

# Preliminary Technical Information Report

Engineering **ABOVE** The Standard.

## Silver Short Plat City of Lake Forest Park, WA

**Prepared By:**

LDC, Inc.  
14201 NE 200th Street, #100  
Woodinville, Washington 98072

**Prepared For:**

Larry and Betty Silver  
5020 NE 187th Street  
Lake Forest Park, Washington 98155

# LDC

THE CIVIL ENGINEERING GROUP

Civil Engineering • Land Survey • Land Use Planning

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# SILVER SHORT PLAT

Permit: \_\_\_\_\_

## *Technical Information Report*

Prepared for

**Larry and Betty Silver**

5020 NE 187<sup>th</sup> Street  
Lake Forest Park, WA 98155  
(425) 864-8829

**Camelot Society**

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Mountlake Terrace, WA 98043  
(425) 771-2108

Prepared by

**LDC, Inc.**

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**REVISION**



**RECEIVED**

**JAN 12 2016**

**City of Lake Forest Park**

**January 2016**

**Job No: 14-181**

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## 1 PROJECT OVERVIEW

The Silver Short Plat project proposes to subdivide one parcel into three lots. One existing residence will remain and two additional homes will be constructed. The new impervious cover proposed for the project is 10,465 SF, less than 5,000 SF of which will be pollution generating impervious surface (PGIS). The residential short plat subdivision development subject property is approximately 0.86 acres. The existing single family home structure, outbuildings and driveway surfaces will remain largely undisturbed. Proposed development will disturb approximately 0.52 acres of the subject property, and 0.34 acres will remain undisturbed.

A Lot Line Adjustment (LLA) will revise the previous parcel boundaries (involving residences addressed as 5020 NE 187<sup>th</sup> Street and 5027 NE 188<sup>th</sup> Street), creating a new boundary for the proposed subject property. The LLA will be processed concurrently to the proposed subdivision development. For purposes of this report, it is assumed that the LLA has already been established, and 5027 NE 188 St. is no longer inclusive to the proposed subdivision subject property. Please see Figure 3.0, Existing Conditions map for previous parcel boundaries and the proposed subject property boundary.

The subject property involves one parcel (parcel number is undetermined at this time) located in the city of Lake Forest Park, Washington. The subject property is located at 5020 NE 187<sup>th</sup> Street, Lake Forest Park, Washington in the SE ¼ of Section 3, Township 26 N, Range 4 E.

In the developed condition, newly proposed lots (lots 2 and 3) will be accessed from NE 188<sup>th</sup> St. via a private drive access tract (Tract A). Access to lot 1 will remain unaltered; lot 1 will continue access via existing private driveway from NE 187<sup>th</sup> St.

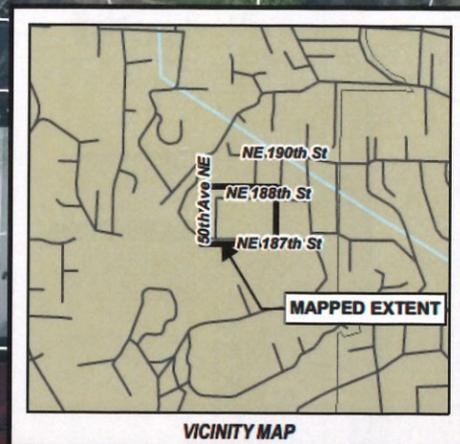
The subject property is currently developed with one single-family residence and associated outbuildings. USGS identifies soils as glacial till soils (Qvt). Topographical survey reveals mild site slopes, ranging from 0-15%, generally sloping west to east. The existing topography represents grading affected by the existing homes onsite.

In the existing condition, runoff from the site travels overland generally to the east and discharges the site at one of three natural discharge locations. All three downstream flowpaths converge within 1/4 mile of the subject property and therefore the subject property represents one threshold discharge area (TDA). The downstream flow paths are described in further detail in section 3.0, Offsite Analysis. The subject property is tributary to the Cedar River and Lake Washington in respective sequence.

Flow Control BMP Basic Dispersion will be applied to the proposed roof surfaces (Lots 2 and 3), and pervious concrete will be applied to the Tract access road and driveways (lots 2 and 3) to meet the Large Lot High Impervious BMP Requirements per the 2009 KCSWDM 5.2.1.3. Flow control facility is not required per the 0.1-cfs exception from the area-specific flow control facility requirement in Section 1.2.3.1, subsection B.2 "Exceptions". Water quality treatment for discharged stormwater is not required per 1.2.8 "Exemption from Core Requirement" #8, subsection 1.a "Surface Area Exemption". Additional discussion regarding the exemption of this project from flow control and water quality requirements can be found in section 4.0 of this report, "Flow Control/Water Quality Facility Analysis and Design".

This TIR and stormwater site plan design was produced in accordance with the 2009 King County Surface Water Design Manual (2009 KCSWDM) as adopted by the City of Lake Forest Park.

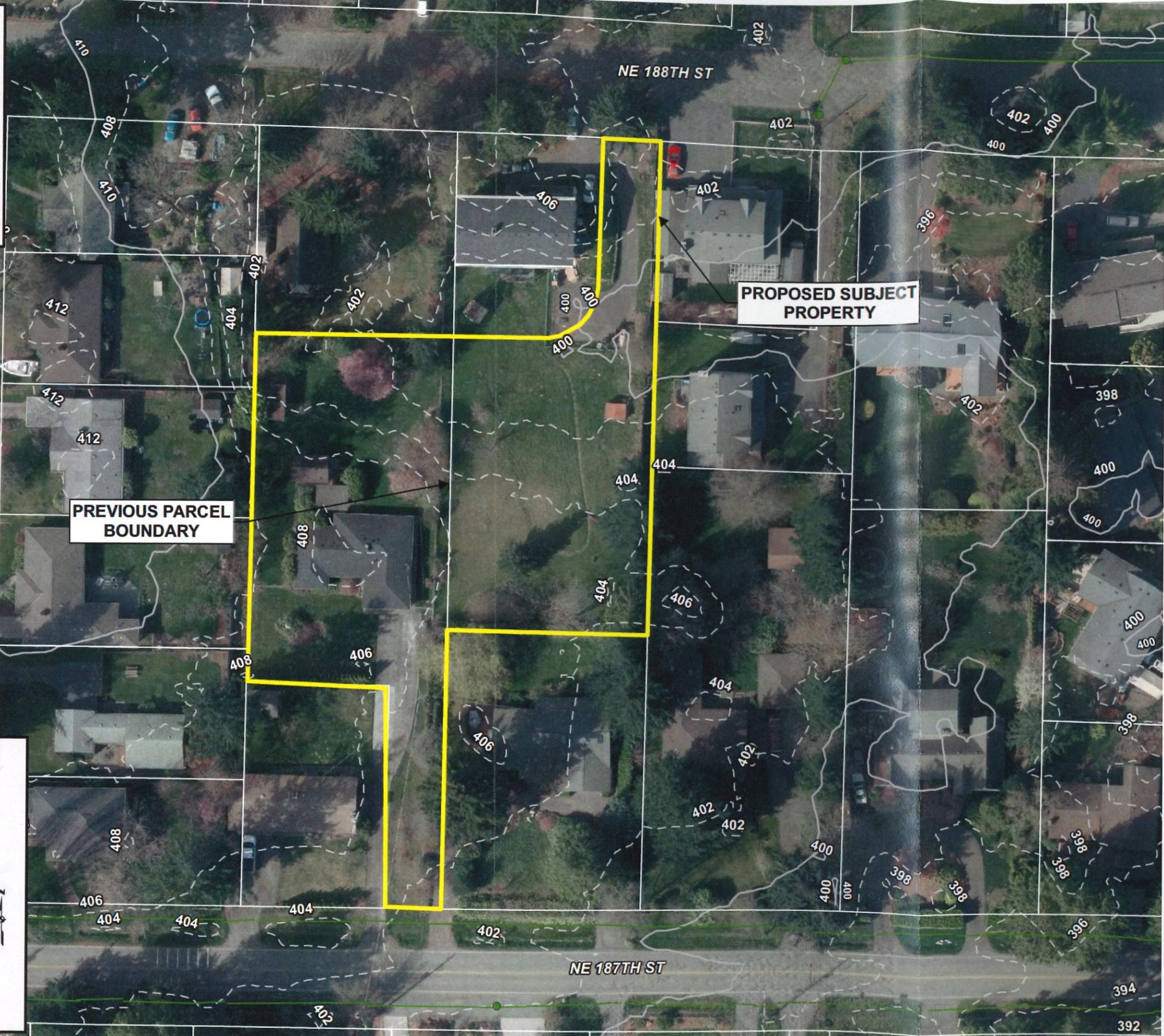
15-553F2ExistingConditionsMap.mxd | MOD: 08/24/2015 | TPA



**LEGEND**

- Subject Property
- Existing Storm System
- Existing Catch Basin
- Parcel Boundary
- Watercourse
- Contours (LIDAR)**
- 10 Foot Contour
- 2 Foot Contour

Scale in Feet  
0 50 100



SOURCE INFORMATION	
SOURCE AGENCY	DESCRIPTION
KING COUNTY GIS	PARCEL BOUNDARY, HYDROLOGY
KING COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
CITY OF KENMORE GIS	UTILITIES

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Commercial  
Infrastructure  
Residential

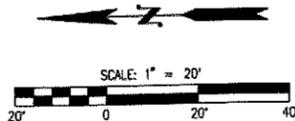
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**LARRY SILVER**

**SILVER SHORT PLAT**  
EXISTING CONDITIONS MAP

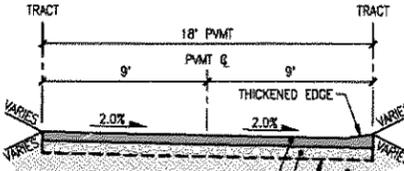
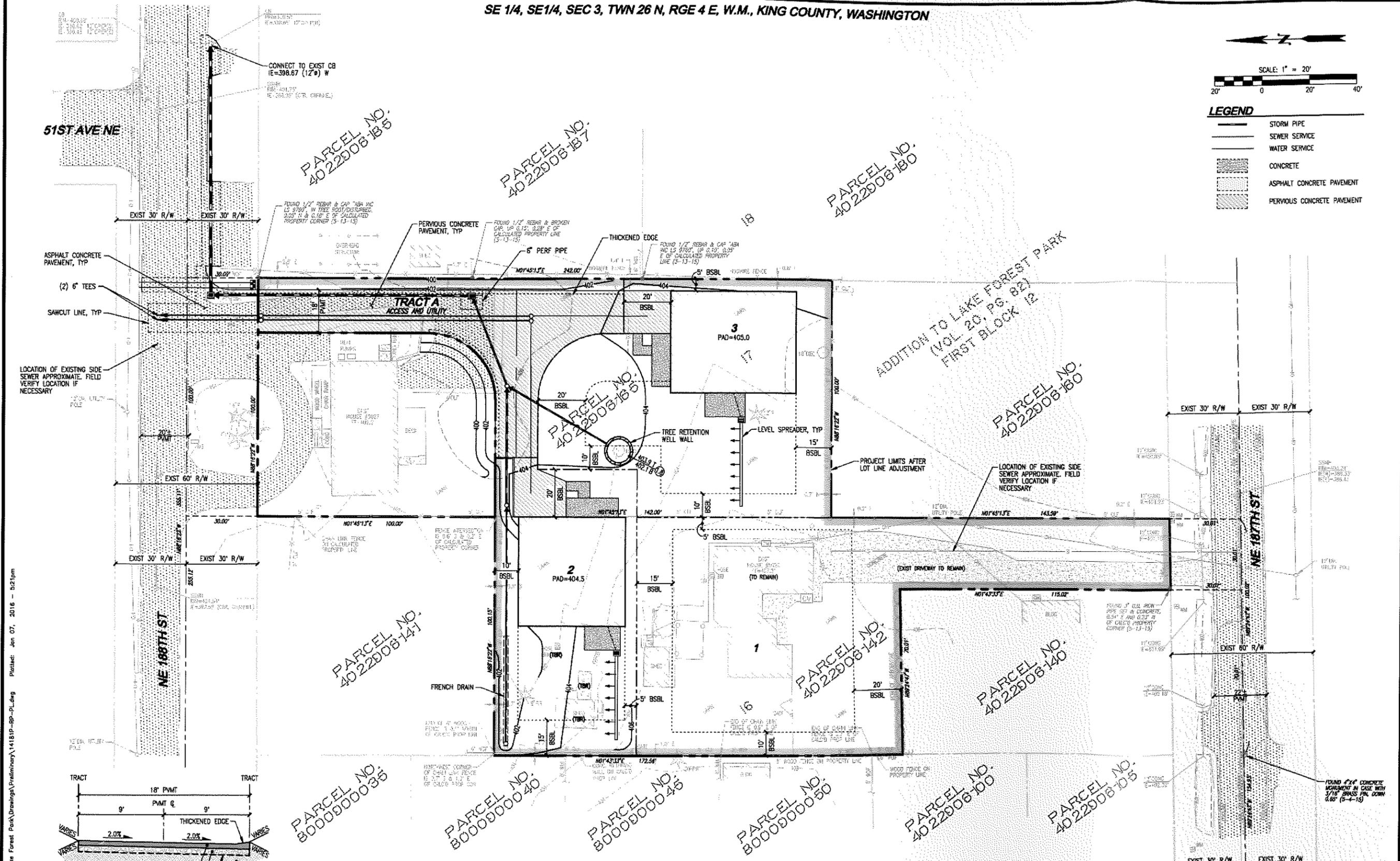
PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET
REVISION:
JOB NUMBER: 15-553
DRAWING NAME: 15-553F02
DESIGNER: D. WESTLEY
DRAWING BY: LABBOTT
DATE: 08-24-15
SCALE: AS SHOWN
JURISDICTION: KENMORE

**FIGURE: 2.0**



**LEGEND**

- STORM PIPE
- SEWER SERVICE
- WATER SERVICE
- CONCRETE
- ASPHALT CONCRETE PAVEMENT
- PERVIOUS CONCRETE PAVEMENT



**TRACT A ROAD SECTION**  
SCALE: 1"=5'

6" POROUS/PERVIOUS CONCRETE MEETING ACI 522.1-B SPECIFICATION FOR PERVIOUS CONCRETE

8" CSBC MIN. COMPACTED 95% MODIFIED PROCTOR CSBC WILL BE GRADED SMOOTH TO REFLECT FINISH GRADE. MIN. 20% VOID RATIO

POROUS PAVEMENT NON-WOVEN GEOTEXT AT INTERFACE WITH AGGREGATE (SIDES AND BOTTOM)

COMPACT SUB-GRADE  
90% MODIFIED PROCTOR OR FIRM UNYIELDING

**PERVIOUS PAVEMENT NOTES**

1. AN UNDER DRAIN IS NOT REQUIRED.
2. BASE MATERIAL MAY BE BELOW EXISTING GRADE.
3. CSBC TO BE PER WASHINGTON DEPT. OF TRANSPORTATION STANDARD SPECIFICATIONS 9-03.9(2) (20% MIN. VOIDS).
4. POROUS PAVEMENT SUBGRADE SLOPE=4.0% (MAX).
5. POROUS CONCRETE SHALL BE TESTED USING THE BUCKET TEST AS OUTLINED IN SECTION 7.6 OF APPENDIX C OF VOLUME 3 OF THE 2005 DGE SMWW.
6. INSPECT PERIODICALLY TO DETERMINE IF SURFACE IS BEING PLUGGED BY FINE MATERIAL.

**TOPOGRAPHIC DISCLAIMER**

THE TOPOGRAPHIC SURVEY WAS PERFORMED BY LDC, INC. IN MAY 2015. ANY CHANGES TO THE SITE AFTER THIS DATE WILL NOT BE REFLECTED IN THE PLANS. ANY DISCREPANCIES FOUND BETWEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.

Call 2 Business Days Before You Dig  
811 or 1-800-424-5555  
Utilize Underground Location Center

NO.	DATE	DESCRIPTION

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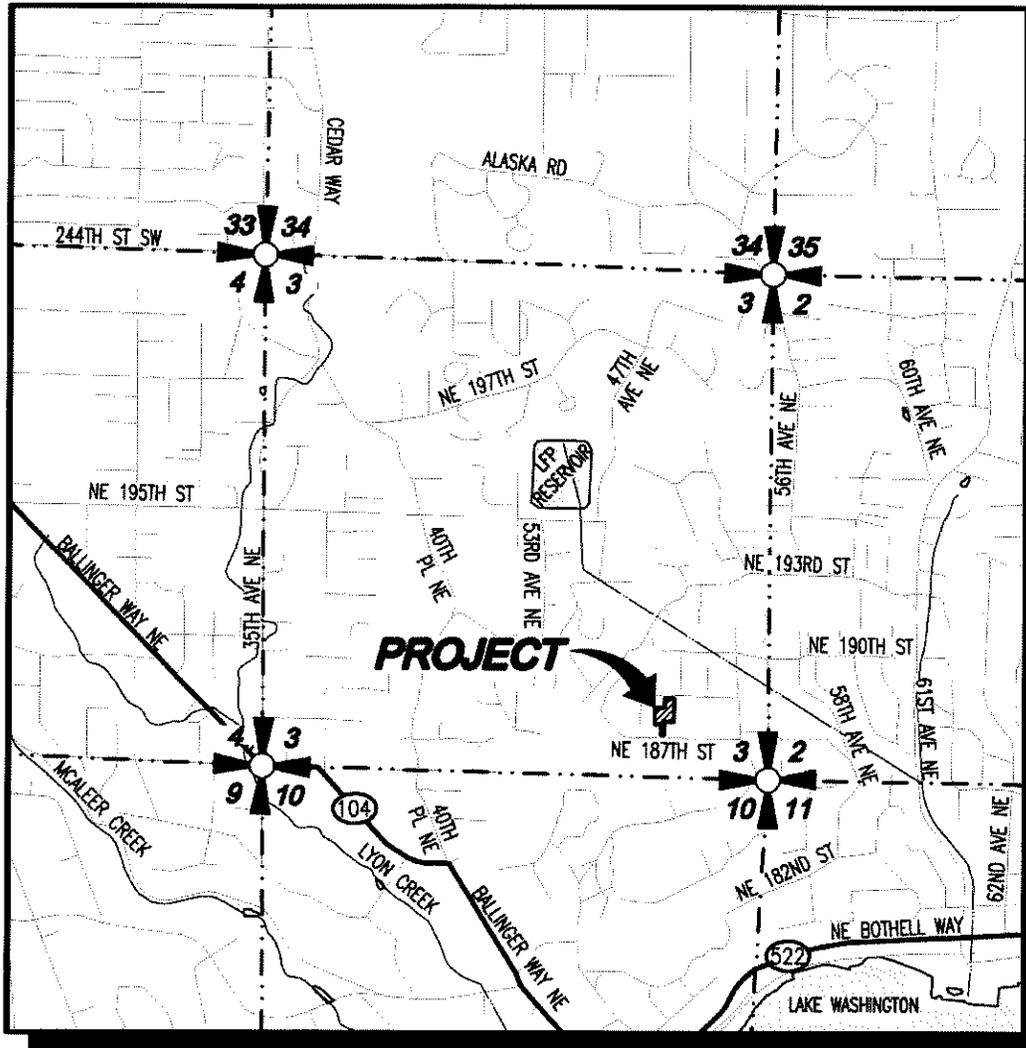
Engineering  
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Planning  
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LARRY AND BETTY SILVER  
**SILVER SHORT PLAT**  
PRELIMINARY ROAD, GRADING AND UTILITY PLAN



JOB NUMBER: 14-181P  
DRAWING NAME: 14181P-RP-PL  
DESIGNER: MWM  
DRAFTING BY: RMD  
DATE: 9-01-15  
SCALE: 1"=20'  
JURISDICTION: LAKE FOREST PARK



**VICINITY MAP**

SCALE: 1"=2000'

Drawing: F:\2014\14-181 Silver SP Lake Forest Park\Exhibits\14181E-VI.dwg Plotted: Aug 25, 2015 - 11:01am

**LDC**

THE CIVIL ENGINEERING GROUP

Engineering  
Structural  
Planning  
Survey

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LARRY AND BETTY SILVER

**SILVER SHORT PLAT**

VICINITY MAP

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER
Project Owner <u>Larry &amp; Betty Silver</u>
Phone <u>(425) 771-2108</u>
Address <u>5020 NE 187th Street</u>
<u>Lake Forest Park, WA 98155</u>
Project Engineer <u>Matthew Merritt, P.E.</u>
Company <u>LDC, Inc.</u>
Phone <u>(425) 806-1869</u>

Part 2 PROJECT LOCATION AND DESCRIPTION
Project Name <u>Silver Short Plat</u>
DDES Permit # _____
Location Township <u>26 N</u>
Range <u>4 E</u>
Section <u>3</u>
Site Address <u>5027 NE 188th St.</u>
<u>Lake Forest Park, WA 98028</u>

Part 3 TYPE OF PERMIT APPLICATION
<input checked="" type="checkbox"/> Landuse Services Subdivison / <u>Short Subd</u> / UPD
<input type="checkbox"/> Building Services M/F / Commerical / SFR
<input checked="" type="checkbox"/> Clearing and Grading
<input checked="" type="checkbox"/> Right-of-Way Use
<input type="checkbox"/> Other _____

Part 4 OTHER REVIEWS AND PERMITS	
<input type="checkbox"/> DFW HPA	<input type="checkbox"/> Shoreline Management
<input type="checkbox"/> COE 404	<input type="checkbox"/> Structural Rockery/Vault/_____
<input type="checkbox"/> DOE Dam Safety	<input type="checkbox"/> ESA Section 7
<input type="checkbox"/> FEMA Floodplain	
<input type="checkbox"/> COE Wetlands	
<input type="checkbox"/> Other _____	

Part 5 PLAN AND REPORT INFORMATION	
<b>Technical Information Report</b>	<b>Site Improvement Plan (Engr. Plans)</b>
Type of Drainage Review <u>Full</u> / Targeted / (circle): Large Site	Type (circle one): <u>Full</u> / Modified / Small Site
Date (include revision dates): _____	Date (include revision dates): _____
Date of Final: _____	Date of Final: _____

Part 6 ADJUSTMENT APPROVALS <b>NA</b>
Type (circle one): Standard / Complex / Preapplication / Experimental / Blanket
Description: (include conditions in TIR Section 2)
_____
_____
Date of Approval: _____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 7 MONITORING REQUIREMENTS NA	
Monitoring Required: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Describe: _____ _____ _____
Start Date: _____	
Completion Date: _____	

Part 8 SITE COMMUNITY AND DRAINAGE BASIN
Community Plan : <u>NA</u>
Special District Overlays: <u>NA</u>
Drainage Basin: <u>Cedar River Basin</u>
Stormwater Requirements: <u>Conservation Flow Control (Level 2)</u>

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS	
<input type="checkbox"/> River/Stream _____	<input type="checkbox"/> Steep Slope _____
<input type="checkbox"/> Lake _____	<input type="checkbox"/> Erosion Hazard _____
<input type="checkbox"/> Wetlands _____	<input type="checkbox"/> Landslide Hazard _____
<input type="checkbox"/> Closed Depression _____	<input type="checkbox"/> Coal Mine Hazard _____
<input type="checkbox"/> Floodplain _____	<input type="checkbox"/> Seismic Hazard _____
<input type="checkbox"/> Other _____	<input type="checkbox"/> Habitat Protection _____
	<input type="checkbox"/> _____

Part 10 SOILS		
Soil Type	Slopes	Erosion Potential
<u>Glacial Till (Qvt)</u>	<u>6 - 15%</u>	<u>None</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
<input type="checkbox"/> High Groundwater Table (within 5 feet)	<input type="checkbox"/> Sole Source Aquifer	
<input type="checkbox"/> Other <u>Poor Infiltration (less than 0.25 in/hr)</u>	<input type="checkbox"/> Seeps/Springs	
<input type="checkbox"/> Additional Sheets Attached		

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 11 DRAINAGE DESIGN LIMITATIONS	
REFERENCE	LIMITATION / SITE CONSTRAINT
<input type="checkbox"/> Core 2 – Offsite Analysis	_____
<input type="checkbox"/> Sensitive/Critical Areas	_____
<input type="checkbox"/> SEPA	_____
<input type="checkbox"/> Other	_____
<input type="checkbox"/> _____	_____
<input type="checkbox"/> Additional Sheets Attached	

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)	
<b>Threshold Discharge Area:</b> Onsite Basin (name or description)	
<b>Core Requirements (all 8 apply)</b>	
Discharge at Natural Location	Number of Natural Discharge Locations: 3
Offsite Analysis	Level: 1 / 2 / 3 dated: 5/18/2015
Flow Control (incl. facility summary sheet)	Level: 1 / 2 / 3 or Exemption Number <small>0.1cfs flow control facility exception</small>
Conveyance System	Small Site BMPs
	Spill containment located at: TBD
Erosion and Sediment Control	ESC Site Supervisor: TBD Contact Phone: After Hours Phone:
Maintenance and Operation	Responsibility: Private / Public If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: Yes / No
Water Quality (include facility summary sheet)	Type: Basic / Sens. Lake / Enhanced Basicm / Bog or Exemption No. <small>Surface Area Exemption, 2009 KCSWDM 1.2.8, subsection 1.a</small>
	Landscape Management Plan: Yes / No
<b>Special Requirements (as applicable)</b>	
Area Specific Drainage Requirements	Type: CDA / SDO / MDP / BP / LMP / Shared Fac. None
	Name: _____
Floodplain/Floodway Delineation	Type: Major / Minor / Exemption / None
	100-year Base Flood Elevation (or range): _____
	Datum: _____
Flood Protection Facilities	Describe: NA
Source Control (comm./industrial landuse)	Describe landuse: NA Describe any structural controls: _____

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Oil Control	High-use Site: Yes / <b>No</b> Treatment BMP: _____  Maintenance Agreement: Yes / <b>No</b> with whom? _____
<b>Other Drainage Structures</b>	
Describe:	

Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS	
<p style="text-align: center;"><b>MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Clearing Limits</li> <li><input checked="" type="checkbox"/> Cover Measures</li> <li><input checked="" type="checkbox"/> Perimeter Protection</li> <li><input checked="" type="checkbox"/> Traffic Area Stabilization</li> <li><input checked="" type="checkbox"/> Sediment Retention</li> <li><input checked="" type="checkbox"/> Surface Water Collection</li> <li><input checked="" type="checkbox"/> Dewatering Control</li> <li><input checked="" type="checkbox"/> Dust Control</li> <li><input checked="" type="checkbox"/> Flow Control</li> </ul>	<p style="text-align: center;"><b>MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Stabilize Exposed Surfaces</li> <li><input checked="" type="checkbox"/> Remove and Restore Temporary ESC Facilities</li> <li><input checked="" type="checkbox"/> Clean and Remove All Silt and Debris, Ensure Operation of Permanent Facilities</li> <li><input type="checkbox"/> Flag Limits of SAO and open space preservation areas</li> <li><input type="checkbox"/> Other _____</li> </ul>

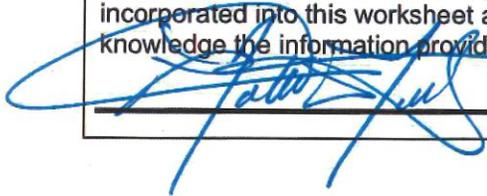
Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch)			
Flow Control	Type/Description	Water Quality	Type/Description
<input type="checkbox"/> Detention	Not Applicable	<input type="checkbox"/> Biofiltration	_____
<input type="checkbox"/> Infiltration	_____	<input type="checkbox"/> Wetpool	_____
<input type="checkbox"/> Regional Facility	_____	<input type="checkbox"/> Media Filtration	_____
<input type="checkbox"/> Shared Facility	_____	<input type="checkbox"/> Oil Control	_____
<input checked="" type="checkbox"/> Flow Control BMPs	Basic Dispersion	<input type="checkbox"/> Spill Control	_____
<input type="checkbox"/> Other	_____	<input type="checkbox"/> Flow Control BMPs	_____
		<input type="checkbox"/> Other	Not Applicable

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 15 EASEMENTS/TRACTS	Part 16 STRUCTURAL ANALYSIS
<input type="checkbox"/> Drainage Easement <input type="checkbox"/> Covenant <input type="checkbox"/> Native Growth Protection Covenant <input type="checkbox"/> Tract <input type="checkbox"/> Other	<input type="checkbox"/> Cast in Place Vault <input type="checkbox"/> Retaining Wall <input type="checkbox"/> Rockery > 4' High <input type="checkbox"/> Structural on Steep Slope <input type="checkbox"/> Other

Part 17 SIGNATURE OF PROFESSIONAL ENGINEER

I, or a civil engineer under my supervision, have visited the site. Actual site conditions as observed were incorporated into this worksheet and the attached Technical Information Report. To the best of my knowledge the information provided here is accurate.



8/25/2015

Signed/Date

## 2 Conditions and Requirements Summary

This report was produced in accordance with the 2009 King County Surface Water Design Manual (2009 KCSWDM) as adopted by the city of Lake Forest Park and applicable City of Lake Forest Park Municipal Code. Per Chapter I of the Manual, the proposed development requires a Full Drainage Review, meeting all eight core requirements as well as all five special requirements, since more than 2,000 square feet of new impervious surfaces and more than 7,000 sf of land disturbing activities. This project does not qualify for a Small Project Drainage review as it will result in more than 10,000 SF of total impervious surface. A summary of how each of the minimum requirements is met is described in further below.

**Core Requirement #1: Discharge at the Natural Location:** Per 2009 KCSWDM 1.2.1 all surface and storm water runoff from a project must be discharged at the natural location so as not to be diverted onto or away from downstream properties. Three natural discharge locations exist on the subject property and all will be utilized in the developed condition. Natural discharge locations further described in section 3.0, Offsite Analysis.

**Core Requirement #2: Offsite Analysis:** All proposed projects must submit an offsite analysis report that assesses potential offsite drainage and a water quality impacts associated with the proposed development of the project site, and proposes appropriate mitigation of those impacts. A level 1 offsite analysis was conducted and at minimum is required per 2009 KCSWDM 1.2.2. The upstream and downstream flow paths are clearly identified and further described in section 3.0. See Offsite Analysis in Section 3 of this report.

**Core Requirement #3: Flow Control:** Per City of Lake Forest Park Municipal Code 16.24.170B the entire city corporate limits of the city of Lake Forest Park are within the conservation flow control area (level 2 flow control). Flow control facility is not required per the 0.1-cfs exception from the area-specific flow control facility

requirements in Section 1.2.3.1, subsection B.2 "Exceptions" as the proposed improvements will not produce a peak flow increase exceeding 0.1 cfs. Flow Control BMP Basic Dispersion will be applied to the proposed roof surfaces (Lots 2 and 3), and pervious concrete will be applied to the Tract access road and driveways (lots 2 and 3) to meet the Large Lot High Impervious BMP Requirements per the 2009 KCSWDM 5.2.1.3. See Flow Control/Water Quality Facility Analysis and Design, section 4.0 of this report.

**Core Requirement #4: Conveyance System:** Per 2009 KCSWDM 1.2.4.1 the new pipe system for this project shall be designed with sufficient capacity to convey and contain the 25-year peak flow at minimum and all peak flow between the 25 and 100 year runoff event does not create or aggravate a severe flooding problem or severe erosion problem. The proposed project's new pipe system will be sized to adequately convey the 100-year storm event. See Conveyance System Analysis and Design, section 5.0, for additional information regarding conveyance design and analysis.

**Core Requirement #5: Erosion and Sediment Control:** See CSWPPP Analysis and Design, Section 8 of this Report for the SWPPP BMP Elements.

**Core Requirement #6: Maintenance and Operations:** All public facilities will be maintained by the City of Lake Forest Park. See Operations and Maintenance in Section 5 of this report.

**Core Requirement #7: Financial Guarantees and Liability:** Any required performance or assurance bonds will be posted with the City as required.

**Core Requirement #8: Water Quality:** Per City of Lake Forest Park municipal code 16.24.170C, this project must meet the requirements of the basic water quality treatment per 2009 KCSWDM section 1.2.8. Per 1.2.8 "Exemption from Core Requirement" #8, subsection 1.a "Surface Area Exemption", water quality treatment for discharged stormwater is not required as less than 5,000 SF of pollution generating

impervious surface is proposed (PGIS). See Flow Control/Water Quality Facility Analysis and Design, section 4.0 of this report, for additional information.

**Special Requirement #1: Other Adopted Area-Specific Requirements:** There are no Critical Drainage Areas, Master Drainage Plans, Basin Plans, Salmon Conservation Plans, Stormwater Compliance Plans, Lake Management Plans, Flood Hazard Reduction Plan Updates, or Shared Facility Drainage Plans within the vicinity of this project. Therefore, this requirement does not apply to the project.

**Special Requirement #2: Flood Hazard Area Delineation:** Per the FEMA Flood Insurance Rate Map 53033C0044 F, the site is located in Zone X corresponding to an area outside of the 500-year flood plain. There are no flood hazard areas (100-year floodplains, zero-rise flood fringe, zero-rise floodway, FEMA floodway, or channel migration zones) on or adjacent to this site. Therefore, this requirement does not apply to the project.

**Special Requirement #3: Flood Protection Facilities:** There are no levees or revetments on or adjacent to this site. Therefore this requirement does not apply to the project.

**Special Requirement #4: Source Controls:** Source controls are not required for residential sites. Therefore, this requirement does not apply to the project.

**Special Requirement #5: Oil Control:** Only commercial or industrial sites are defined as high-use sites. Therefore, this requirement does not apply to the project.

### 3.0 OFFSITE ANALYSIS

#### Task 1. Study Area Definition and Maps

King County LiDAR, onsite engineering survey, and 2012 aerial photography were the best topographical references available for the area containing the site. The limits of downstream analysis extended roughly 0.25 miles beyond the subject property (See figure 5.0, Offsite Analysis Map). The project site is tributary to the Cedar River and Lake Washington in respective sequence.

#### Task 2. Resource Review

All of the resources below have been reviewed for existing and potential issues near the project site:

- **Adopted Basin Plans**

No Adopted Basin Plans were located that include the project site.

- **Drainage Basin**

This site is located within the Cedar River drainage basin.

- **Floodplain / Floodway (FEMA) maps**

According to King County Stormwater iMAP and FEMA mapping (floodplain map #53033C0063 G) this project is not within a floodplain.

- **Sensitive Areas**

According to King County iMAP and FEMA floodplain mapping, no floodplains or floodways exist in the natural downstream flowpath (within ¼ mile of the subject property).

- **Drainage Complaints and Studies**

According to King County iMap, five formal drainage complaints located in the primary downstream flow path (flow path 1) have been recorded. These are not applicable per section 2.3.1.1, “drainage complaints that are more than 10

years old are not required for Level 1 downstream analysis". Additionally, developed discharge will follow to downstream flowpath 1.

- **Road Drainage Problems**

No issues were identified near the proposed site.

- **USGS Soil Survey**

According to the USGS soil mapping, site soils consist of Glacial Till (Qvt). See Appendix 3-C for Soil Map, King County Area, Washington and soil classification description.

- **Wetland Inventory Maps**

There are no wetland areas located on or downstream of the proposed subject property.

- **Migrating River Studies**

Migrating River Studies are considered to be not applicable to the proposed site development as the subject property is not located near a migrating river channel.

- **Section 303d List of Polluted Waters**

Washington State Department of Ecology's Water Quality Assessment for Washington 303d do not contain listings for the Cedar River downstream from the subject property.

- **King County Water Quality Problems**

The site is located in a Basic Water Quality Treatment Area. The TIR and plans shall comply with the 2009 KCSWDM chapter 6.

- **Stormwater Compliance Plans**

Not applicable to the proposed project.

### **Task 3. Field Inspection**

On May 18<sup>th</sup> 2015, upstream and downstream analyses were performed at the site. The weather was mostly sunny and approximately 70°F. The ground was dry, and no overland flow was observed in the downstream flow paths. The following observations were verified during this site visit. Please refer to figure 5.0, Downstream Analysis Map, for reference locations.

#### **Upstream Analysis**

An upstream offsite basin is located along subject property's western property boundary. The upstream basin has been delineated using lidar contour data and is estimated to be approximately 0.45 acres of lawn and landscaped area. The upstream runoff is conveyed overland to the east, enters the site, continues as overland flow and exits the subject property at one of two flow paths, flow path 1 and flow path 2. The flow paths are described in further below.

#### **Downstream Analysis**

Three natural discharge locations, and tributary basins, are present on the subject property. All three downstream flow paths converge within a quarter mile of the subject property; the onsite basin represents one threshold discharge area. In the existing condition, Flow path 2 is the primary discharge location. In the developed condition, Flow path 1 is the proposed site discharge downstream flow path and is described below in detail.

#### **Flow Path 1**

Flow path 1 is discharged from the subject property along the northern property boundary at NE 188<sup>th</sup> St. These overland flows are conveyed atop of asphalt pavement in NE188th St. ROW and are collected in one of two roadside stormwater collection catch basins located just east of intersection 51<sup>st</sup> Ave NE & NE188th St.

Concentrated flows are conveyed through 12” concrete pipe and enter a type 1 catch basin located at intersection 52<sup>nd</sup> Ave NE and NE 188<sup>th</sup> St. No known outlet exists at this catch basin. See “Task 4. Drainage System Description and Problem Descriptions”, this section, for a more detailed description of the identified drainage problem.

It is assumed that (in large storm events) flows discharge this structure through the open grate lid of the catch basin, continue on as overland flow, are collected by downstream catch basin located on the northwest corner of intersection NE188th St. and 53<sup>rd</sup> Ave NE, and are conveyed to the south through 12” concrete pipe. These tightlined flows are then discharged into the roadside ditch located in the southwest corner of intersection NE188th St. and 53<sup>rd</sup> Ave NE②. Roadside ditch flows are conveyed to the south along 53<sup>rd</sup> Ave NE, through a series of 12” concrete driveway culverts③, and enter a catch basin structure located in the northwest corner of intersection NE 187<sup>th</sup> St. & 53<sup>rd</sup> Ave NE④. Flows are rerouted and conveyed to the east through a series of 18” concrete pipe and CB structures routed on the south side of NE 187<sup>th</sup> St. At this point we have satisfied the ¼ mile downstream assessment length as required in a level 1 offsite analysis.

**Flow Path 2**

Flow path 2 is the primary discharge location in the existing condition and is located along the eastern property boundary at a low point on the site. These flows discharge the site④ and are conveyed as surface flow through adjacent parcels through a series of private storm drain pipes, yard drains, and swales. No drainage easement exists for flow path 2 where it exists over private property. These flows eventually outlet from private property and discharge into a public roadside ditch on the south side of NE 188<sup>th</sup> St. just west of intersection NE 188<sup>th</sup> St & 53<sup>rd</sup> Ave NE⑤. At this location flows converge with the flow path 1 and continue on in the same course as described under flow path 1.

### **Flow Path 3**

Flow path 3 discharges the site along the southern and southeastern property boundaries. These flows are conveyed overland and are collected in a roadside ditch located on the north side of NE 187<sup>th</sup> St. The flows are conveyed due east through a series of open ditch roadside swales and 12" concrete driveway culverts. Flow path 3 converges with flow paths 1 and 2 at ROW catch basin structure located in the northwest corner of intersection NE 187<sup>th</sup> St & 53<sup>rd</sup> Ave NE ⑥ and continues on in the same flow path as described under flow path 1.

### **Task 4. Drainage System Description and Problem Descriptions**

Based on the offsite analysis and email correspondence with the City of Lake Forest Park, there is evidence of an existing downstream drainage problem near the city catch basin located in the intersection of 52<sup>nd</sup> Ave NE and NE 188<sup>th</sup> St, referenced as CB-7-3569 in Cities of Lake Forest Park / Kenmore Public Works Work Order # 35372. Correspondence with the city revealed that the CB originally outletted through a 12" concrete pipe that discharged to a roadside ditch along NE 188<sup>th</sup> St. At some point the ditchline was filled and the catch basin structure began to settle. According to city work order #35255, on July 18<sup>th</sup> 2014 the city plugged the outlet pipe and did not account for a method of discharge.

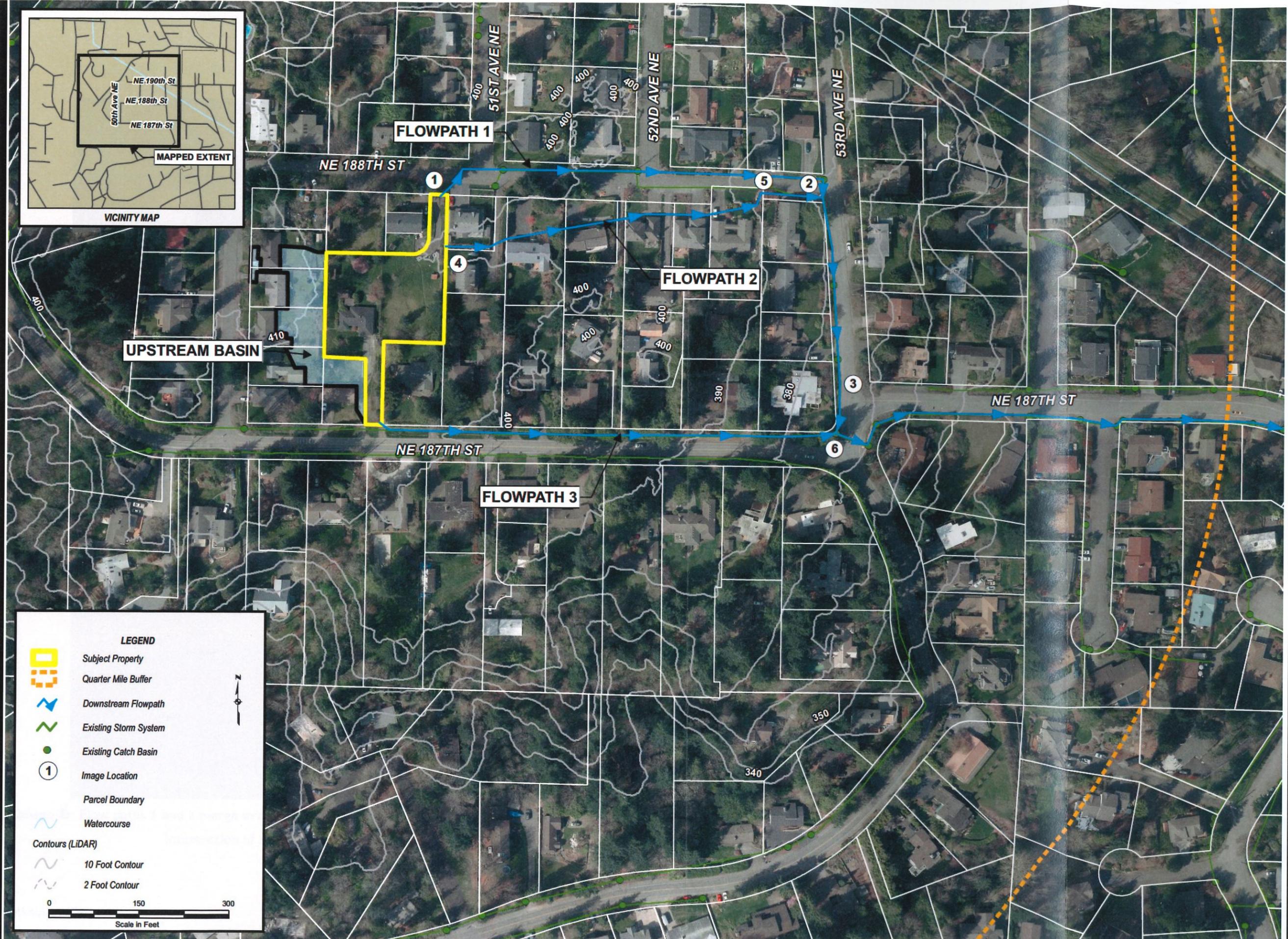
### **Task 5. Mitigation of Existing or Potential Drainage Issues**

Drainage problem identified in level 1 offsite analysis will require CB-7-3569 to properly discharge into the appropriate downstream conveyance flow path and shall be further evaluated by the City of Lake Forest Park.

**APPENDIX 3-A**

**UPSTREAM AND DOWNSTREAM ANALYSIS PHOTO RECORD (SEE FIGURE 5.0 FOR  
DOWNSTREAM ANALYSIS MAP)**

14-181F5.001SiteAnalysisMap.mxd | MOD: 08/24/2015 | DEW



SOURCE INFORMATION	
SOURCE AGENCY	DESCRIPTION
KING COUNTY GIS	PARCEL BOUNDARY, HYDROLOGY
KING COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY)
CITY OF KENMORE GIS	UTILITIES
	THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.

**LDC**  
 THE CIVIL ENGINEERING GROUP  
 14201 NE 200th St., #100  
 Woodinville, WA 98072  
 www.LDCorp.com  
 Ph: 425.805.1889  
 Fax: 425.482.2893

Commercial Infrastructure Residential

**LARRY SILVER**  
**SILVER SHORT PLAT**  
 OFFSITE ANALYSIS MAP

PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET
REVISION:
JOB NUMBER: 14-181
DRAWING NAME: 14-181F05
DESIGNER: D.WESTLEY
DRAWING BY: D.WESTLEY
DATE: 08-24-15
SCALE: AS SHOWN
JURISDICTION: KENMORE

**FIGURE:**  
**5.0**



Image ①: Flow path 1 discharges from the northern property line and enters NE188th St. ROW



Image ②: Flow paths 1 and 2 merge in roadside ditch located on the southwest corner at intersection of NE188th St. & 53<sup>rd</sup> Ave NE



Image ③: Flow paths 1 and 2 flow through a series of roadside ditch and 12" concrete driveway culverts along NE 188<sup>th</sup> St.

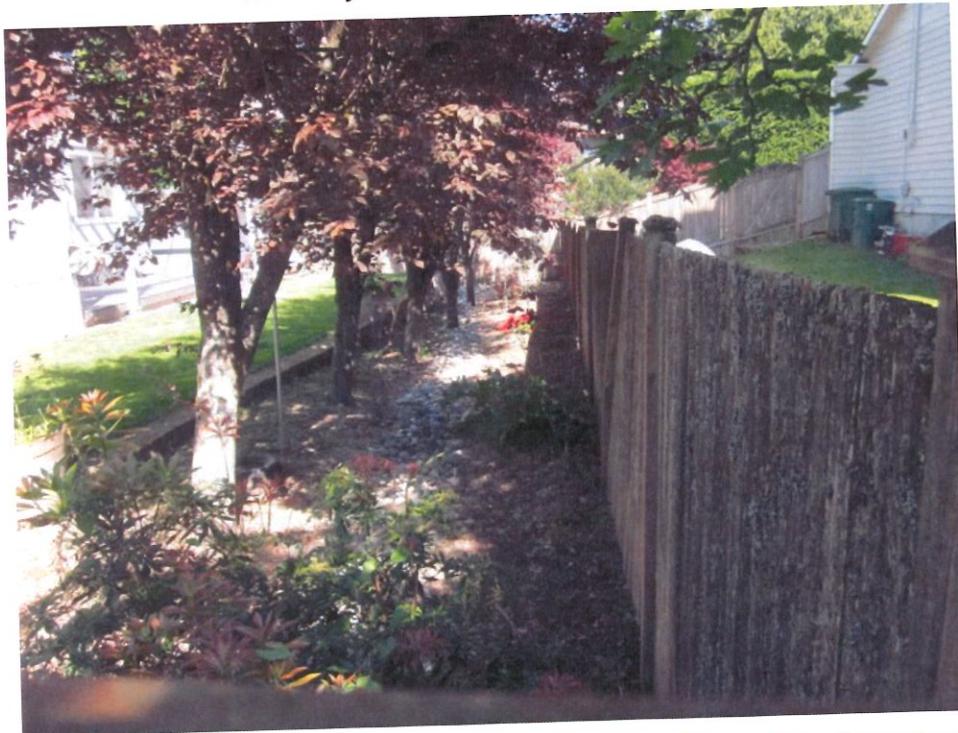


Image ④: Flow path 2 discharges the subject property and is conveyed overland and via underground pipe through adjacent private properties



Image ⑤: Flow path 2 outlets from private property and is discharged into NE 188<sup>th</sup> St. ROW roadside ditch



Image ⑥: Flow paths 1 and 2 merge with flow path 3 and are routed to the east along NE 187<sup>th</sup> St.

**APPENDIX 3-B**

**DRAINAGE COMPLAINTS/PROBLEM DESCRIPTION**

*Mayor*  
Mary Jane Goss

17425 Ballinger Way NE  
Lake Forest Park, WA 98155-5556  
Telephone: 206-368-5440  
Fax: 206-364-6521  
E-mail: [cityhall@ci.lake-forest-park.wa.us](mailto:cityhall@ci.lake-forest-park.wa.us)  
[www.cityoffp.com](http://www.cityoffp.com)



*Councilmembers*  
Tom French  
Jeff R. Johnson  
Mark Phillips  
E. John Resha III  
Catherine Stanford  
Hilda Thompson  
John A. E. Wright

June 23, 2015

Mr. Daniel Westley  
LDC, Inc.  
14201 NE 200<sup>th</sup> St., Ste 100  
Woodinville, WA 98072

Via Email: [dwestley@ldccorp.com](mailto:dwestley@ldccorp.com)

Dear Mr. Westley:

The City of Lake Forest Park received your request for public record/information dated May 19, 2015, for the following:

- “1. Does City of Lake Forest Park have inventory of all city storm components (e.g. pipe type and size, CB type and size)? Even better if you have it in GIS.
2. I have a question specifically about a storm system running along NE 188th ST (between 51st Ave NE and 52nd Ave NE). It appears to not have a discharge and I understand it was recently replaced due to some severe settlement near the structure.
3. Do you have record of any drainage complaints for this area? Also, any additional drainage complaints downstream of this area that we should be aware of?”

Question #1: Here is a link to the map:

<https://www.dropbox.com/s/lfvqx3xhopnsx57/Updated%20NPDES%20Compliance%20Map.mpk?dl=0>

I've attached work orders that respond to questions #2 and #3, above.

This concludes the City's response to your request. Please contact me if you have questions.

Sincerely,

*Evelyn Jahed*

Evelyn Jahed  
City Clerk

cc: Building and Planning Department  
City Attorney

# Cities of Lake Forest Park / Kenmore Public Works Work Order

- Call Out
- Overtime
- Parks
- Streets
- Facilities

Date Received: 7/10/2014  
 Time Received:   
 Assigned To: Streets  
 Date Assigned: 7/10/2014  
 Respond Time:   
 Completion Date: 7/18/2014

Task: 3111

Project:   
 Project Completed:

LFP TBD:

### Employee Allocation

Personnel	Hours	
	LFP	Kenmore
<input type="checkbox"/> Adam		
<input type="checkbox"/> Bravo		
<input type="checkbox"/> Calvin		
<input type="checkbox"/> Chuck		
<input type="checkbox"/> Craig		
<input type="checkbox"/> CWP		
<input type="checkbox"/> Frank		
<input type="checkbox"/> Ian		
<input type="checkbox"/> Innovac		
<input type="checkbox"/> Jeff		
<input type="checkbox"/> Jesse		
<input type="checkbox"/> KC Traffic-		
<input type="checkbox"/> Keith		
<input type="checkbox"/> Kevin		
<input type="checkbox"/> Kristian		
<input type="checkbox"/> Marty		
<input type="checkbox"/> Matt		
<input type="checkbox"/> Nolan		
<input type="checkbox"/> Scott		
<b>Total Hours:</b>		

CAR #:   
 Contact: LFP PD  
 Phone:   
 Address:   
 Requests Call Back

- Area/Zone
- 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10

- Parks/Facility Sites
- Rhody Park
  - Linwood Park
  - Log Boom Park
  - Swamp Creek
  - Northshore Summit
  - Squires Landing
  - Animal Acres
  - Blue Heron
  - Cole Nature Preserve
  - Eagle Scout
  - Horizon View
  - Lyon Creek

Location Description:  
 intersection of NE 188th St and 52nd Ave NE  
 LFP  
 Kenmore

ESA Information

BMP Used Details  
 HPA Used   
 Install Date:   
 Remove Date:

Details - include stats for task (miles/feet mowed/swept/repaired)  
 I got a call last night around 2100 hrs about a possible sink hole forming at the intersection of NE 188th St and 52nd Ave NE. The citizen said he stuck a broom handle down in the hole and determined it was 4-5 feet wide under the surface.  
 I went up there and quickly found it. The surface has about a 2-3" hole, with my flashlight, I could only determine maybe a 1-2 foot void under the surface. I marked the hole with orange paint and placed a couple cones around it. This street is not a widely used street and should be fine until you can get a crew out there to determine the necessary course of action.  
 Tree Related

Comments:  
 pipe extends 3 feet from CB then ends into dirt.  
 Mud off pipe in CB, pothole on southside of street/ROW  
 Asphalt patch and mud CB

Materials - include stats such as vendor, prices, yardage, tonnage

Equipment  
 133, 131

# Cities of Lake Forest Park / Kenmore Public Works Work Order

- Call Out
- Overtime
- Parks
- Streets
- Facilities

Receive Date:

Time Received:

Assigned To:

Date Assigned:

Respond Time:

Completion Date:

Task:

Project:

Project Completed:

LFP TBD:

**Employee Allocation**

	Hours	
	LFP	Kenmore
Bravo	<input type="text" value="0"/>	<input type="text" value="0"/>
Craig	<input type="text" value="2.5"/>	<input type="text" value="0"/>
Keith	<input type="text" value="0.5"/>	<input type="text" value="0"/>
Kevin	<input type="text" value="2.5"/>	<input type="text" value="0"/>

**Location**

CAR #:

Contact:

Phone:

Address:

Requests Call Back

**Area/Zone**

<input type="checkbox"/> 1	<input type="checkbox"/> 6
<input type="checkbox"/> 2	<input type="checkbox"/> 7
<input type="checkbox"/> 3	<input type="checkbox"/> 8
<input type="checkbox"/> 4	<input type="checkbox"/> 9
<input type="checkbox"/> 5	<input type="checkbox"/> 10

**Parks/Facility Sites**

<input type="checkbox"/> Kenmore Park	<input type="checkbox"/> Swamp Creek	<input type="checkbox"/> Animal Acres	<input type="checkbox"/> Eagle Scout
<input type="checkbox"/> Linwood Park	<input type="checkbox"/> Northshore Summit	<input type="checkbox"/> Blue Heron	<input type="checkbox"/> Horizon View
<input type="checkbox"/> Log Boom Park	<input type="checkbox"/> Squires Landing	<input type="checkbox"/> Cole Nature Prsvr	<input type="checkbox"/> Lyon Creek

**Location Description:**

LFP

Kenmore

**ESA Information**

BMP Used

HPA Used

Total Hours:

**Details - include stats for task (miles/feet mowed/swept/repaired)**

We had Bravo pothole ROW to look for abandoned pipe from structure CB-7-3569. Found approx 6 feet of 12" concrete in ROW going back towards CB to the north. Looks like ditchline was filled in on south side of the street. System from QB goes nowhere. Missing section of pipe in middle of the street.

Tree Related

**Comments:**

2 yards of 5/8s gravel from stock

**Materials - include stats such as vendor, prices, yardage, tonnage**

**Equipment**

131, 143, 131

WO#:

# Cities of Lake Forest Park / Kenmore

## Public Works

### Work Order

- Call Out
- Overtime
- Parks
- Streets
- Facilities

Receive Date: 10/20/2008

Time Received: \_\_\_\_\_

Assigned To: \_\_\_\_\_

Date Assigned: \_\_\_\_\_

Respond Time: \_\_\_\_\_

Completion Date: 10/20/2008

Task: 3600

Project: \_\_\_\_\_

LFP TBD:

Project Completed:

#### Employee Allocation

	Hours	
	LFP	Kenmore
Bravo	0	0
Jeff	2	0
Keith	2	0

Total Hours: 4 0

#### Location

CAR #: \_\_\_\_\_

Contact: \_\_\_\_\_

Phone: \_\_\_\_\_

Address: \_\_\_\_\_

Requests Call Back

#### Area/Zone

- 1  6
- 2  7
- 3  8
- 4  9
- 5  10

#### Parks/Facility Sites

- Kenmore Park
- Swamp Creek
- Animal Acres
- Eagle Scout
- Linwood Park
- Northshore Summit
- Blue Heron
- Horizon View
- Log Boom Park
- Squires Landing
- Cole Nature Prsvr
- Lyon Creek

#### Location Description:

188th and 52nd

LFP

Kenmore

#### ESA Information

BMP Used Details: \_\_\_\_\_

HPA Used

#### Details - include stats for task (miles/feet mowed/swept/repared)

Met Martin from Bravo to investigate stormline leaving CB for 3' then nothing but 5/8s

Tree Related

#### Comments:

\_\_\_\_\_

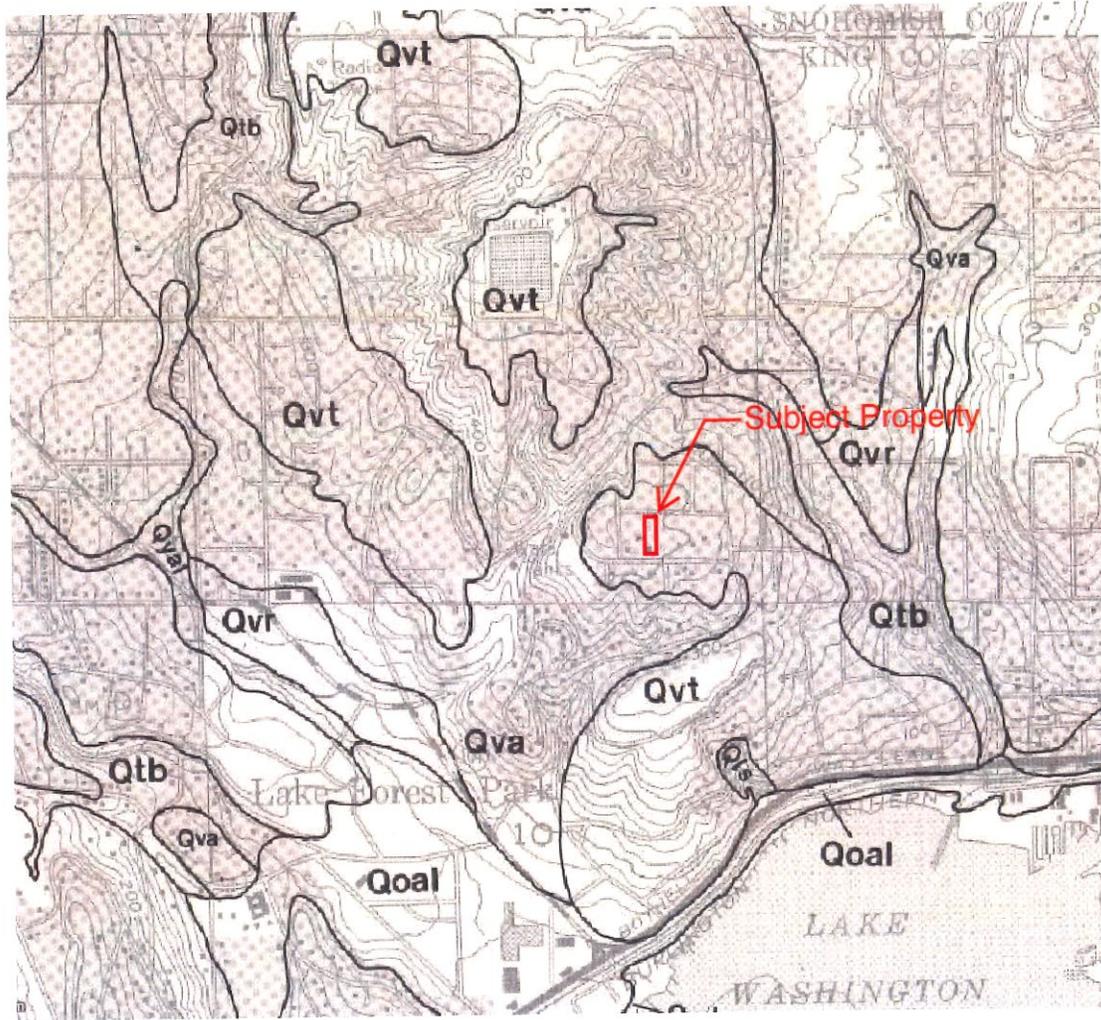
#### Materials - include stats such as vendor, prices, yardage, tonnage

\_\_\_\_\_

#### Equipment

125

APPENDIX 3-C  
USGS SOILS MAP



#### 4.0 FLOW CONTROL/WATER QUALITY FACILITY ANALYSIS AND DESIGN

The flow control and water quality requirements are controlled by the 2009 King County Surface Water Design Manual (2009 KCSWDM) as adopted by the City of Lake Forest Park. Per City of Lake Forest Park Municipal Code 16.24.170B the entire city corporate limits of the city of Lake Forest Park are within the conservation flow control area (level 2 flow control).

##### Onsite and Upstream Basins:

See the attached figure 3.1 for a depiction of the existing site basin layout. In the pre-developed state, the project has been modeled in KCRTS using the following coverage:

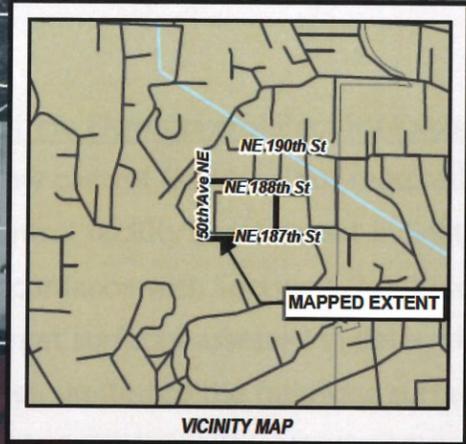
<b>Onsite Predeveloped Cover</b>	<b>Area</b>
Till Forest	0.52 acres**
<b>Total</b>	<b>0.52 acres**</b>

\*\*Note: 0.52 Acres modeled in KCRTS are Target Surfaces as defined in section 1.2.3.1, subsection B "Target Surfaces". This explains why the modeled target surface area is inconsistent with the subject property surface area.

See the attached figure 3.1 for a depiction of the upstream site basin layout. Predeveloped and developed upstream basin quantities are summarized below. The upstream basin quantities will be used for conveyance modeling purposes only.

<b>Predeveloped and Developed Upstream Basin</b>	<b>Area</b>
Till Grass	0.43 acres
<b>Total</b>	<b>0.43 acres</b>

15-553F3.1 ExistingHydrologyMap.mxd | MOD: 08/24/2015 | TPA



**UPSTREAM BASIN**  
0.45 AC

**EXISTING ONSITE BASIN = 0.86 AC**

EXISTING BASIN AREAS	
<b>EXISTING SITE TOTAL</b>	
FORESTED	0.86 AC
TOTAL =	0.86 AC
<b>EXISTING BASIN TOTAL (MODELED)</b>	
FORESTED	0.52 AC
TOTAL =	0.52 AC
<b>UPSTREAM BASIN TOTAL</b>	
FORESTED	0.45 AC
TOTAL =	0.45 AC

**LEGEND**

- Subject Property
- Existing Storm System
- Existing Catch Basin
- Parcel Boundary
- Watercourse
- Contours (LIDAR)**
- 10 Foot Contour
- 2 Foot Contour

0 50 100  
Scale in Feet

**LARRY SILVER**

**SILVER SHORT PLAT**  
EXISTING HYDROLOGY MAP

**LDC**  
THE CIVIL ENGINEERING GROUP  
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Woodinville, WA 98072  
Ph. 425-806-1869  
Ft. 425-462-2893  
www.LDCcorp.com

SOURCE AGENCY	DESCRIPTION
KING COUNTY GIS	PARCEL BOUNDARY, HYDROLOGY
KING COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY)
CITY OF KENMORE GIS	THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT. UTILITIES

PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET

REVISION:  
JOB NUMBER: 15-553  
DRAWING NAME: 15-553F03.1  
DESIGNER: D.WESTLEY  
DRAWING BY: TABBOTT  
DATE: 08-24-15  
SCALE: AS SHOWN  
JURISDICTION: KENMORE

**FIGURE:**  
**3.1**

**0.1 cfs Flow Control Facility Exception:**

Flow control facility is not required per 0.1-cfs exception from the area-specific flow control facility requirement in Section 1.2.3.1, subsection B “Exceptions”. In accordance with Section 1.2.3.1, subsection B “Target Surfaces”, the developed target surfaces assessed in determining the 0.1cfs flow control facility exception have been limited to the following surfaces and modeled in KCRTS as summarized in the table below. See the attached figure 3.2 for a depiction of the developed site basin layout.

**0.1 Flow Control Facility Exception Target Surfaces:**

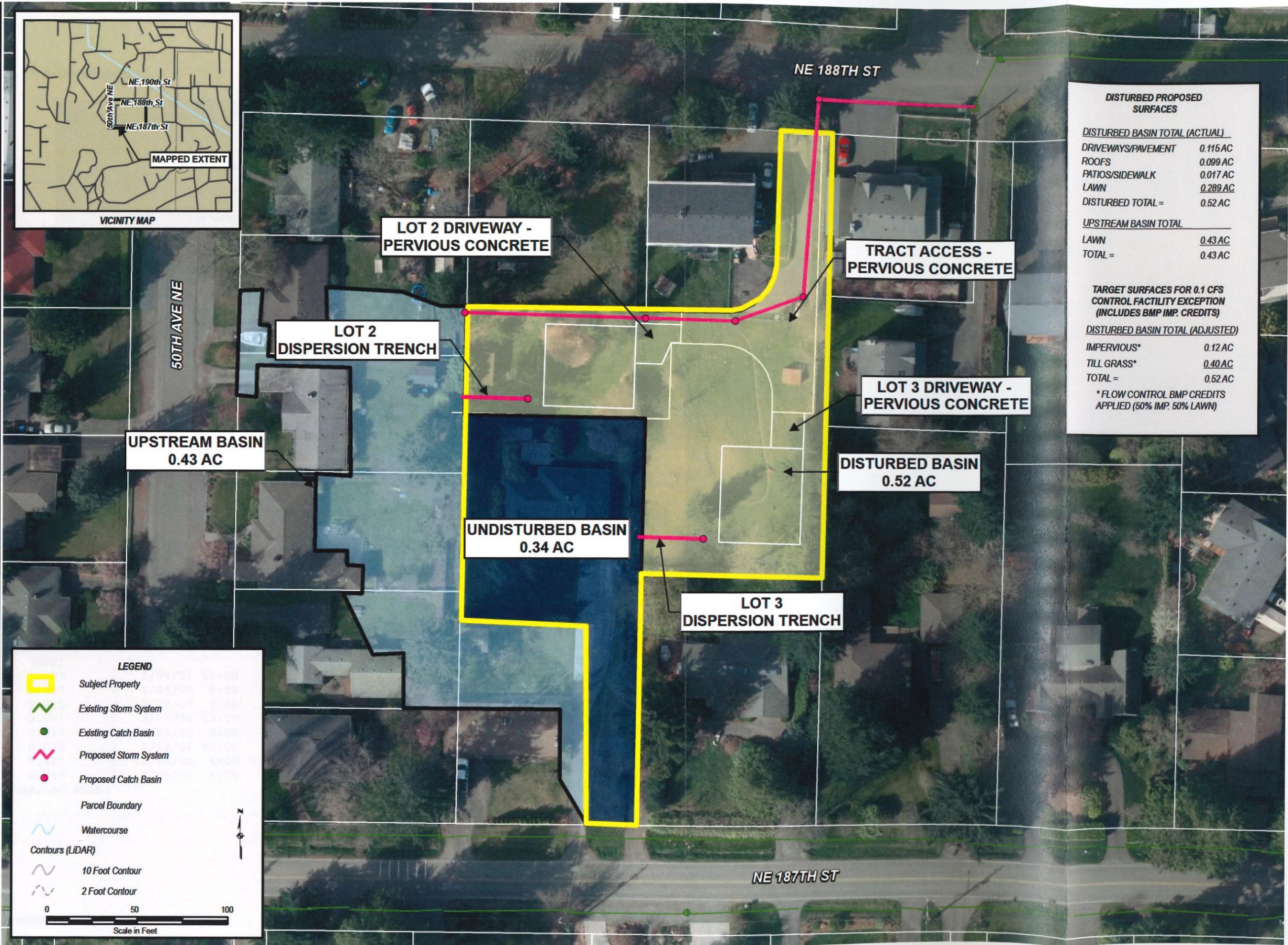
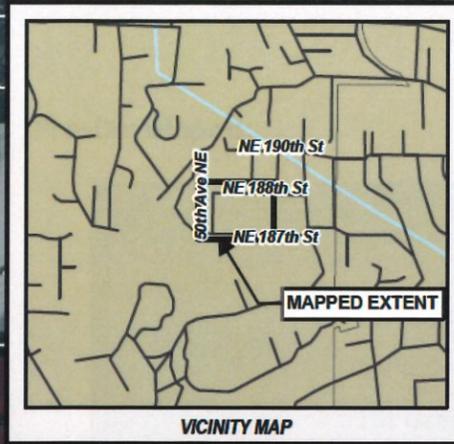
LOT/TRACT	SURFACE	TARGET SURFACES [1.2.3B]	IMPERVIOUS AREA (AC)	PERVIOUS AREA (AC)	TOTAL AREA (AC)
Tract A	Pavement*	1. New Impervious Surface	0.048*	0.048*	0.096
Tract A	Lawn	2. New Pervious Surface	-----	0.015	0.015
Lot 2 & 3	Driveways*	1. New Impervious Surface	0.009*	0.009*	0.019
Lot 2 & 3	Roofs*	1. New Impervious Surface	0.050*	0.050*	0.099
Lot 2 & 3	Patios/SW	1. New Impervious Surface	0.017	-----	0.017
Lot 2 & 3	Lawn	2. New Pervious Surface	-----	0.274	0.274
		TOTAL =	0.12	0.40	0.52

\*Note: Proposed target surfaces served by flow control BMP basic dispersion (roofs in lot 2 and 3) or Permeable Pavement (access tract and driveways lots 2 and 3) have been modeled in KCRTS using the BMP facility sizing credits (50% impervious, 50% lawn) as specified in 2009 KCSWDM Table 1.2.3.C.

**0.1cfs Flow Control Facility Exception [2009 KCSWDM 1.2.3.1, Subsection B.2]:**

Developed - PreDeveloped = 0.1cfs or less → 0.143 cfs-0.043 cfs = 0.1 cfs

(See KCRTS Land Use Summary, Peak Flow Frequency Analysis, and Target Surfaces considered as described in the following pages)



DISTURBED PROPOSED SURFACES	
<u>DISTURBED BASIN TOTAL (ACTUAL)</u>	
DRIVEWAYS/PAVEMENT	0.115 AC
ROOFS	0.099 AC
PATIOS/SIDEWALK	0.017 AC
LAWN	0.289 AC
<b>DISTURBED TOTAL =</b>	<b>0.52 AC</b>
<u>UPSTREAM BASIN TOTAL</u>	
LAWN	0.43 AC
<b>TOTAL =</b>	<b>0.43 AC</b>
TARGET SURFACES FOR 0.1 CFS CONTROL FACILITY EXCEPTION (INCLUDES BMP IMP. CREDITS)	
<u>DISTURBED BASIN TOTAL (ADJUSTED)</u>	
IMPERVIOUS*	0.12 AC
TILL GRASS*	0.40 AC
<b>TOTAL =</b>	<b>0.52 AC</b>
* FLOW CONTROL BMP CREDITS APPLIED (50% IMP. 50% LAWN)	

**LEGEND**

- Subject Property
- Existing Storm System
- Existing Catch Basin
- Proposed Storm System
- Proposed Catch Basin
- Parcel Boundary
- Watercourse
- Contours (LIDAR)**
- 10 Foot Contour
- 2 Foot Contour

0 50 100  
Scale in Feet

**SOURCE INFORMATION**

SOURCE AGENCY	DESCRIPTION
KING COUNTY GIS	PARCEL BOUNDARY; HYDROLOGY
KING COUNTY GIS	CONTOURS GENERATED FROM BARE EARTH LIDAR (KING COUNTY). THIS DATA HAS A STATED VERTICAL ACCURACY OF APPROXIMATELY 1 FOOT.
CITY OF KENMORE GIS	UTILITIES

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14201 NE 20th St., #100  
Woodinville, WA 98072

**LARRY SILVER**

**SILVER SHORT PLAT**  
DEVELOPED HYDROLOGY MAP

PROJECTION: WASHINGTON STATE PLANE, NORTH ZONE, NAD 83 HARN, FEET

REVISION:

JOB NUMBER:	14-181
DRAWING NAME:	14-181F03.2
DESIGNER:	D.WESTLEY
DRAWING BY:	T.ABBOTT
DATE:	01-07-16
SCALE:	AS SHOWN
JURISDICTION:	KENMORE

**FIGURE:**  
**3.2**

Pre-Developed:

Category	Area
Till Forest	0.52 acres
Till Pasture	0.00 acres
Till Grass	0.00 acres
Outwash Forest	0.00 acres
Outwash Pasture	0.00 acres
Outwash Grass	0.00 acres
Wetland	0.00 acres
Impervious	0.00 acres
<b>Total</b>	<b>0.52 acres</b>

Scale Factor: 1.01    Hourly    Reduced

Time Series: Silver2\_PreDev >>

Compute Time Series

Modify User Input

File for computed Time Series [.TSF]

Flow Frequency Analysis

Time Series File:silver2\_predev.tsf

Project Location:Sea-Tac

---Annual Peak Flow Rates---

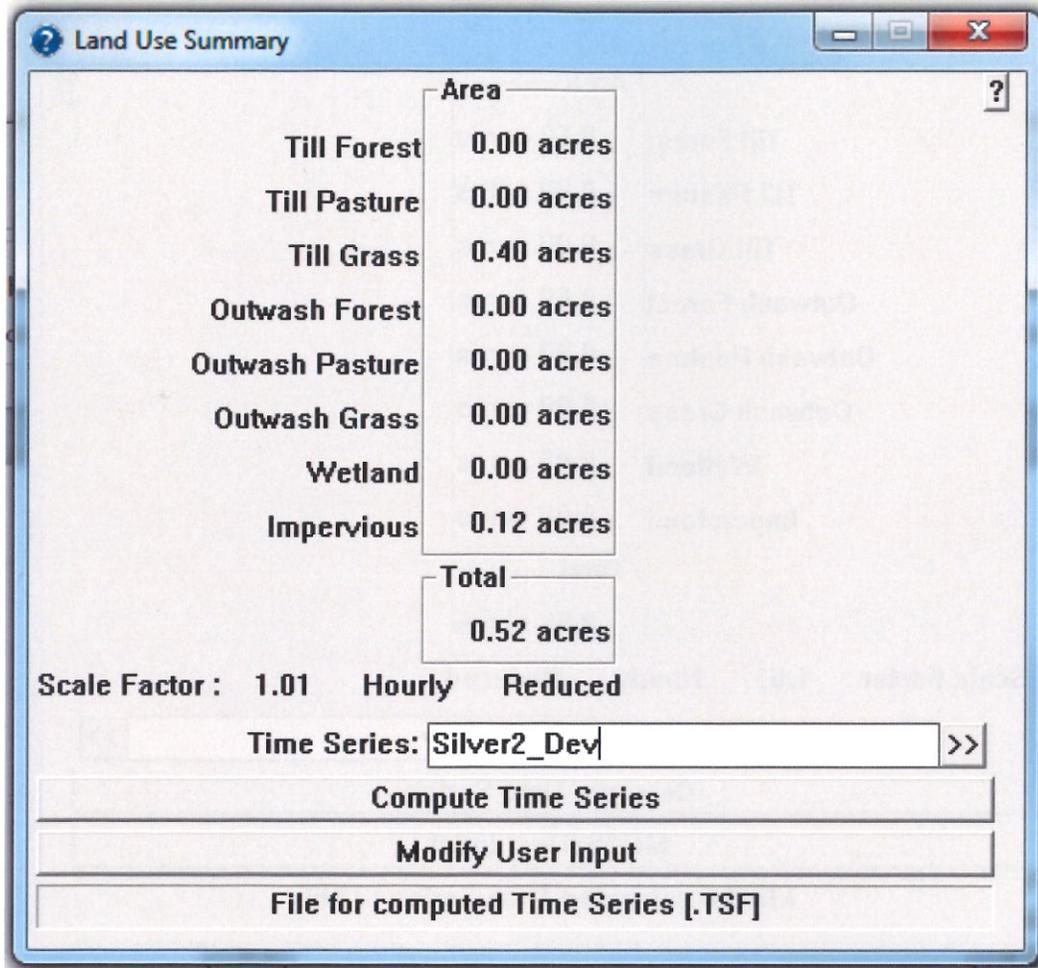
Flow Rate (CFS)	Rank	Time of Peak
0.033	2	2/09/01 18:00
0.009	7	1/06/02 3:00
0.025	4	2/28/03 3:00
0.001	8	3/24/04 19:00
0.014	6	1/05/05 8:00
0.025	3	1/18/06 20:00
0.021	5	11/24/06 4:00
0.043	1	1/09/08 9:00

Computed Peaks

-----Flow Frequency Analysis-----

Peaks (CFS)	Rank	Return Period	Prob
0.043	1	100.00	0.990
0.033	2	25.00	0.960
0.025	3	10.00	0.900
0.025	4	5.00	0.800
0.021	5	3.00	0.667
0.014	6	2.00	0.500
0.009	7	1.30	0.231
0.001	8	1.10	0.091
0.039		50.00	0.980

Developed:



Flow Frequency Analysis

Time Series File:silver2\_dev.tsf  
Project Location:Sea-Tac

---Annual Peak Flow Rates---

Flow Rate (CFS)	Rank	Time of Peak
0.065	4	2/09/01 2:00
0.044	7	1/05/02 16:00
0.081	2	2/27/03 7:00
0.038	8	8/26/04 2:00
0.048	6	10/28/04 16:00
0.068	3	1/18/06 16:00
0.063	5	11/24/06 3:00
0.143	1	1/09/08 6:00

Computed Peaks

-----Flow Frequency Analysis-----

Peaks (CFS)	Rank	Return Period	Prob
0.143	1	100.00	0.990
0.081	2	25.00	0.960
0.068	3	10.00	0.900
0.065	4	5.00	0.800
0.063	5	3.00	0.667
0.048	6	2.00	0.500
0.044	7	1.30	0.231
0.038	8	1.10	0.091
0.122		50.00	0.980

## Target Surfaces

Facilities in Conservation Flow Control Areas<sup>27</sup> must mitigate (either directly or in effect) the runoff from the following target developed surfaces within the *threshold discharge area* for which the facility is required:

1. **New impervious surface** that is **not fully dispersed** per the criteria on Page 1-46. For individual lots within residential subdivision projects, the extent of **new impervious surface** shall be assumed as specified in Chapter 3. *Note, any new impervious surface such as a bridge that spans the ordinary high water of a stream, pond, or lake may be excluded as a target surface if the runoff from such span is conveyed to the ordinary high water area in accordance with Criteria (b), (c), (d), and (e) of the "Direct Discharge Exemption" (p 1-37).*
2. **New pervious surface** that is **not fully dispersed**. For individual lots within residential subdivision projects, the extent of **new pervious surface** shall be assumed to be the entire lot area, except the assumed impervious portion and any portion in which native conditions are preserved by covenant, tract, or easement. In addition, the **new pervious surface** on individual lots shall be assumed to be 100% grass if located within the Urban Growth Area (UGA) and 50% grass/50% pasture if located outside the UGA.
3. **Existing impervious surface** added since January 8, 2001 that is **not fully dispersed** and not yet mitigated with a County-approved flow control facility or flow control BMP. *Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook salmon.*
4. **Replaced impervious surface** that is **not fully dispersed** on a **transportation redevelopment project** in which **new impervious surface** is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
5. **Replaced impervious surface** that is **not fully dispersed** on a **parcel redevelopment project** in which the total of new plus **replaced impervious surface** is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing *site* improvements.

The existing lawn area (lot 1) is not a target surface when assessing the 0.1 cfs flow control facility exception. These surfaces do not meet the definition of a **new pervious surface**.

The existing impervious surfaces in undisturbed areas (lot 1) are not a target surface considered when assessing the 0.1 cfs flow control facility exception. These surfaces do not meet the condition of an **existing impervious surface** added since January 8<sup>th</sup> 2001. According to aerial photography and King County Assessor's Property Report, the existing impervious roofs, driveways, patios and outbuildings (lot 1) have remained unaltered since before January 8<sup>th</sup> 2001.

**Flow Control BMP:**

Flow Control BMP Basic Dispersion will be applied to the proposed roof surfaces (Lots 2 and 3) and pervious concrete will be applied to the Tract access road and the driveways (lots 2 and 3) to meet the Large Lot High Impervious BMP Requirements per the 2009 KCSWDM 5.2.1.3. Additionally, the post-construction soil standard mitigation option #3, Amend existing soil in place, will be utilized for proposed lawn surfaces (in lots 2 and 3).

Preliminary soils investigation, per USGS soil mapping, identifies the soils to be glacial till (Qvt) which has characteristics that yields little infiltration.

Therefore Full Infiltration is not a beneficial method of flow control and is considered infeasible.

**Water Quality Treatment:**

Per 1.2.8 “Exemption from Core Requirement” #8, subsection 1.a “Surface Area Exemption”, water quality treatment for discharged stormwater is not required as less than 5,000 SF of pollution generating impervious surface is proposed (PGIS).

For additional details, see the project calculations included on the following pages.

## 5.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

To comply with the National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit, the City of Lake Forest Park adopted the 2009 King County Surface Water Design Manual. Conveyance analysis and design methods were selected per the 2009 King County Surface Water Design Manual, chapter 4, Conveyance System Analysis and Design.

Conveyance capacity analysis using Manning's Uniform Flow Analysis method (per section 4.2.1.2) was performed for preliminary design purposes. See Appendix 5-A for conveyance system analysis and design calculations.

The conveyance capacity analysis for the 8" site discharge pipe and the 6" yard drain pipe were evaluated preliminarily using Manning's equation as applied to the most restrictive pipe segments based on the flattest slope and the maximum unmitigated flow rates. See Appendix 5-A for open channel flow calculations for circular pipe.

6" Yard Drain Pipe (routing upstream basin, and lot 2 roof and lawn):

Diameter:	6"
Minimum Slope:	1.0%
Pipe Capacity:	0.60 cfs
Maximum Flow:	0.339 cfs
Evaluation:	System Adequate

8" Site Discharge Pipe (routing all disturbed onsite and upstream flows):

Diameter:	8"
Minimum Slope:	0.6%
Pipe Capacity:	1.01 cfs
Maximum Flow:	0.653 cfs
Evaluation:	System Adequate

Final construction TIR will include backwater calculations as performed using King County Backwater (KCBW) per section 4.2.1.2. This routine employs the standard step backwater method to calculate the flows and headwater elevations through a pipe network.

**APPENDIX 5-A**

**CONVEYANCE SYSTEM ANALYSIS AND DESIGN CALCULATIONS**

# CONVEYANCE - 6" YARD DRAIN PIPE

**Land Use Summary**

	Area
Till Forest	0.00 acres
Till Pasture	0.00 acres
Till Grass	0.54 acres
Outwash Forest	0.00 acres
Outwash Pasture	0.00 acres
Outwash Grass	0.00 acres
Wetland	0.00 acres
Impervious	0.05 acres
<b>Total</b>	<b>0.59 acres</b>

Scale Factor: 1.01    15-Min    Reduced

Edit Flow Paths

Time Series: Silver\_6Conveyance >>

Compute Time Series

Modify User Input

File for computed Time Series [.TSF]

## Flow Frequency Analysis

Time Series File:silver\_6conveyance.tsf  
 Project Location:Sea-Tac

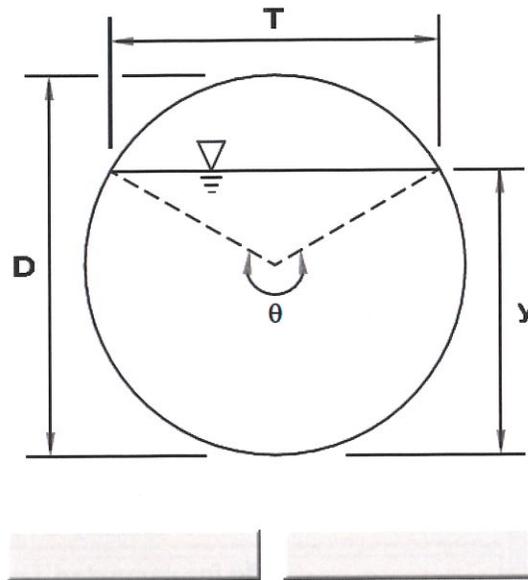
---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----			
Flow Rate (CFS)	Rank	Time of Peak		Peaks (CFS)	Rank	Return Period	Prob
0.080	4	2/09/01	12:45	0.339	1	100.00	0.990
0.046	7	1/06/02	1:00	0.194	2	25.00	0.960
0.168	3	12/08/02	17:15	0.168	3	10.00	0.900
0.029	8	8/26/04	1:00	0.080	4	5.00	0.800
0.194	2	11/17/04	5:00	0.069	5	3.00	0.667
0.065	6	1/18/06	15:00	0.065	6	2.00	0.500
0.069	5	11/24/06	1:00	0.046	7	1.30	0.231
0.339	1	1/09/08	6:30	0.029	8	1.10	0.091
Computed Peaks				0.290		50.00	0.980

Open Channel Flow Calculator For Circular Pipes	<i>Land Development Consultants, Inc.</i>	
	14201 NE 200th St. Ste. 100 Woodinville, WA 98072	Tel: (425) 806-1869 Fax: (425) 482-2893

Project Name: Silver Short Plat  
Description: Conveyance Calc - 6" Yard Drain Pipe

Project No.: 14-181  
Date: 8/24/2015  
Calc. By: DEW

Pipe Diameter (D) = 6 in  
Pipe Slope (S) = 1.00 %  
Flow Depth (y) = 0.27 ft  
Flowrate (Q) = 0.34 cfs  
Mannings Coeff. (n) = 0.012  
Theta Angle ( $\theta$ ) = 3.27 rad  
Wetted Area (A) = 0.11 ft<sup>2</sup>  
Wet. Perimeter (P) = 0.82 ft  
Hydraulic Radius (R) = 0.13 ft  
Top Width (T) = 0.50 ft  
Flow Velocity = 3.19 fps



**Formulas:**

Theta Angle ( $\theta$ ): If  $y \geq r$ :  $\theta = 2\pi - 2a \cos\left(\frac{y-r}{r}\right)$  where: r = Pipe Radius

If  $y \leq r$ :  $\theta = 2a \cos\left(\frac{r-y}{r}\right)$  where: r = Pipe Radius

Wetted Area (A):  $A = \frac{1}{8}(\theta - \sin \theta)d^2$

Wetted Perimeter (P):  $P = \frac{1}{2}\theta d$

Hydraulic Radius (R):  $R = \frac{A}{P}$

Top Width (T):  $T = \sin\left(\frac{\theta}{2}\right)d$

# CONVEYANCE - 8" SITE DISCHARGE PIPE

**Land Use Summary**

	Area
Till Forest	0.00 acres
Till Pasture	0.00 acres
Till Grass	0.73 acres
Outwash Forest	0.00 acres
Outwash Pasture	0.00 acres
Outwash Grass	0.00 acres
Wetland	0.00 acres
Impervious	0.24 acres
<b>Total</b>	<b>0.96 acres</b>

Scale Factor: 1.01    15-Min    Reduced

Edit Flow Paths

Time Series: Silver\_8Conveyance >>

Compute Time Series

Modify User Input

File for computed Time Series [.TSF]

## Flow Frequency Analysis

Time Series File:silver\_8conveyance.tsf  
 Project Location:Sea-Tac

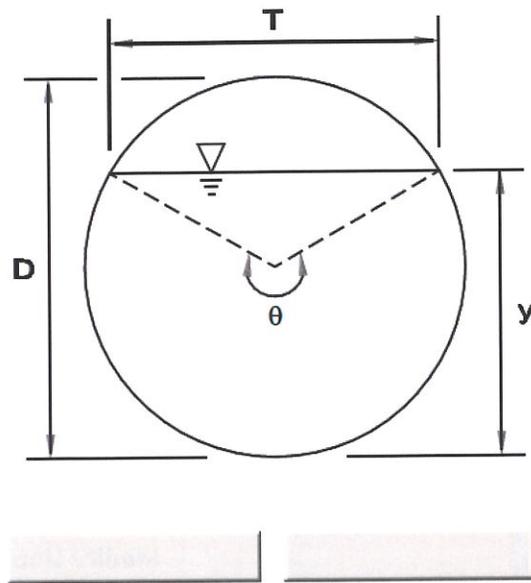
---Annual Peak Flow Rates---				-----Flow Frequency Analysis-----			
Flow Rate (CFS)	Rank	Time of Peak		Peaks (CFS)	Rank	Return Period	Prob
0.154	6	2/09/01	12:45	0.653	1	100.00	0.990
0.110	7	1/05/02	15:00	0.376	2	25.00	0.960
0.376	2	12/08/02	17:15	0.328	3	10.00	0.900
0.099	8	8/26/04	0:45	0.178	4	5.00	0.800
0.328	3	11/17/04	5:00	0.175	5	3.00	0.667
0.175	5	10/27/05	10:45	0.154	6	2.00	0.500
0.178	4	10/25/06	22:45	0.110	7	1.30	0.231
0.653	1	1/09/08	6:30	0.099	8	1.10	0.091
Computed Peaks				0.561		50.00	0.980

Open Channel Flow Calculator For Circular Pipes	<b>Land Development Consultants, Inc.</b>	
	14201 NE 200th St. Ste. 100 Woodinville, WA 98072	Tel: (425) 806-1869 Fax: (425) 482-2893

Project Name: Silver Short Plat  
 Description: Conveyance Calc - 8" Site Discharge Pipe

Project No.: 14-181  
 Date: 8/24/2015  
 Calc. By: DEW

Pipe Diameter (D) = 8 in  
 Pipe Slope (S) = 0.60 %  
 Flow Depth (y) = 0.39 ft  
 Flowrate (Q) = 0.65 cfs  
 Mannings Coeff. (n) = 0.012  
 Theta Angle ( $\theta$ ) = 3.48 rad  
 Wetted Area (A) = 0.21 ft<sup>2</sup>  
 Wet. Perimeter (P) = 1.16 ft  
 Hydraulic Radius (R) = 0.18 ft  
 Top Width (T) = 0.66 ft  
 Flow Velocity = 3.09 fps



**Formulas:**

Theta Angle ( $\theta$ ):  
 If  $y \geq r$ :  $\theta = 2\pi - 2a \cos\left(\frac{y-r}{r}\right)$  where: r = Pipe Radius  
 If  $y \leq r$ :  $\theta = 2a \cos\left(\frac{r-y}{r}\right)$  where: r = Pipe Radius

Wetted Area (A):  $A = \frac{1}{8}(\theta - \sin \theta)d^2$

Wetted Perimeter (P):  $P = \frac{1}{2}\theta d$

Hydraulic Radius (R):  $R = \frac{A}{P}$

Top Width (T):  $T = \sin\left(\frac{\theta}{2}\right)d$

6.0 SPECIAL REPORTS AND STUDIES

7.0 OTHER PERMITS

## 8.0 CSWPPP ANALYSIS AND DESIGN

Design of the SWPPP was completed in conformance with Appendix D of the Drainage Manual. Compliance with the 9 elements is summarized below.

1. Clearing Limits: Clearing limits have been delineated on sheet ER-01 of the construction plans. The clearing limits extend only to those areas that will be disturbed during construction of the subject project. The specific BMPs for marking the clearing limits that will be applied for this project include:

- Plastic or Metal Fence (D.3.1.1)

2. Cover Measures: Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Surface Roughening (D.3.2.1)
- Mulching (D.3.2.2)
- Nets and Blankets (D.3.2.3)
- Plastic Covering (D.3.2.4)
- Temporary and Permanent Seeding (D.3.2.6)
- Sodding (D.3.2.7)

No soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

3. Perimeter Protection: Perimeter protection to filter sediment from sheetwash shall be installed prior to upslope grading. The specific BMPs for control of flow rates that shall be used on this project include:

- Silt Fence (D.3.3.1)
- Vegetated Strip (D.3.3.3)

4. Traffic Stabilization: The proposed access location will be used for a construction entrance. See Sheet ER-01 of the construction plans for location. A detail is also attached on Sheet ER-02 of the construction plans. The specific BMPs for traffic stabilization that shall be used on this project include:

- Stabilized Construction Entrance (D.3.4.1)
- Construction Road/Parking Area Stabilization (D.3.4.2)

5. Sediment Retention: Surface water collected from disturbed areas of the site must be routed through a sediment pond or trap prior to release from the site, unless the areas are small enough to be treated solely with perimeter protection as noted in number 3 above. The specific BMPs for sediment retention that shall be used on this project include:

- Sediment Trap (D.3.5.1)
- Sediment Pond (D.3.5.2)
- Storm Drain Inlet Protection (D.3.5.3)

6. Surface Water Collection: All surface water from disturbed areas shall be intercepted, conveyed to a sediment pond or trap, and discharged downslope of any disturbed areas. The following specific BMPs will be used for surface water collection for this project:

- Interceptor Dike and Swale (D.3.6.1)
- Ditches (D.3.6.4)
- Outlet Protection (D.3.6.5)

7. Dewatering Control: Dewatering Control Notes listed on sheet ER-02 of the construction plans specify necessary controls.

8. Dust Control: Preventative measures to minimize wind transport of soils will be implemented when a traffic hazard may be created or when sediment may be deposited on adjacent properties. These measures include water or chemical treatments.

9. Flow Control: Surface water from disturbed areas must be retained onsite to prevent an increase in the existing site conditions 2-year and 10-year runoff peak discharges from the project site during construction.

**9.0 BOND QUANTITIES & FACILITY SUMMARIES**

## 10.0 OPERATIONS AND MAINTENANCE MANUAL

The proposed storm system consists of catch basins, manholes, flow restrictor and conveyance pipes. These facilities will require periodic maintenance and inspection based on the procedures below. The procedures are based on Appendix A of the 2009 King County Surface Water Design Manual.

**NO. 5 – CATCH BASINS AND MANHOLES**

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than 1/2 cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than 3/4 inch past curb face into the street (if applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 1/4 inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than 1/2 inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and structurally sound.
		Cracks wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than 1/4 inch wide at the joint of inlet/outlet pipe.
	Settlement/misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than 1/2-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than 1/4-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.	Inlet/outlet pipes clear of sediment.
	Trash and debris	Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
	Damaged	Cracks wider than 1/2-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

<b>NO. 5 – CATCH BASINS AND MANHOLES</b>			
<b>Maintenance Component</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance is Needed</b>	<b>Results Expected When Maintenance is Performed</b>
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $\frac{7}{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris. footnote to guidelines for disposal
	Damaged or missing	Grate missing or broken member(s) of the grate. <b>Any open structure requires urgent maintenance.</b>	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. <b>Any open structure requires urgent maintenance.</b>	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

<b>NO. 6 – CONVEYANCE PIPES AND DITCHES</b>			
<b>Maintenance Component</b>	<b>Defect or Problem</b>	<b>Conditions When Maintenance is Needed</b>	<b>Results Expected When Maintenance is Performed</b>
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

<b>NO. 9 – FENCING</b>			
<b>Maintenance Component</b>	<b>Defect or Problem</b>	<b>Conditions When Maintenance is Needed</b>	<b>Results Expected When Maintenance is Performed</b>
Site	Erosion or holes under fence	Erosion or holes more than 4 inches high and 12-18 inches wide permitting access through an opening under a fence.	No access under the fence.
Wood Posts, Boards and Cross Members	Missing or damaged parts	Missing or broken boards, post out of plumb by more than 6 inches or cross members broken	No gaps on fence due to missing or broken boards, post plumb to within 1½ inches, cross members sound.
	Weakened by rotting or insects	Any part showing structural deterioration due to rotting or insect damage	All parts of fence are structurally sound.
	Damaged or failed post foundation	Concrete or metal attachments deteriorated or unable to support posts.	Post foundation capable of supporting posts even in strong wind.
Metal Posts, Rails and Fabric	Damaged parts	Post out of plumb more than 6 inches.	Post plumb to within 1½ inches.
		Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
		Any part of fence (including post, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
		Missing or loose tension wire.	Tension wire in place and holding fabric.
	Deteriorated paint or protective coating	Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
	Openings in fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	Fabric mesh openings within 50% of grid size.

<b>NO. 11 – GROUNDS (LANDSCAPING)</b>			
<b>Maintenance Component</b>	<b>Defect or Problem</b>	<b>Conditions When Maintenance is Needed</b>	<b>Results Expected When Maintenance is Performed</b>
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. <b>A hazard tree identified by a qualified arborist must be removed as soon as possible.</b>	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

<b>NO. 12 – ACCESS ROADS</b>			
<b>Maintenance Component</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance is Needed</b>	<b>Results Expected When Maintenance is Performed</b>
Site	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet (i.e., trash and debris would fill up one standards size garbage can).	Roadway drivable by maintenance vehicles.
		Debris which could damage vehicle tires or prohibit use of road.	Roadway drivable by maintenance vehicles.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Blocked roadway	Any obstruction which reduces clearance above road surface to less than 14 feet.	Roadway overhead clear to 14 feet high.
Any obstruction restricting the access to a 10- to 12 foot width for a distance of more than 12 feet or any point restricting access to less than a 10 foot width.		At least 12-foot of width on access road.	
Road Surface	Erosion, settlement, potholes, soft spots, ruts	Any surface defect which hinders or prevents maintenance access.	Road drivable by maintenance vehicles.
	Vegetation on road surface	Trees or other vegetation prevent access to facility by maintenance vehicles.	Maintenance vehicles can access facility.
Shoulders and Ditches	Erosion	Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Shoulder free of erosion and matching the surrounding road.
	Weeds and brush	Weeds and brush exceed 18 inches in height or hinder maintenance access.	Weeds and brush cut to 2 inches in height or cleared in such a way as to allow maintenance access.
Modular Grid Pavement	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damaged or missing	Access surface compacted because of broken or missing modular block.	Access road surface restored so road infiltrates.