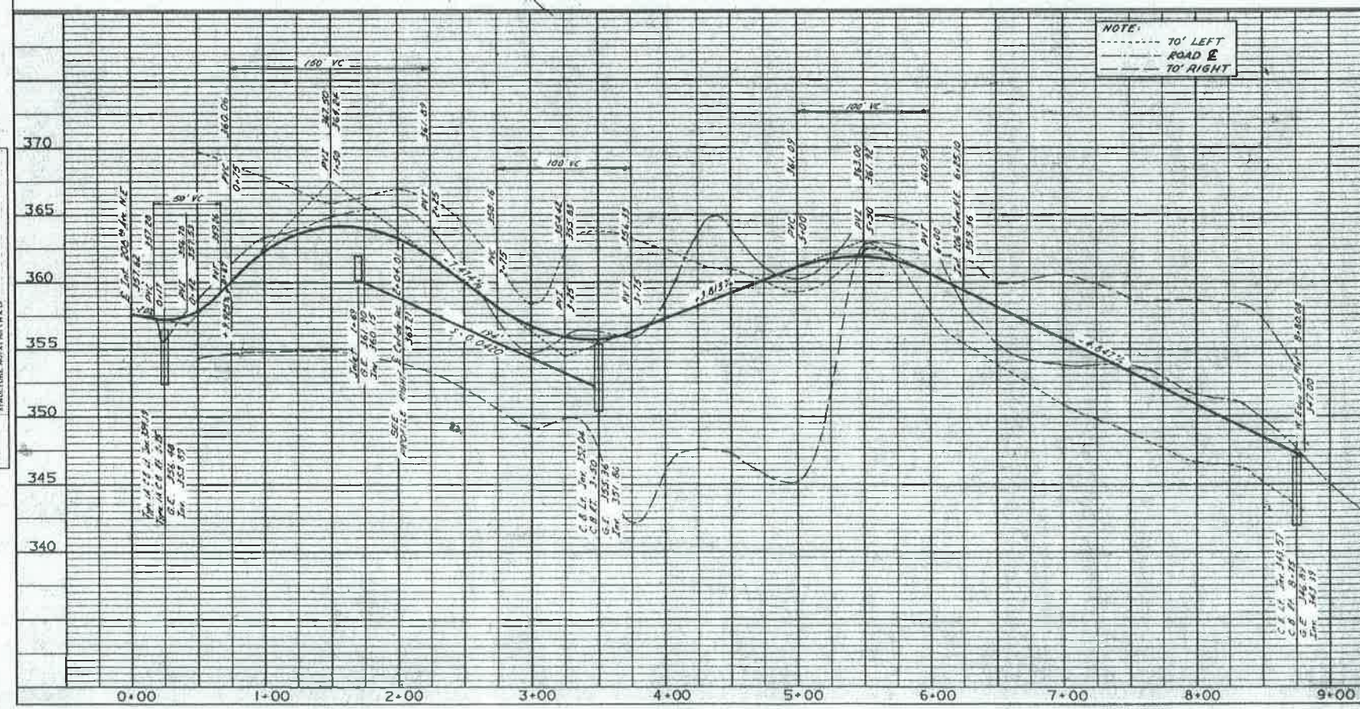
K.C.A.S. Datum

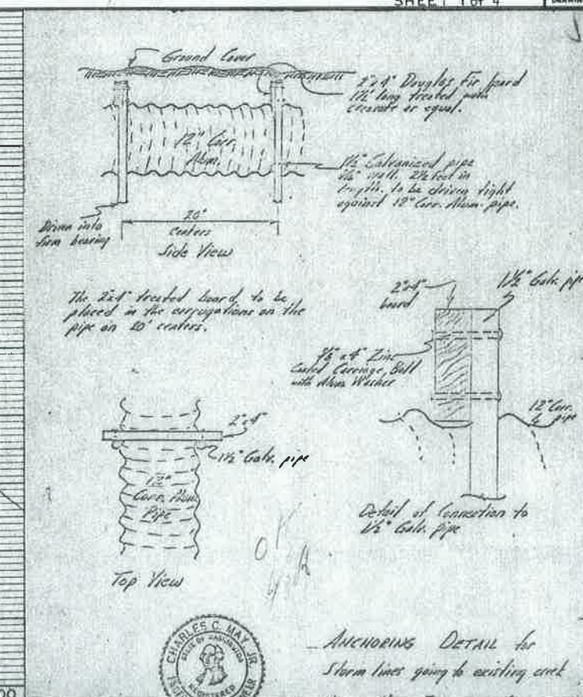
UNION HILL ESTATES
ROAD PROFILE & DRAINAGE

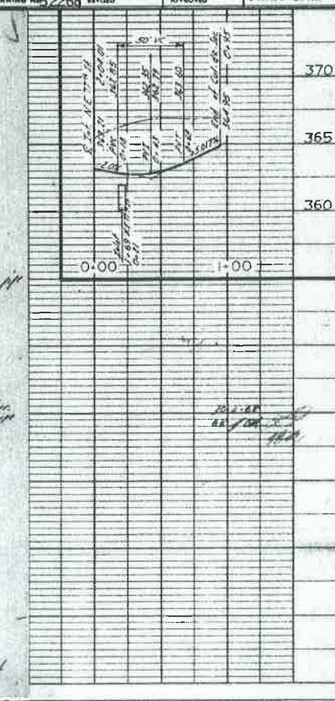
R. E. MERIWETHER & ASSOCIATES, INC.
12261 NORTHRUP WAY BELLEVUE, WASH.
SM 5-8330

SCALE As Noted
DATE 8-1-68
DRAWN BY G. M.
DRAWING No. 52268 REVISED APPROVED

SHEET 1 of 4




ANCHORING DETAIL for Storm lines going to existing creek

PLATE 1 - PLAN - PROFILE - P.A.R.
CLEARPRINT PAPER CO., S.F. CAL.

H-151

23254

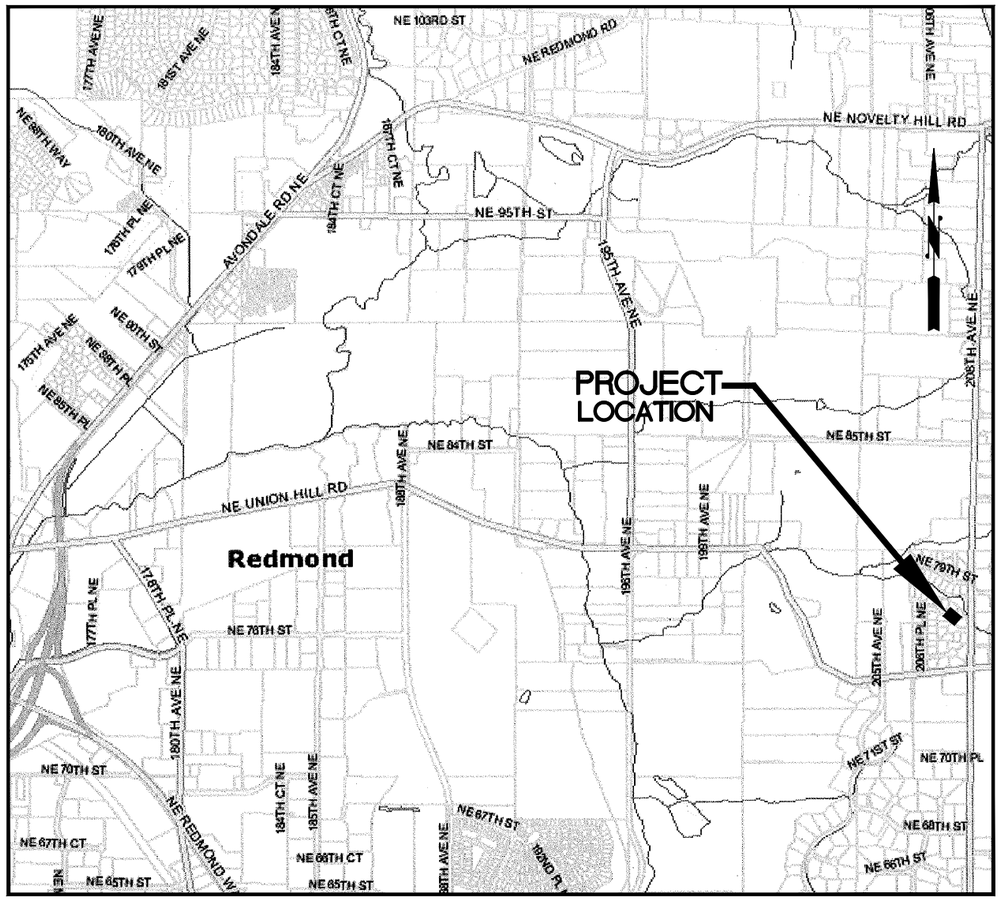
# Evans Creek Tributary 108

# Preliminary Technical Information Report

# Appendix C

# Preliminary Plans

## VICINITY MAP



# EVANS CREEK DETENTION VAULT

## AT NE 76TH PL

## INDEX


| SHEET | DESCRIPTION |
|---|---|
| 1 | VICINITY MAP AND SHEET INDEX |
| 2 | PLAN AND PROFILE |
| 3 | SECTIONS AND DETAILS |


**CALL 2 WORKING DAYS BEFORE YOU DIG**
**1-800-424-5555**
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

| | | |
|---|---|---|
| FIELD BOOK: | 2014-? | 10-2014 |
| SURVEYED: | BP/TZH | 10-2014 |
| SURVEY BASE MAP: | TZH | 10-2014 |
| CHECKED: | BP | 10-2014 |

| NUM. | REVISION | BY | DATE |
|---|---|---|---|
| | PRELIMINARY DESIGN PROGRESS COPY 10/2014 | | |

| NUM. | RECORD CHANGES APPROVED | BY | DATE |
|---|---|---|---|
| | | | |

| | | |
|---|---|---|
| APPROVED: | CLAIRE JONSON, P.E. | 10/2014 |
| PROJECT MANAGER: | CLAIRE JONSON, P.E. | 10/2014 |
| DESIGNED: | DALE NELSON | 10/2014 |
| | SCOTT MILLER | 10/2014 |
| CAD DESIGN: | LICA DULAN | 10/2014 |

FUNDING SOURCE No.
PROJECT No. 1121161
CONTRACT No.

LORRAINE L. LAI — STATE OF WASHINGTON — 37699 — REGISTERED PROFESSIONAL ENGINEER

CLARIZZA SANTOS JONSON — STATE OF WASHINGTON — 42300 — REGISTERED PROFESSIONAL ENGINEER

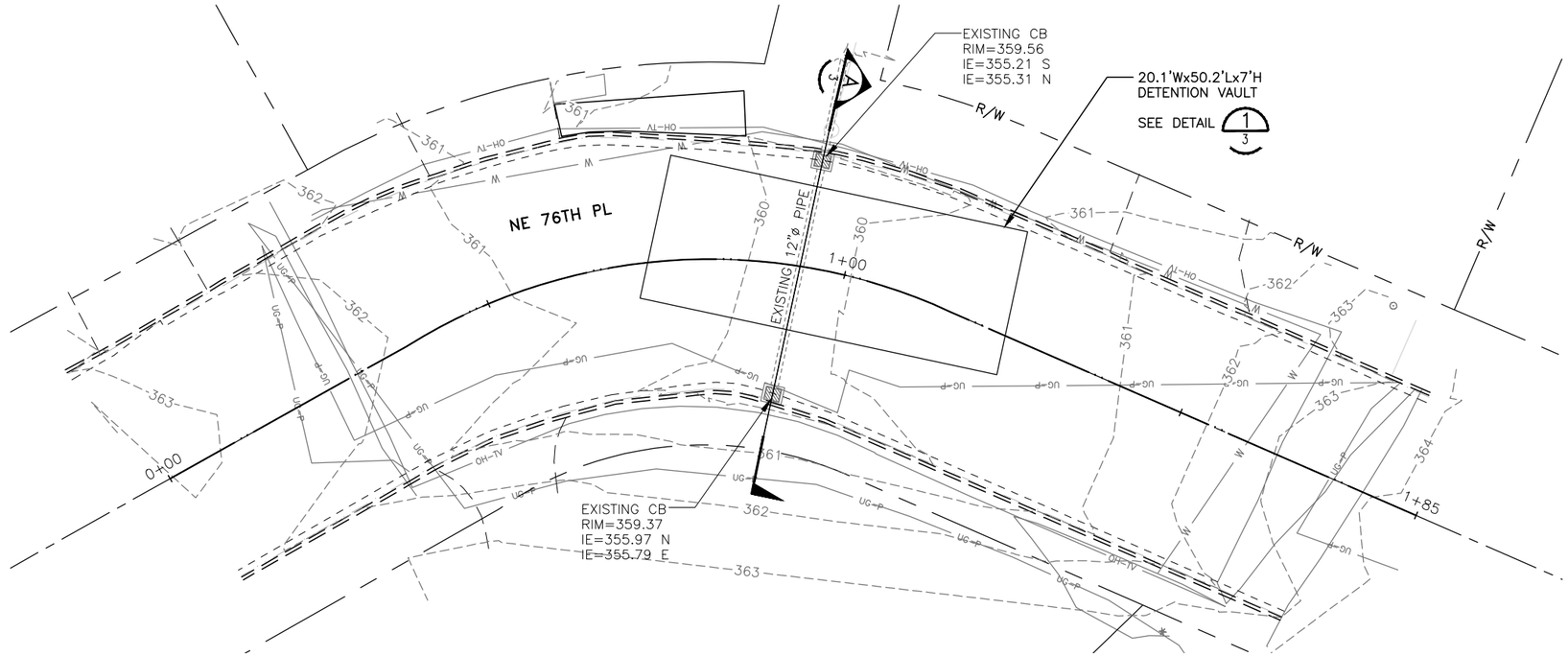
King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
*Christie True, Director*

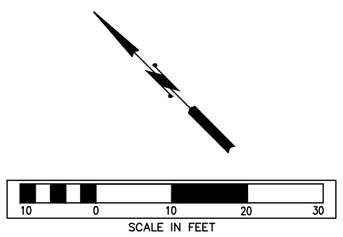
EVANS CREEK DETENTION VAULT
AT NE 76TH PL

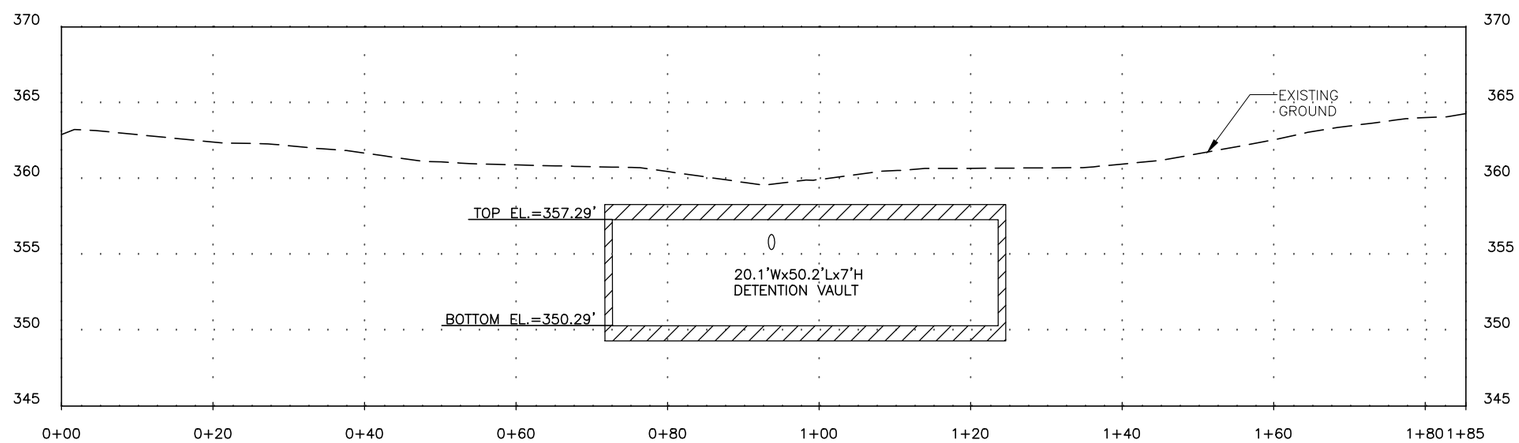
VICINITY MAP AND SHEET INDEX

SHEET 1 OF 3 SHEETS

2014-14

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| | | | |
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| SURVEY BASE MAP: | TZH | 10-2014 | |
| CHECKED: | BP | 10-2014 | |

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| DESIGNED: | DALE NELSON | 10/2014 |
| | SCOTT MILLER | 10/2014 |
| CAD DESIGN: | LICA DULAN | 10/2014 |

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REGISTERED PROFESSIONAL ENGINEER

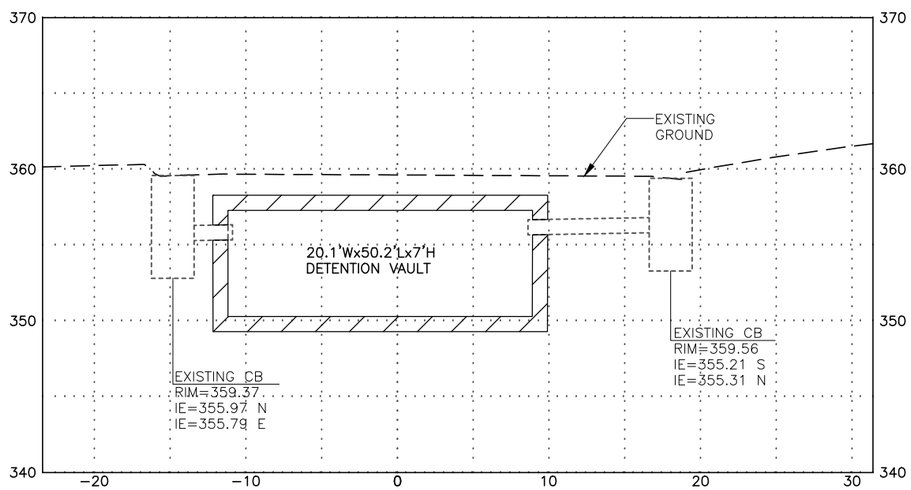
King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
**Capital Services Unit**
*Christie True, Director*

**EVANS CREEK DETENTION VAULT AT NE 76TH PL**

**PLAN AND PROFILE**

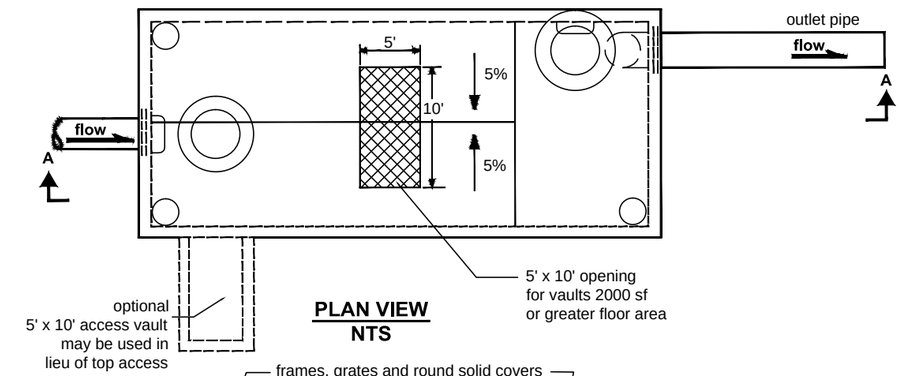
SHEET **2** OF **3** SHEETS

**2014-14**

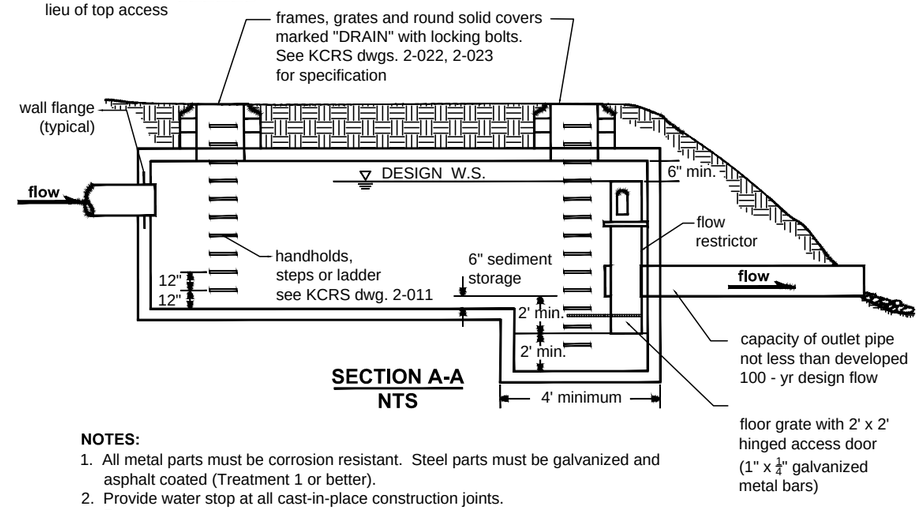



SECTION A–A (A / 2)
SCALE: 1"=5'

NOTE: All vault areas must be within 50' of an access point




**PLAN VIEW**
**NTS**




**SECTION A-A**
**NTS**

**NOTES:**

1. All metal parts must be corrosion resistant. Steel parts must be galvanized and asphalt coated (Treatment 1 or better).
2. Provide water stop at all cast-in-place construction joints. Preceast vaults shall have approved rubber gasket system.
3. Vaults ≤10' wide must use removable lids.
4. Prefabricated vault sections may require structural modifications to support 5' x 10' opening over main vault. Alternatively, access can be provided via a side vestibule as shown.

DETENTION VAULT DETAIL (1 / 2)
NTS

**CALL 2 WORKING DAYS**
**BEFORE YOU DIG**
**1-800-424-5555**
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

| | | |
|---|---|---|
| FIELD BOOK: | 2014–? | 10–2014 |
| SURVEYED: | BP/TZH | 10–2014 |
| SURVEY BASE MAP: | TZH | 10–2014 |
| CHECKED: | BP | 10–2014 |

| NUM. | REVISION | BY | DATE |
|---|---|---|---|
| | | | |

PRELIMINARY DESIGN
PROGRESS COPY
10/2014

| NUM. | RECORD CHANGES APPROVED | BY | DATE |
|---|---|---|---|
| | | | |

| | | |
|---|---|---|
| APPROVED: | CLAIRE JONSON, P.E. | 10/2014 |
| PROJECT MANAGER: | CLAIRE JONSON, P.E. | 10/2014 |
| DESIGNED: | DALE NELSON | 10/2014 |
| | SCOTT MILLER | 10/2014 |
| CAD DESIGN: | LICA DULAN | 10/2014 |

FUNDING SOURCE No.
PROJECT No. 1121161
CONTRACT No.

CLARIZIA SANTOS JONSON
STATE OF WASHINGTON
42300
REGISTERED
PROFESSIONAL ENGINEER

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
**Capital Services Unit**
*Christie True, Director*

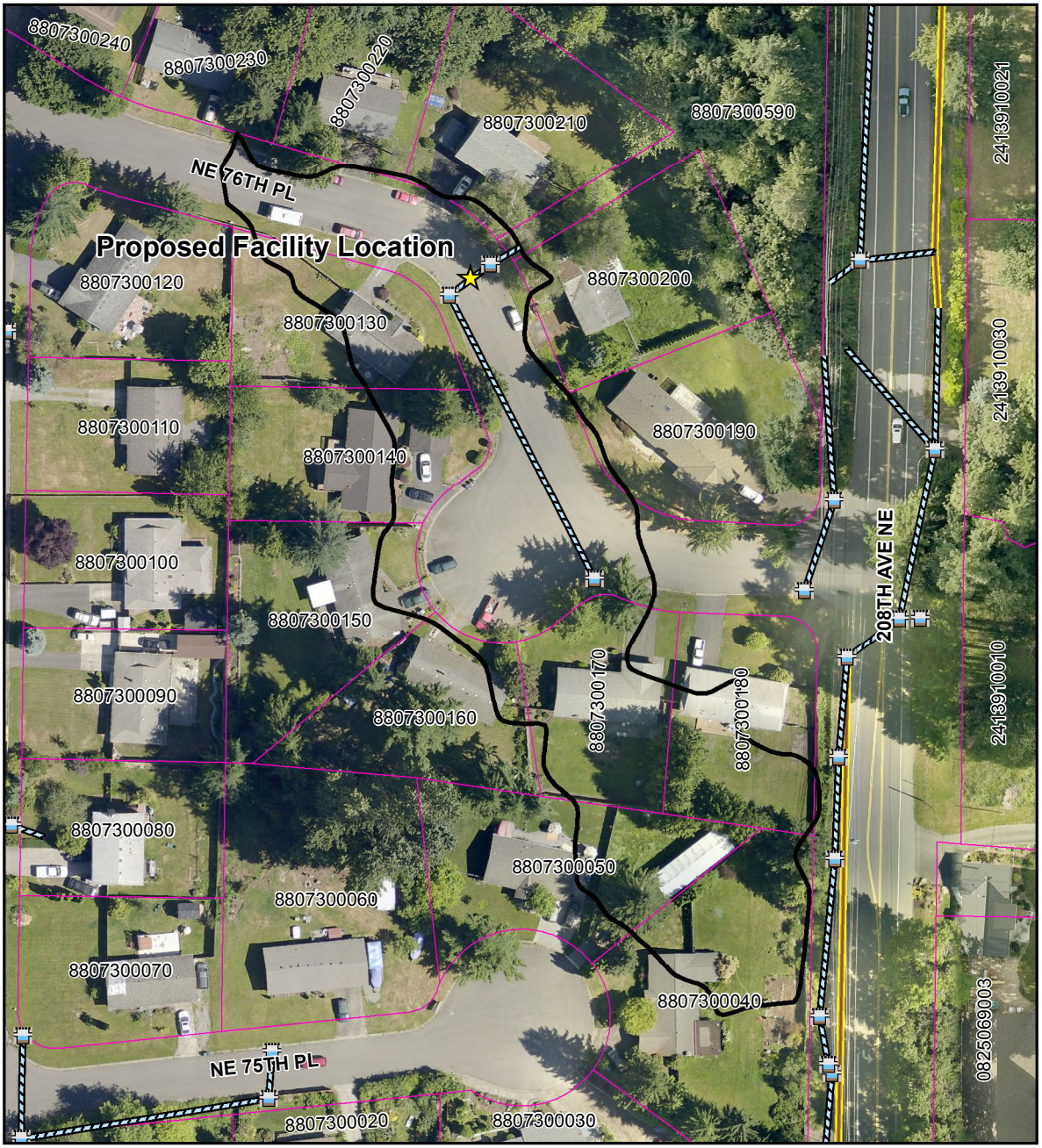
**EVANS CREEK DETENTION VAULT AT NE 76TH PL**

**SECTIONS AND DETAILS**

SHEET **3** OF **3** SHEETS

**2014-14**

# Appendix D




## Evans 108 C6 Subbasin

Existing Catch Basin

Existing Pipe

Existing Ditch

Subbasin

N

0 50 100 Feet

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October 17, 2014

scott.miller@kingcounty.gov \\dnrp.kingcounty.lcl\wlrksc\CIP\Share\SWS CAPITAL PROJECTS\Small Stream Basin Retrofit Siting 1117558\Evans Creek Retrofit Siting 1121161\TIR Predesign Reports\E108_C6_ParcelView.pdf

King County

Department of Natu ral Resources and Parks

**Water and Land Resources Division**

# Appendix E
# WWHM2012
# PROJECT REPORT

---

**Project Name:** Evans 36 V
**Site Name:** Evans 36 V
**Site Address:**
**City :**
**Report Date:** 9/24/2014
**Gage :** Seatac
**Data Start :** 1948/10/01
**Data End :** 2009/09/30
**Precip Scale:** 1.00
**Version :** 2014/08/08

---

**Low Flow Threshold for POC 1 :** 50 Percent of the 2 Year

---

**High Flow Threshold for POC 1:** 50 year

---

**PREDEVELOPED LAND USE**

**Name :** Basin 1
**Bypass:** No

**GroundWater:** No

| Pervious Land Use | Acres |
|---|---|
| C, Forest, Flat | .74645 |
| C, Forest, Mod | .66501 |
| C, Forest, Steep | .04701 |
| Pervious Total | 1.45847 |

| Impervious Land Use | Acres |
|---|---|
| Impervious Total | 0 |
| Basin Total | 1.45847 |

---

**Element Flows To:**

| Surface | Interflow | Groundwater |
|---|---|---|

---

**MITIGATED LAND USE**

**Name :** Time Series 1
**Time Series number 404 is connected to:**

**Element Flows To:**
**Outlet 1** **Outlet 2**
Vault 1

---

**Name** : Vault 1
**Width :** 20.082279986004 ft.
**Length :** 50.2056999650101 ft.
**Depth:** 5 ft.
**Discharge Structure**
**Riser Height:** 4 ft.
**Riser Diameter:** 10 in.
**Orifice 1 Diameter:** 1.03 in. **Elevation:** 0 ft.
**Orifice 2 Diameter:** 1.1 in. **Elevation:** 2.55 ft.
**Orifice 3 Diameter:** 0.66 in. **Elevation:** 2.93 ft.

**Element Flows To:**
**Outlet 1** **Outlet 2**

---

**Vault Hydraulic Table**

| Stage(ft) | Area(ac) | Volume(ac-ft) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.023 | 0.000 | 0.000 | 0.000 |
| 0.0556 | 0.023 | 0.001 | 0.006 | 0.000 |
| 0.1111 | 0.023 | 0.002 | 0.009 | 0.000 |
| 0.1667 | 0.023 | 0.003 | 0.011 | 0.000 |
| 0.2222 | 0.023 | 0.005 | 0.013 | 0.000 |
| 0.2778 | 0.023 | 0.006 | 0.014 | 0.000 |
| 0.3333 | 0.023 | 0.007 | 0.016 | 0.000 |
| 0.3889 | 0.023 | 0.009 | 0.017 | 0.000 |
| 0.4444 | 0.023 | 0.010 | 0.018 | 0.000 |
| 0.5000 | 0.023 | 0.011 | 0.019 | 0.000 |
| 0.5556 | 0.023 | 0.012 | 0.020 | 0.000 |
| 0.6111 | 0.023 | 0.014 | 0.021 | 0.000 |
| 0.6667 | 0.023 | 0.015 | 0.022 | 0.000 |
| 0.7222 | 0.023 | 0.016 | 0.023 | 0.000 |
| 0.7778 | 0.023 | 0.018 | 0.024 | 0.000 |
| 0.8333 | 0.023 | 0.019 | 0.025 | 0.000 |
| 0.8889 | 0.023 | 0.020 | 0.026 | 0.000 |
| 0.9444 | 0.023 | 0.021 | 0.027 | 0.000 |
| 1.0000 | 0.023 | 0.023 | 0.027 | 0.000 |
| 1.0556 | 0.023 | 0.024 | 0.028 | 0.000 |
| 1.1111 | 0.023 | 0.025 | 0.029 | 0.000 |
| 1.1667 | 0.023 | 0.027 | 0.030 | 0.000 |
| 1.2222 | 0.023 | 0.028 | 0.030 | 0.000 |
| 1.2778 | 0.023 | 0.029 | 0.031 | 0.000 |
| 1.3333 | 0.023 | 0.030 | 0.032 | 0.000 |
| 1.3889 | 0.023 | 0.032 | 0.032 | 0.000 |
| 1.4444 | 0.023 | 0.033 | 0.033 | 0.000 |
| 1.5000 | 0.023 | 0.034 | 0.034 | 0.000 |
| 1.5556 | 0.023 | 0.036 | 0.034 | 0.000 |
| 1.6111 | 0.023 | 0.037 | 0.035 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 1.6667 | 0.023 | 0.038 | 0.036 | 0.000 |
| 1.7222 | 0.023 | 0.039 | 0.036 | 0.000 |
| 1.7778 | 0.023 | 0.041 | 0.037 | 0.000 |
| 1.8333 | 0.023 | 0.042 | 0.037 | 0.000 |
| 1.8889 | 0.023 | 0.043 | 0.038 | 0.000 |
| 1.9444 | 0.023 | 0.045 | 0.038 | 0.000 |
| 2.0000 | 0.023 | 0.046 | 0.039 | 0.000 |
| 2.0556 | 0.023 | 0.047 | 0.039 | 0.000 |
| 2.1111 | 0.023 | 0.048 | 0.040 | 0.000 |
| 2.1667 | 0.023 | 0.050 | 0.041 | 0.000 |
| 2.2222 | 0.023 | 0.051 | 0.041 | 0.000 |
| 2.2778 | 0.023 | 0.052 | 0.042 | 0.000 |
| 2.3333 | 0.023 | 0.054 | 0.042 | 0.000 |
| 2.3889 | 0.023 | 0.055 | 0.043 | 0.000 |
| 2.4444 | 0.023 | 0.056 | 0.043 | 0.000 |
| 2.5000 | 0.023 | 0.057 | 0.044 | 0.000 |
| 2.5556 | 0.023 | 0.059 | 0.046 | 0.000 |
| 2.6111 | 0.023 | 0.060 | 0.052 | 0.000 |
| 2.6667 | 0.023 | 0.061 | 0.056 | 0.000 |
| 2.7222 | 0.023 | 0.063 | 0.059 | 0.000 |
| 2.7778 | 0.023 | 0.064 | 0.061 | 0.000 |
| 2.8333 | 0.023 | 0.065 | 0.063 | 0.000 |
| 2.8889 | 0.023 | 0.066 | 0.065 | 0.000 |
| 2.9444 | 0.023 | 0.068 | 0.069 | 0.000 |
| 3.0000 | 0.023 | 0.069 | 0.072 | 0.000 |
| 3.0556 | 0.023 | 0.070 | 0.075 | 0.000 |
| 3.1111 | 0.023 | 0.072 | 0.077 | 0.000 |
| 3.1667 | 0.023 | 0.073 | 0.080 | 0.000 |
| 3.2222 | 0.023 | 0.074 | 0.082 | 0.000 |
| 3.2778 | 0.023 | 0.075 | 0.084 | 0.000 |
| 3.3333 | 0.023 | 0.077 | 0.086 | 0.000 |
| 3.3889 | 0.023 | 0.078 | 0.088 | 0.000 |
| 3.4444 | 0.023 | 0.079 | 0.090 | 0.000 |
| 3.5000 | 0.023 | 0.081 | 0.091 | 0.000 |
| 3.5556 | 0.023 | 0.082 | 0.093 | 0.000 |
| 3.6111 | 0.023 | 0.083 | 0.095 | 0.000 |
| 3.6667 | 0.023 | 0.084 | 0.096 | 0.000 |
| 3.7222 | 0.023 | 0.086 | 0.098 | 0.000 |
| 3.7778 | 0.023 | 0.087 | 0.099 | 0.000 |
| 3.8333 | 0.023 | 0.088 | 0.101 | 0.000 |
| 3.8889 | 0.023 | 0.090 | 0.102 | 0.000 |
| 3.9444 | 0.023 | 0.091 | 0.104 | 0.000 |
| 4.0000 | 0.023 | 0.092 | 0.105 | 0.000 |
| 4.0556 | 0.023 | 0.093 | 0.213 | 0.000 |
| 4.1111 | 0.023 | 0.095 | 0.409 | 0.000 |
| 4.1667 | 0.023 | 0.096 | 0.662 | 0.000 |
| 4.2222 | 0.023 | 0.097 | 0.961 | 0.000 |
| 4.2778 | 0.023 | 0.099 | 1.300 | 0.000 |
| 4.3333 | 0.023 | 0.100 | 1.675 | 0.000 |
| 4.3889 | 0.023 | 0.101 | 2.083 | 0.000 |
| 4.4444 | 0.023 | 0.102 | 2.521 | 0.000 |
| 4.5000 | 0.023 | 0.104 | 2.987 | 0.000 |
| 4.5556 | 0.023 | 0.105 | 3.479 | 0.000 |
| 4.6111 | 0.023 | 0.106 | 3.997 | 0.000 |
| 4.6667 | 0.023 | 0.108 | 4.539 | 0.000 |
| 4.7222 | 0.023 | 0.109 | 5.104 | 0.000 |
| 4.7778 | 0.023 | 0.110 | 5.690 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 4.8333 | 0.023 | 0.111 | 6.299 | 0.000 |
| 4.8889 | 0.023 | 0.113 | 6.927 | 0.000 |
| 4.9444 | 0.023 | 0.114 | 7.576 | 0.000 |
| 5.0000 | 0.023 | 0.115 | 8.244 | 0.000 |
| 5.0556 | 0.023 | 0.117 | 8.931 | 0.000 |
| 5.1111 | 0.000 | 0.000 | 9.636 | 0.000 |

---

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**ANALYSIS RESULTS**

**Stream Protection Duration**

---

**Predeveloped Landuse Totals for POC #1**
**Total Pervious Area:1.45847**
**Total Impervious Area:0**

---

**Mitigated Landuse Totals for POC #1**
**Total Pervious Area:0**
**Total Impervious Area:0**

---

**Flow Frequency Return Periods for Predeveloped. POC #1**

| Return Period | Flow(cfs) |
|---|---|
| 2 year | 0.043587 |
| 5 year | 0.070201 |
| 10 year | 0.086596 |
| 25 year | 0.105361 |
| 50 year | 0.117889 |
| 100 year | 0.129239 |

**Flow Frequency Return Periods for Mitigated. POC #1**

| Return Period | Flow(cfs) |
|---|---|
| 2 year | 0.02976 |
| 5 year | 0.045735 |
| 10 year | 0.058894 |
| 25 year | 0.078849 |
| 50 year | 0.096396 |
| 100 year | 0.116475 |

---

**Stream Protection Duration**
**Annual Peaks for Predeveloped and Mitigated. POC #1**

| Year | Predeveloped | Mitigated |
|---|---|---|
| 1949 | 0.046 | 0.032 |
| 1950 | 0.057 | 0.036 |
| 1951 | 0.096 | 0.081 |
| 1952 | 0.030 | 0.024 |
| 1953 | 0.024 | 0.021 |
| 1954 | 0.037 | 0.025 |
| 1955 | 0.060 | 0.041 |
| 1956 | 0.048 | 0.031 |
| 1957 | 0.039 | 0.030 |

| | | |
|---|---|---|
| 1958 | 0.043 | 0.030 |
| 1959 | 0.037 | 0.026 |
| 1960 | 0.066 | 0.038 |
| 1961 | 0.036 | 0.027 |
| 1962 | 0.023 | 0.019 |
| 1963 | 0.031 | 0.026 |
| 1964 | 0.043 | 0.026 |
| 1965 | 0.029 | 0.026 |
| 1966 | 0.028 | 0.023 |
| 1967 | 0.063 | 0.038 |
| 1968 | 0.037 | 0.027 |
| 1969 | 0.036 | 0.029 |
| 1970 | 0.030 | 0.026 |
| 1971 | 0.033 | 0.026 |
| 1972 | 0.072 | 0.047 |
| 1973 | 0.033 | 0.027 |
| 1974 | 0.035 | 0.025 |
| 1975 | 0.049 | 0.033 |
| 1976 | 0.035 | 0.025 |
| 1977 | 0.005 | 0.012 |
| 1978 | 0.030 | 0.023 |
| 1979 | 0.018 | 0.017 |
| 1980 | 0.077 | 0.037 |
| 1981 | 0.027 | 0.022 |
| 1982 | 0.054 | 0.041 |
| 1983 | 0.047 | 0.031 |
| 1984 | 0.029 | 0.024 |
| 1985 | 0.017 | 0.020 |
| 1986 | 0.076 | 0.061 |
| 1987 | 0.067 | 0.041 |
| 1988 | 0.026 | 0.022 |
| 1989 | 0.017 | 0.016 |
| 1990 | 0.149 | 0.087 |
| 1991 | 0.084 | 0.074 |
| 1992 | 0.034 | 0.027 |
| 1993 | 0.034 | 0.025 |
| 1994 | 0.011 | 0.013 |
| 1995 | 0.048 | 0.033 |
| 1996 | 0.106 | 0.077 |
| 1997 | 0.086 | 0.037 |
| 1998 | 0.021 | 0.021 |
| 1999 | 0.086 | 0.038 |
| 2000 | 0.034 | 0.030 |
| 2001 | 0.006 | 0.013 |
| 2002 | 0.037 | 0.035 |
| 2003 | 0.052 | 0.021 |
| 2004 | 0.062 | 0.057 |
| 2005 | 0.045 | 0.036 |
| 2006 | 0.052 | 0.035 |
| 2007 | 0.111 | 0.061 |
| 2008 | 0.141 | 0.176 |
| 2009 | 0.067 | 0.045 |

---

**Stream Protection Duration**
**Ranked Annual Peaks for Predeveloped and Mitigated. POC #1**

| Rank | Predeveloped | Mitigated |
|---|---|---|

| | | |
|---|---|---|
| 1 | 0.1490 | 0.1764 |
| 2 | 0.1413 | 0.0871 |
| 3 | 0.1107 | 0.0813 |
| 4 | 0.1063 | 0.0766 |
| 5 | 0.0957 | 0.0745 |
| 6 | 0.0864 | 0.0613 |
| 7 | 0.0858 | 0.0608 |
| 8 | 0.0841 | 0.0572 |
| 9 | 0.0766 | 0.0466 |
| 10 | 0.0757 | 0.0449 |
| 11 | 0.0721 | 0.0412 |
| 12 | 0.0672 | 0.0412 |
| 13 | 0.0668 | 0.0407 |
| 14 | 0.0656 | 0.0382 |
| 15 | 0.0633 | 0.0381 |
| 16 | 0.0624 | 0.0381 |
| 17 | 0.0600 | 0.0371 |
| 18 | 0.0565 | 0.0365 |
| 19 | 0.0544 | 0.0360 |
| 20 | 0.0524 | 0.0359 |
| 21 | 0.0517 | 0.0348 |
| 22 | 0.0490 | 0.0347 |
| 23 | 0.0481 | 0.0334 |
| 24 | 0.0480 | 0.0326 |
| 25 | 0.0471 | 0.0323 |
| 26 | 0.0464 | 0.0315 |
| 27 | 0.0455 | 0.0308 |
| 28 | 0.0433 | 0.0304 |
| 29 | 0.0425 | 0.0304 |
| 30 | 0.0387 | 0.0302 |
| 31 | 0.0374 | 0.0287 |
| 32 | 0.0372 | 0.0274 |
| 33 | 0.0370 | 0.0270 |
| 34 | 0.0370 | 0.0268 |
| 35 | 0.0365 | 0.0266 |
| 36 | 0.0362 | 0.0264 |
| 37 | 0.0354 | 0.0261 |
| 38 | 0.0346 | 0.0260 |
| 39 | 0.0338 | 0.0260 |
| 40 | 0.0338 | 0.0260 |
| 41 | 0.0336 | 0.0259 |
| 42 | 0.0327 | 0.0254 |
| 43 | 0.0325 | 0.0253 |
| 44 | 0.0313 | 0.0252 |
| 45 | 0.0303 | 0.0250 |
| 46 | 0.0301 | 0.0244 |
| 47 | 0.0298 | 0.0237 |
| 48 | 0.0294 | 0.0234 |
| 49 | 0.0289 | 0.0230 |
| 50 | 0.0283 | 0.0224 |
| 51 | 0.0270 | 0.0221 |
| 52 | 0.0265 | 0.0213 |
| 53 | 0.0245 | 0.0211 |
| 54 | 0.0229 | 0.0206 |
| 55 | 0.0205 | 0.0195 |
| 56 | 0.0183 | 0.0192 |
| 57 | 0.0172 | 0.0167 |

| | | |
|---|---|---|
| 58 | 0.0171 | 0.0157 |
| 59 | 0.0114 | 0.0134 |
| 60 | 0.0061 | 0.0130 |
| 61 | 0.0047 | 0.0124 |

---

**Stream Protection Duration**
**POC #1**

Facility FAILED duration standard for 1+ flows.

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0218 | 17162 | 13616 | 79 | Pass |
| 0.0228 | 15648 | 11899 | 76 | Pass |
| 0.0237 | 14330 | 10532 | 73 | Pass |
| 0.0247 | 13135 | 9152 | 69 | Pass |
| 0.0257 | 12016 | 8027 | 66 | Pass |
| 0.0266 | 10955 | 7088 | 64 | Pass |
| 0.0276 | 10059 | 6312 | 62 | Pass |
| 0.0286 | 9244 | 5655 | 61 | Pass |
| 0.0296 | 8532 | 4949 | 58 | Pass |
| 0.0305 | 7880 | 4383 | 55 | Pass |
| 0.0315 | 7227 | 3893 | 53 | Pass |
| 0.0325 | 6682 | 3446 | 51 | Pass |
| 0.0334 | 6207 | 2999 | 48 | Pass |
| 0.0344 | 5754 | 2588 | 44 | Pass |
| 0.0354 | 5379 | 2280 | 42 | Pass |
| 0.0364 | 5003 | 2002 | 40 | Pass |
| 0.0373 | 4673 | 1758 | 37 | Pass |
| 0.0383 | 4365 | 1506 | 34 | Pass |
| 0.0393 | 4075 | 1324 | 32 | Pass |
| 0.0402 | 3811 | 1140 | 29 | Pass |
| 0.0412 | 3557 | 957 | 26 | Pass |
| 0.0422 | 3320 | 821 | 24 | Pass |
| 0.0431 | 3095 | 696 | 22 | Pass |
| 0.0441 | 2887 | 559 | 19 | Pass |
| 0.0451 | 2710 | 522 | 19 | Pass |
| 0.0461 | 2496 | 494 | 19 | Pass |
| 0.0470 | 2331 | 466 | 19 | Pass |
| 0.0480 | 2175 | 454 | 20 | Pass |
| 0.0490 | 2025 | 440 | 21 | Pass |
| 0.0499 | 1879 | 428 | 22 | Pass |
| 0.0509 | 1754 | 416 | 23 | Pass |
| 0.0519 | 1655 | 403 | 24 | Pass |
| 0.0529 | 1528 | 393 | 25 | Pass |
| 0.0538 | 1407 | 378 | 26 | Pass |
| 0.0548 | 1301 | 364 | 27 | Pass |
| 0.0558 | 1216 | 351 | 28 | Pass |
| 0.0567 | 1142 | 326 | 28 | Pass |
| 0.0577 | 1082 | 304 | 28 | Pass |
| 0.0587 | 1024 | 284 | 27 | Pass |
| 0.0596 | 965 | 267 | 27 | Pass |
| 0.0606 | 897 | 248 | 27 | Pass |
| 0.0616 | 843 | 225 | 26 | Pass |
| 0.0626 | 791 | 210 | 26 | Pass |
| 0.0635 | 743 | 196 | 26 | Pass |
| 0.0645 | 707 | 177 | 25 | Pass |

| | | | | |
|---|---|---|---|---|
| 0.0655 | 664 | 160 | 24 | Pass |
| 0.0664 | 617 | 146 | 23 | Pass |
| 0.0674 | 583 | 135 | 23 | Pass |
| 0.0684 | 546 | 126 | 23 | Pass |
| 0.0694 | 509 | 122 | 23 | Pass |
| 0.0703 | 478 | 117 | 24 | Pass |
| 0.0713 | 436 | 112 | 25 | Pass |
| 0.0723 | 396 | 109 | 27 | Pass |
| 0.0732 | 365 | 103 | 28 | Pass |
| 0.0742 | 342 | 96 | 28 | Pass |
| 0.0752 | 314 | 87 | 27 | Pass |
| 0.0762 | 289 | 85 | 29 | Pass |
| 0.0771 | 259 | 76 | 29 | Pass |
| 0.0781 | 237 | 73 | 30 | Pass |
| 0.0791 | 213 | 69 | 32 | Pass |
| 0.0800 | 191 | 57 | 29 | Pass |
| 0.0810 | 173 | 52 | 30 | Pass |
| 0.0820 | 150 | 47 | 31 | Pass |
| 0.0829 | 136 | 44 | 32 | Pass |
| 0.0839 | 122 | 43 | 35 | Pass |
| 0.0849 | 108 | 40 | 37 | Pass |
| 0.0859 | 96 | 39 | 40 | Pass |
| 0.0868 | 90 | 34 | 37 | Pass |
| 0.0878 | 82 | 31 | 37 | Pass |
| 0.0888 | 72 | 30 | 41 | Pass |
| 0.0897 | 68 | 28 | 41 | Pass |
| 0.0907 | 61 | 28 | 45 | Pass |
| 0.0917 | 51 | 26 | 50 | Pass |
| 0.0927 | 43 | 25 | 58 | Pass |
| 0.0936 | 40 | 23 | 57 | Pass |
| 0.0946 | 34 | 22 | 64 | Pass |
| 0.0956 | 27 | 21 | 77 | Pass |
| 0.0965 | 24 | 19 | 79 | Pass |
| 0.0975 | 21 | 17 | 80 | Pass |
| 0.0985 | 20 | 16 | 80 | Pass |
| 0.0994 | 19 | 15 | 78 | Pass |
| 0.1004 | 17 | 14 | 82 | Pass |
| 0.1014 | 14 | 12 | 85 | Pass |
| 0.1024 | 13 | 10 | 76 | Pass |
| 0.1033 | 10 | 9 | 90 | Pass |
| 0.1043 | 7 | 7 | 100 | Pass |
| 0.1053 | 6 | 5 | 83 | Pass |
| 0.1062 | 6 | 4 | 66 | Pass |
| 0.1072 | 5 | 4 | 80 | Pass |
| 0.1082 | 5 | 4 | 80 | Pass |
| 0.1092 | 5 | 4 | 80 | Pass |
| 0.1101 | 5 | 4 | 80 | Pass |
| 0.1111 | 3 | 4 | 133 | Fail |
| 0.1121 | 3 | 4 | 133 | Fail |
| 0.1130 | 3 | 4 | 133 | Fail |
| 0.1140 | 3 | 4 | 133 | Fail |
| 0.1150 | 3 | 4 | 133 | Fail |
| 0.1159 | 3 | 4 | 133 | Fail |
| 0.1169 | 3 | 4 | 133 | Fail |
| 0.1179 | 3 | 4 | 133 | Fail |

**The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.**

---

**Water Quality BMP Flow and Volume for POC #1**
**On-line facility volume:** 0 **acre-feet**
**On-line facility target flow:** 0 **cfs.**
**Adjusted for 15 min:** 0 **cfs.**
**Off-line facility target flow:** 0 **cfs.**
**Adjusted for 15 min:** 0 **cfs.**

---

**LID Report**

| LID Technique | Used for Treatment? | Total Volumn Needs Treatment (ac-ft) | Volumn Through Facility (ac-ft) | Infiltration Volumn (ac-ft) | Cumulative Volumn Infiltration Credit | Percent Water Quality Volumn | Percent Volumn Infiltrated | Comment Water Quality Treated |
|---|---|---|---|---|---|---|---|---|
| Vault 1 POC | N | 64.77 | | | N | 0.00 | | |
| Total Volume Infiltrated | | 64.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0% | No Treat. Credit |

Compliance with LID Standard 8
Duration Analysis Result = Failed

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## Perlnd and Implnd Changes

No changes have been made.

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## Appendix F Evans Creek Tributary 108 Stormwater Retrofit Detention Vault located at NE 76th Place

### Employee Cost Breakdown by Classification

| | Section Manager (Hrs) | Engineer 3 (Hrs) | Engineer 2 (Hrs) | Engineer 1 (Hrs) | Total Hours per Task | Total Project Salary $ | Total Benefits $ | Total Indirect $ | Grand TOTAL $ | Total Elgible Employee Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| **TASK** | | | | | | | | | | |
| *Task 1. Project Management* | 20.00 | 80.00 | | | 100.00 | | | | | |
| *Task 2. Design and Procurement* | | 80.00 | 80.00 | 80.00 | 240.00 | | | | | |
| *Task 3. Construction and Close Out* | | 80.00 | 80.00 | 40.00 | 200.00 | | | | | |
| *Task 4. Public Involvement* | | 40.00 | 20.00 | 10.00 | 70.00 | | | | | |
| **Total Hrs per Classification** | 20.00 | 280.00 | 180.00 | 130.00 | 610.00 | | | | | |
| Salary Rate By Classification ($/HR) | $64.48 | $49.86 | $44.17 | $39.19 | | | | | | |
| Total Salary Cost ($) by Classification | $1,289.67 | $13,960.30 | $7,951.23 | $5,094.53 | | $28,295.73 | | | | |
| Benefits Cost ($) 68.08% of salary | $878.01 | $9,504.17 | $5,413.19 | $3,468.36 | | | $19,263.74 | | | |
| Indirect Costs ($) 66.4% of salary | $856.34 | $9,269.64 | $5,279.61 | $3,382.77 | | | | $18,788.37 | | |
| **Total Cost ($) by Classification** | $3,024.03 | $32,734.12 | $18,644.03 | $11,945.66 | | | | | $66,347.84 | $59,449.34 |

NOTE: Using 2016 rates as proxy average for project spanning 2016-2018
NOTE: Using indirect and benefit multipliers from D. Hess and Salary rates.
NOTE: Assume pd is part of benefits
NOTE: Total Elgible Cost calculated as: (Total Benefits + Total Salary) times 1.25

### Total Cost Breakdown By Task

| Cost Item | Employee Salary ($/HR) | Task 1 | Task 2 | Task 3 | Task 4 |
|---|---|---|---|---|---|
| | | | | | |
| Section Manager (Curt Crawford) | $64.48 | 20.00 | | | |
| Engineer 3 (Claire Jonson, Rachel Berryessa) | $49.86 | 80.00 | 80.00 | 80.00 | 40.00 |
| Engineer 2 (Dale Nelson, Bob Pendergast) | $44.17 | | 80.00 | 80.00 | 20.00 |
| Engineer 1 (Lica Dulan) | $39.19 | | 80.00 | 40.00 | 10.00 |
| **Total Task Hours** | | 100.00 | 240.00 | 200.00 | 70.00 |
| Total Task Salary Cost | | $5,278.33 | $10,657.63 | $9,090.08 | $3,269.69 |
| Total Task Benefit Cost@ 68.08% of salary | | $3,593.49 | $7,255.72 | $6,188.53 | $2,226.00 |
| Total Task Indirect Cost @ 66.4% salary | | $3,504.81 | $7,076.67 | $6,035.82 | $2,171.07 |
| Contract Work for Soils Testing | | | $10,000.00 | | |
| Contract Work for Construction and Materials - see Attachment C1 | | | | $118,828.71 | |
| Grand Total of Each Task | | $12,376.63 | $34,990.02 | $140,143.13 | $7,666.76 |
| Total Task Eligible Cost | | $11,089.78 | $32,391.69 | $137,926.97 | $6,869.61 |

| | |
|---|---|
| 610.00 | **Total Hours** |
| $28,295.73 | **Total Project Salary $** |
| $19,263.74 | **Total Benefits $** |
| $18,788.37 | **Total Indirect $** |
| $10,000.00 | **Contract Work for Soils Testing** |
| $118,828.71 | **Contract Work for Construction and Materials** |
| **$195,176.54** | **Grand TOTAL $** |

$195,176.54

| | | | | | |
|---|---|---|---|---|---|
| | **Appendix F-1 Retrofit Detention Vault Construction Cost** | | | Prepared by: | CJ |
| **NOTE: ENGINEER'S SHEET ONLY FOR COMPARISON TO BID SUBMITTALS, NOT FOR PUBLIC USE** | | | | Date: | 12/10/2014 |
| Evans Creek Tributary 108 Stormwater Retrofit Detention Vault at NE 76th Place | | | | | |
| **Contract Item No.** | | **Unit** | **Unit Price** | **Approx. Quantity** | **Construction Cost** |
| | **Earthwork** | | | | |
| | Gravel Borrow for Backfill | TON | 35.00 | 150 | $ 5,250.00 |
| | CUT: Unsuitable Foundation, incl. Haul | CY | 50.00 | 203 | $ 10,150.00 |
| | Crushed Surfacing Base Course | TON | 50.00 | 24 | $ 1,200.00 |
| | Crushed Surfacing Top Course | TON | 44.00 | 27 | $ 1,188.00 |
| | **SubTotal** | | | | **$ 17,788.00** |
| | | | | | |
| | **Drainage** | | | | |
| | Pipe - 12 In. Diam. LCPEP | LF | 50.00 | 75 | $ 3,750.00 |
| | Pipe bedding - 5/8 minus | CY | 25.00 | 3 | $ 75.00 |
| | Catch Basin Type 1L | EACH | 1,500.00 | 2 | $ 3,000.00 |
| | Detention Vaults | EACH | 50,000.00 | 1 | $ 50,000.00 |
| | **SubTotal** | | | | **$ 56,825.00** |
| | | | | | |
| | | | | | |
| | **Temporary Erosion Control** | | | | |
| | ***Temporary Water Pollution / Erosion Control*** | | | | |
| | Bypass - pump (1 month) | FA | 5,000.00 | 1 | $5,000.00 |
| | SWPPP. Straw Mulch, Filter Fabric Fence; Sand Bag Check Dams | FA | 5,000.00 | 1 | $5,000.00 |
| | **SubTotal** | | | | **$10,000.00** |
| | | | | | |
| | **Miscellaneous** | | | | |
| | Traffic Control | Day | 400.00 | 5 | $2,000.00 |
| | | | | | |
| | **SubTotal** | | | | **$2,000.00** |
| | | | | | |
| | ***Grand SubTotal*** | | | | $86,613.00 |
| | *Mobilization (15% of Grand SubTotal)* | | | | $12,991.95 |
| | ***Total*** | | | | **$99,604.95** |
| | | | | | |
| | ***Sales Tax*** | | 9% | | $9,263.26 |
| | ***Construction Changes (min 10%)*** | | 10% | | $9,960.50 |
| | | | | | |
| | | | | | |
| | ***Grand Total*** | | | | **$118,828.71** |