Stormwater Drainage Report
For Targeted and Large / Full Project Sites

Project Name: Finn Meadows North and South Short Plats

Project Address(es):

12619 8th Avenue NE, Kirkland, WA 98034 (Finn Meadows North Short Plat)

12606 82nd Avenue NE, Kirkland, WA 98034 (Finn Meadows South Short Plat)

Parcel Number(s):

Parcel#384070-0465
Parcel#384070-0520

Name of Developer/Owner:

iCap Equity, LLC
10900 NE 8th Street, Suite 1000
Bellevue, WA 98004

Name of Engineer: Ting-I Steven Lee, P.E.
Company: Preferred Engineering, LLC
Address: 11627 SE 58th Street, Bellevue, WA 98006

Phone Number: 206.501.5708

Report Date: 10/9/2015

Engineer's Stamp:

This box to be completed by COK staff	
PERMIT #	

A. Project Overview

1. *King County Reference 8A: TIR Worksheet.*

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 1 PROJECT OWNER AND PROJECT ENGINEER

Project Owner iCap Finn Meadows, LLC
Phone 425.278.9030
Address 3535 Factoria Blvd, Ste 300
Bellevue, WA 98006
Project Engineer Ting-I S. Lee, PE
Company Preferred Engr, LLC
Phone 206.501.5708

Part 2 PROJECT LOCATION AND DESCRIPTION

Project Name Finn Meadows
DDES Permit # —
Location Township
Range
Section
Site Address 12606 82nd Ave NE
Kirkland, WA 98034

Part 3 TYPE OF PERMIT APPLICATION

- [x] Landuse Services
Subdivison / Short Subd / UPD
- [ ] Building Services
M/F / Commerical / SFR
- [ ] Clearing and Grading
- [ ] Right-of-Way Use
- [ ] Other

Part 4 OTHER REVIEWS AND PERMITS

- [ ] DFW HPA
- [ ] COE 404
- [ ] DOE Dam Safety
- [ ] FEMA Floodplain
- [ ] COE Wetlands
- [ ] Other
- [ ] Shoreline Management
- [x] Structural Rockery/Vault/
- [ ] ESA Section 7

Part 5 PLAN AND REPORT INFORMATION

Technical Information Report		Site Improvement Plan (Engr. Plans)	
Type of Drainage Review (circle):	Full / Targeted / Large Site	Type (circle one): 2 x S.Plat.	Full / Modified / Small Site
Date (include revision dates):	Nov. 2015	Date (include revision dates):	Nov 2015
Date of Final:	Nov. 2015	Date of Final:	Nov. 2015

Part 6 ADJUSTMENT APPROVALS

Type (circle one): Standard / Complex / Preapplication / Experimental / Blanket

Description: (include conditions in TIR Section 2)

N/A.

Date of Approval:

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 7 MONITORING REQUIREMENTS

Monitoring Required: Yes / No

Start Date: _____

Completion Date: N/A

Describe: Each Construction Site (2-5 lot S.Plats) are less than 1 acre in size. They will share 1 - Flow Control & Wet Vault

Part 8 SITE COMMUNITY AND DRAINAGE BASIN

Community Plan : N/A

Special District Overlays: N/A

Drainage Basin: Denny Creek Watershed

Stormwater Requirements: Level 2 Flow Control

Part 9 ONSITE AND ADJACENT SENSITIVE AREAS

- ☐ River/Stream —
- ☐ Lake —
- ☐ Wetlands —
- ☐ Closed Depression N/A
- ☐ Floodplain —
- ☐ Other None
- ☐ Steep Slope —
- ☐ Erosion Hazard —
- ☐ Landslide Hazard —
- ☐ Coal Mine Hazard —
- ☐ Seismic Hazard —
- ☐ Habitat Protection —
- ☐ _____

Part 10 SOILS

Soil Type	Slopes	Erosion Potential
Glacial Tills AgC	~5 to 7%	Mod

- ☐ High Groundwater Table (within 5 feet) — No.
- ☐ Other (See Geotech Report)
- ☐ Sole Source Aquifer
- ☐ Seeps/Springs
- ☐ Additional Sheets Attached

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 11 DRAINAGE DESIGN LIMITATIONS	
REFERENCE	LIMITATION / SITE CONSTRAINT
☑ Core 2 – Offsite Analysis	Done – See Report
☐ Sensitive/Critical Areas	None
☐ SEPA	
☐ Other	
☐	
☐ Additional Sheets Attached	

Part 12 TIR SUMMARY SHEET (provide one TIR Summary Sheet per Threshold Discharge Area)	
Threshold Discharge Area: (name or description)	
Core Requirements (all 8 apply)	
Discharge at Natural Location	Number of Natural Discharge Locations: One
Offsite Analysis	Level: (1) / 2 / 3 dated: 10/9/2015
Flow Control (incl. facility summary sheet)	Level: 1 / (2) / 3 or Exemption Number _____ Small Site BMPs _____
Conveyance System	Spill containment located at: N/A (VAULT) - WQ
Erosion and Sediment Control	ESC Site Supervisor: Shawn Lee, PE, CESCL Contact Phone: 206.501.5708 After Hours Phone: 206.501.5708
Maintenance and Operation	Responsibility: Private / (Public) If Private, Maintenance Log Required: Yes / No
Financial Guarantees and Liability	Provided: (Yes) / No Bond @ End of Const. for 2 yrs.
Water Quality (include facility summary sheet)	Type: (Basic) / Sens. Lake / Enhanced Basicm / Bog or Exemption No. _____ Landscape Management Plan: Yes / (No)
Special Requirements (as applicable)	
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:
Source Control (comm./industrial landuse)	Describe landuse: Describe any structural controls:

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Oil Control	High-use Site: Yes / (No) Treatment BMP: _____ Maintenance Agreement: Yes / No with whom? _____
Other Drainage Structures	
Describe: On site BMPs - As recommended by the geotech is limited... May Utilize pavers. for ea. lot.	

Part 13 EROSION AND SEDIMENT CONTROL REQUIREMENTS

MINIMUM ESC REQUIREMENTS DURING CONSTRUCTION	MINIMUM ESC REQUIREMENTS AFTER CONSTRUCTION
☑ Clearing Limits	☑ Stabilize Exposed Surfaces
☑ Cover Measures	☑ Remove and Restore Temporary ESC Facilities
☑ Perimeter Protection	☑ Clean and Remove All Silt and Debris, Ensure Operation of Permanent Facilities
☑ Traffic Area Stabilization	☐ Flag Limits of SAO and open space preservation areas
☑ Sediment Retention	☐ Other _____
☑ Surface Water Collection	
☑ Dewatering Control	
☑ Dust Control	
☑ Flow Control	

Part 14 STORMWATER FACILITY DESCRIPTIONS (Note: Include Facility Summary and Sketch)

Flow Control	Type/Description	Water Quality	Type/Description
☑ Detention	Vault.	☐ Biofiltration	
☐ Infiltration		☑ Wetpool	Vault.
☐ Regional Facility		☐ Media Filtration	
☐ Shared Facility		☐ Oil Control	
☑ Flow Control BMPs	Pavers.	☐ Spill Control	
☐ Other		☐ Flow Control BMPs	
		☐ Other	

TECHNICAL INFORMATION REPORT (TIR) WORKSHEET

Part 15 EASEMENTS/TRACTS		Part 16 STRUCTURAL ANALYSIS
☐ Drainage Easement		☑ Cast in Place Vault
☐ Covenant		☐ Retaining Wall
☐ Native Growth Protection Covenant		☐ Rockery > 4' High
☑ Tract		☐ Structural on Steep Slope
☐ Other		☐ 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.
10/9/2015
Signed/Date

2. *General description of project vicinity*

The iCap Finn Hill North short plat is a proposed 5 residential lot short plat proposed generally west of 84th Avenue NE and south of NE 126th Place in the City of Kirkland. The current short plat Parcel number is 3840700465 with a mailing address 12619 84th Avenue NE. Currently there is a single family residential house on the lot with numerous conifer type trees along the east side of the parcel and some more conifer trees along the south property line. The existing house is expected to be demolished along with the current shed and driveway. The proposed development is in COK's RSA 8 Low Density Residential Zone. Most of the utilities will be stubbed connections off of 126th with storm draining through a 15-ft private drainage easement along the south property line and carried to the iCap Finn Hill South short plat located diagonally to the southwest of this short plat. The developer was unable to obtain a rectangular storm easement to better route the storm drainage due to the adjacent property owner's desire to save the adjacent trees. Therefore, the proposed drainage is routed through a trapezoidal shaped drainage easement area. It is anticipated that the project will use a permeable pavement type driveway for it's Low Impact BMP onsite feature.

The iCap Finn Hill South project is located east of 82nd Avenue NE and diagonally to the southwest of iCap Finn Hill North short plat. The short plat is proposing 5 residential lots with a drainage tract contained within the project site. The drainage tract will contain a combined water quality and retention vault servicing both the iCap Finn Hill North and South Short Plats, and an access street will be constructed for ingress and egress to the South Finn Hill lots via 82nd Avenue NE. The existing use of the south parcel is currently a single family house that will be demolished prior to construction. Some conifer type trees line the eastern and southern property lines.

The project frontage improvements for the iCap Finn Hill North Short Plat include the following: The north short plat will include improvements along 126th for curb and gutter. Along 84th the frontage will be widened and tapered offsite. The frontage along 84th will also include curb, gutter, landscape and sidewalk improvements.

3. *Describe existing hydrology*

The existing hydrology for the iCap Finn Hill North site and South site are similar in use. Single family houses are both currently being used on each parcel. There is grass cover and trees for each of the parcels.

The North iCap Finn Hill Project has a total of 0.901 acres of land impacted by the proposed project, which includes the offsite roadway areas.

The South iCap Finn Hill Project has a total of 0.916 acres of land impacted by the proposed project, which includes the offsite roadway areas.

4. *Description of proposed project*

The iCap North Short Plat will construct 5 lots fronting off of 126th with driveways provided for each lot. A perpendicularly aligned access road will be constructed off of 126th and will extend to the south property line. Drainage will be routed to the proposed iCap Finn Hill South Short plat situated to the southwest of the parcel via a proposed private easement that will collect all lot and roof runoff to a private 10 feet wide easement to be placed adjacent to the south property line. Each of the created single family residential lots will use a permeable pavement type driveway for it's onsite BMP requirement. Sewer stub will be connect to the new 126th street sewer main and the proposed water services will also be tapped off of the new 126th street water main. Trees along the planter strip will also be planted for the project as well as frontage trees for 84th Avenue.

The iCap South Short Plat will construct 5 lots fronting off of the newly created access road proposed for the site. The new access road will be perpendicular to 82nd and be laid adjacent to the north property line. Drainage will be routed from the proposed iCap Finn Hill North project and directed to the proposed combined water quality and retention vault to be located to the southwest of the parcel. A new sewer main is proposed as well as a new water main to be laid under the proposed access road. Sewer and water services will be tapped off of the new mains.

5. *Description of nearby receiving waters*

The two short plat projects is located within the Denny Creek Watershed's upper headwater area. The runoff direction will be maintained with pre and post project runoff draining to Denny Creek ultimately. The project's immediate runoff generally drains towards the west to southwest, via grass and brush cover, and enters into the 82nd Avenue NE closed drainage system. The runoff then heads west after 125 feet of closed runoff to the north and west to a shallow grassed lined ditch laid adjacent to NE 126th Place. The creek drains westward between single family houses, some culverts, and the NE 126th Place road for approximately 1300 feet before being routed to the Juanita Drive NE drainage system that discharges to the 316 acre Big Finn Hill Park / Denny Creek system. The lower Denny Creek area is parkland that is enjoyed by local residents and recreationists that support it's native plants and trees, such as Douglas fir, big leaf maple, and salmonberry.

6. *Site vicinity map showing location of site, nearby roads, receiving waters, and significant geographical features*

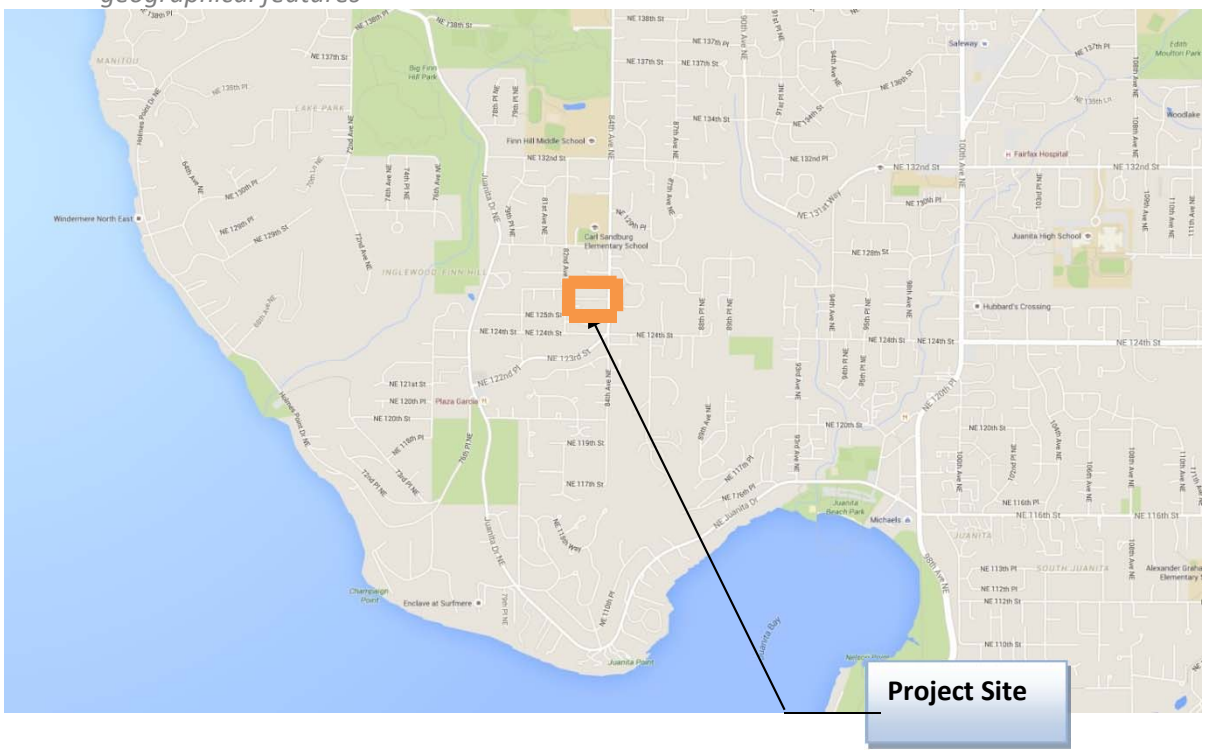

Figure 1: Vicinity Map

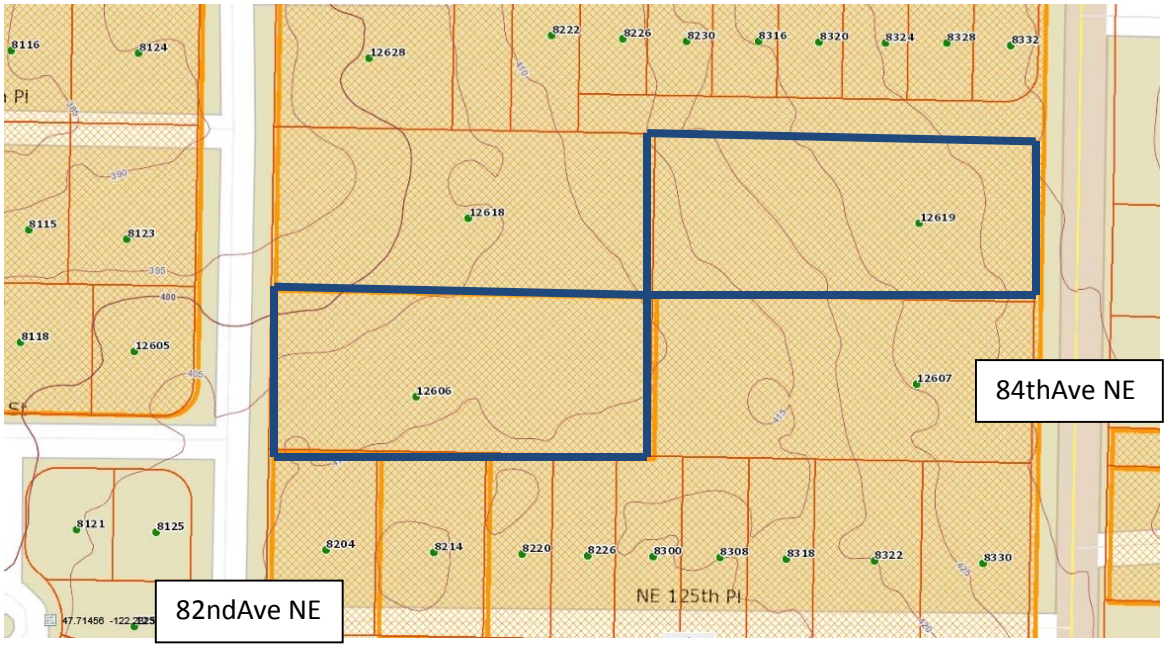

Figure 2: Site with Contours

1/4 MILE DS
PROJECT DISCHARGE
G
122 LF
138 LF
75 LF
47 LF
25 LF
A
B
C
D
Denny Creek
Champagne Creek

B. Minimum Requirements:

1) *Determine project size: targeted or full*

The following report provides the Level 1 Downstream Analysis and TIR report (hereafter also referred to as the drainage report) required for final engineering design approval. Information contained within this report has been compiled from the Kirkland GIS data, the King County GIS data, field exploration and investigations, and as well as from historical information. The following report complies with the City of Kirkland (COK) Policy D-10 and the 2009 King County Stormwater Design Manual (KCSWDM). The Policy D-10 document is the COK Addendum to the 2009 KCSWDM. The drainage review required for this project is a Full Drainage Review within a Level 2 flow control area. The project will result in more than 5,000 square feet or more of new impervious surface, or 10,000 square feet or more of new plus replaced impervious surface. Since the thresholds exceed 10, 000 square feet or more of new plus replaced impervious surface for each short plat, then the project is subject to the Full Drainage Review criteria and requires discussion of the eight core requirements in Section 1.2 and the six special requirements in Section 1.3.

2) *Determine which minimum requirements apply, and state how each applicable requirement is met*

Requirement #1: Discharge at the natural location.

Applies. The project will continue to discharge at it's current discharge location. All runoff currently drains overland through some grass and trees. The excess runoff that does not perk into the subsurface is collected in a CB located on 82nd Avenue NE. The proposed runoff will also be collected, treated and detained in a vault prior to release to the storm system on 82nd Avenue NE.

Requirement #2: Offsite Analysis

Applies. See more detailed analysis below. The requirement is being met and information is provided in Section C of this report. There are no known flooding, water quality or other problems downstream that would be aggravated by this project since the project will mitigate for it's water quality and provide flow control. No known critical areas within a quarter mile downstream would be affected by this project.

Requirement #3: Flow Control

Applies. Flow control is explained in greater detail within Section D of this report and includes calculations. Onsite flow control is provided on the South Finn Hill short plat project using a combined flow control and water quality treatment facility. Runoff will abide by the Level 2 flow control standards since the project converts more than 10,000 square feet of natural area to impervious area. A level 2 flow control analysis standard will be applied, which matches historic durations for 50% of the 2 year through the 50 year peaks AND matches 2 year and 10 year peaks.

Flow control BMPs will be provided on each proposed residential lot by using permeable pavement. Full dispersion, full infiltration, basic dispersion, limited infiltration are not possible due to the till type soils underlain onsite. (See geotechnical report.) Therefore, the use of permeable pavement will be used for the proposed driveways.

Requirement #4: Conveyance System
Applies to this project. The conveyance system proposed for onsite will be analyzed during the final engineering TIR report phase. Proposed storm pipes will mostly be 12 inch PPP type closed conveyance with slopes more than 0.5% to 1.0%. The proposed system will be designed to convey and contain the 25 year peak flow. The analysis will be computed using the Rational Method and Waterworks.

Requirement #5: Erosion and Sediment Control
Applies to this project. The project will clear and grade the two sites. Each respective site is less than 1 acre and will be designed by an ESC supervisor who is also a CESCL. The site will be designed to contain short term stormwater runoff by using various erosion control BMPs including straw wattles, inlet protections, silt fencing, straw mats, construction entrance, covering soil when unworked and re-vegetating when phases are completed.

Requirement #6: Maintenance and Operations
Applies to this project. The site will be maintained by the developer and/or it's HOA. Long term stormwater control facilities will be privately maintained by each HOA. An Operation and Maintenance manual shall be retained on site and transferred to the new property owners/HOA upon ownership changes. Any future BMPs will be designed in accordance with current City of Kirkland standards and/or KCSWDM criteria. Maintenance responsibilities will be clearly defined during final engineering design for the Final TIR and will coordinate what facilities and who will be responsible for the built system and for how long. Typically the developer will be responsible for maintaining the system until the City takes over the facility after 2 years of performance. It is understood that the private facility may have inspections by the City and deficiencies must be fixed by whoever is responsible for maintenance.

Requirement #7: Financial Guarantees and Liabilities
Applies to this project. The project will post a bond prior to construction and after final inspection approvals for a 2 year performance bond. In addition, the applicant shall maintain liability insurance prior to a permit issuance for construction to the amounts of $1,000,000 for commercial general liability insurance with a $2,000,000 aggregate. Copies of this insurance policy shall be provided to the City during / after final engineering. In addition, the applicant will furnish a Construction Maintenance Bond for any new public improvements to be deeded to the City for 2 years. The bond calculation worksheet will be furnished during final engineering submittal.

The owner of the project will initiate a facilities covenant document prior to final plat approval.

Requirement #8: Water Quality
Per the 2009 King County Stormwater Manual, the iCap North Short Plat project proposes approximately 3,162 square feet of pollution generating impervious area (PGIS) that will drain towards the iCap South Short Plat project vault. The South Short Plat will have 7,463 square feet of pollution generating impervious area requiring treatment. Therefore a water quality volume is proposed to be provided to mitigate for the project's PGIS runoff impact.

The water quality vault sizing calculation is provided in the Section G of this report.

Special Requirement #1: Other Adopted Area Specific Requirements

The proposed project's drainage basin is within the Lake Washington WRIA 8 – Cedar Sammamish Watershed that contains Lake Washington also. The City of Kirkland has adopted the WRIA 8 within it's Ordinance for protection Salmon and other wildlife draining to Lake Washington. Any and all endangered species must comply with the WRIA 8 plan for this basin, which this project is within. The project is located in the upstream area of the Denny Creek basin. There does not exist any in City basin plans beyond the Cedar River WRIA 8 Watershed plan that was developed by the County.

Special Requirement #2: Flood Hazard Area Delineation

There exists no flood hazards within the project area or immediately downstream of this discharge location.

Special Requirement #3: Flood Protection Facilities

There exists no known flood protection facilities in this area, upstream, or downstream.

Special Requirement #4: Source Control

This project shall not contain any stored materials which may contaminate the land and runoff that may infiltrate into the aquifer. No short or long term gasing trucks, containers, or other flammable or toxic chemicals will be stored on-site without proper containment methodologies.

Special Requirement #5: Oil Control

Oil control is not necessary for this development since traffic through the intersection of 126th and 84th or 124th and 82nd does not exceed 1,000 ADT or more.

Special Requirement #6: Aquifer Protection Area

The proposed project is located in Northshore Utility District's water service boundary. Renton's Resource Stream Flow per the City of Renton Aquifer Protection Mapping. The project does not appear to be within an aquifer area that provides well water.

C. Offsite Analysis:

1) *Describe study area*

Both project sites are part of the Finn Hill neighborhood and drains to the west towards Denny Creek. The drainage pathway generally drains westward overland towards 82nd Avenue NE and then northwards to NE 128th Street. Then westwards towards Juanita Drive NE and northwards to the CB and ditch system that flows westwards through Big Finn Hill Park.

2) *Upstream analysis*

The two short plat projects are at the uppermost portion of the Denny Creek watershed basin. 84th Avenue NE is a street basin divider and does not appear to drain runoff from the street to the existing parcels. There does not appear to be any upstream contributing basin to these two sites. The only potential upstream area that may currently drain to the site is the runoff from 84th Avenue NE to a lack of a roadside ditch that sheet flows onto the property's grass and tree area.

3) *Downstream analysis*

Both project sites are part of the Finn Hill upland neighborhood approximately ¼ mile east of Big Finn Hill Park and drains to the west towards Denny Creek via NE 126th Place. The drainage pathway generally drains westward overland towards 82nd Avenue NE and then northwards to NE 128th Street. Then westwards towards Juanita Drive NE and northwards to the CB and ditch system that flows westwards through Big Finn Hill Park. The following is a downstream analysis and conditions assessment in greater detail:

Description Point	Description	Structure and DS Point	Notes
A	Discharge location from project's vault to 82nd avenue NE	12"ADS pipe, 0 feet DS of discharge point	The CB appears to be fine upstream of the discharge location.
A to B	Type 1 Vaned Grate CB, Not a deep structure.	12" ADS pipe discharging north, 208 feet DS.	The CB appears to be fine without much sediment in the structure. Condition: Good.
B to C	Type 1 vaned grate CB. Not a deep structure.	12" ADS pipe discharging west, 261 feet DS.	The CB appears to be fine but has some sediments in the sump. Condition: Good.
C to D	Start of shallow roadside ditch. Grassed.	Shrubs line the south side of the ditch. Grassed on the north slope of the ditch. 308 feet DS.	The ditch appears to be in good condition without debris in there.
D to E	The ditch along NE 126th Place is in good condition.	12" concrete culverts provide access to the SFH to the south of the street. The ditch system does not seem to be eroding or is it in poor	At the end of the street, the ditch widens and is conveyed through grassy and treed/brushed area. This area is unimproved/developed

		condition. 1083 feet DS.	and access through this area was limited due to ownership determination difficulties.
E to F	Treed area with abundance of conifers. Could not walk too deeply into the foliage. This is the unimproved roadway on 80th Avenue NE.	12” aluminum or steel type pipe. 1221 feet D.S. (ID #26061 in COK GIS)	Condition appears okay but has organics filled to the pipe invert so hard to tell if there is sediment in sump.
F to G	Treed area with conifers and brush.	12” alumin or steel type pipe. 1343 feet D.S. (ID #26080 in COK GIS)	End of ¼ mile downstream analysis walk. There is a street side CB without a curb. Flow was observed and operating through the CB.

D. Flow Control Design:

1) Evaluate the feasibility and applicability of full dispersion, infiltration, and state the low impact development (LID) BMP that will be used on this project (1 minimum). Use Stormwater LID Feasibility Evaluation Worksheet (Pre-Approved Plan policy L-1).

   The use of Pre Approved Plan policy L-2 will be used for the full drainage review type projects that these two projects are considered since each short plat creates more than 5,000 square feet or more of new impervious surface area. The following feasibility analysis is evaluated based upon Policy L-2:

   Full Dispersion:
   The soils analyzed by Icicle Creek Engineers (see Geotech report) state that full dispersion is not recommended since till soils found onsite do not infiltrate well. There will not be 50 to 100 feet of native vegetation retained with a flowpath for any of the future lots.

   Basic Dispersion:
   The site will not have 25 feet to 50 feet of vegetated flowpath on each proposed SF lot. These lots are not very large lots, which is expected in the RS-8 zone.

   Upon looking at the remaining BMPs from the 2009 KCSWDM list there is a possibility of using permeable pavement for the driveways to comply with the onsite BMP requirement. According to the Icicle Creek geotechnical report (August 11, 2015), the upper 3 to 5.5 feet of weathered soils overly the impermeable glacial till with sandy loam. The proposed permeable pavement for the driveways can utilize the upper 3 to 5.5 feet of weathered soils area with a long term design infiltration rate of 0.25 inches per hour. Each lot will be approximately 5,000 square feet or less and therefore using the driveway as a permeable pavement BMP will result in achieving the BMP area requirement. The 10% of the lot requirement is complied.

2) Existing hydrology
   The existing landuse for both the north and south parcels for these projects are similar. Each parcel has a single family house, driveway, perimeter trees and grass. The North iCap Finn Hill Project has a total of 0.901 acres of land impacted by the proposed project, which includes the offsite roadway areas.

   The South iCap Finn Hill Project has a total of 0.916 acres of land impacted by the proposed project, which includes the offsite roadway areas. The existing areas will be modeled as fully forested, even though the existing condition has impervious areas. This will result in a more conservative discharge from the site.

3) Proposed hydrology
   The proposed landuse for the project site is a mixture of residential rooftops, permeable driveways, grass, landscape plants, access roads, sidewalks and improved roadway. Below is the total proposed landuse areas:

Finn Hill North									
	Area (sf)	**Assume Max Imp=50% Imperv. Allowable**	**Proposed S/W (sf)**	**PGIS (sf)**	**Pervious (sf)**	**Treed (sf)**	**Grassed (sf)**	**Imperv. (sf)**	
Lot 1	6,916.1	3,458.05			3458.05			3458.05	
Lot 2	6,039.5	3,019.75			3019.75			3019.75	
Lot 3	6,040.0	3,020.00			3020			3020	
Lot 4	6,040.5	3,020.25			3020.25			3020.25	
Lot 5	6,103.3	3,051.65			3051.65			3051.65	
Non-Lot Areas Impacted*	8,127.2		2478.5	3162.4	2486.3			5640.9	
	39,266.6	15,569.70	2478.5	3162.4	18056			21210.6	
				Totals (acres)=	0.415	0.06	0.355	0.487	
		Totals Adjusted for Pervious Pavement Driveways (acres)=			**0.443**	**0.06**	**0.383**	**0.458**	
Finn Hill South									
Lot 1	5,002.7	2,501.35			2501.35			2501.35	
Lot 2	5,002.3	2,501.15			2501.15			2501.15	
Lot 3	5,001.9	2,500.95			2500.95			2500.95	
Lot 4	4,608.0	2,304.00			2304			2304	
Lot 5	4,408.8	2,204.40			2204.4			2204.4	
Drainage Tract	3,954.8	2,660.00			1294.8			2660	
Non-Lot Areas Impacted*	11,914.8		1640	7463	2811.8			9103	
	39,893.3				16118.45			23774.85	
				Totals (acres)=	0.370	0.06	0.310	0.546	
		Totals Adjusted for Pervious Pavement Driveways (acres)=			**0.399**	**0.06**	**0.339**	**0.517**	
Note: * Includes offsite areas with subbase affected									
					0.842	0.120	0.722	0.975	1.817
					acres	**acres**	**acres**	**acres**	

4) Soil types
The soil types found on both the north short plat area and the south short plat area are both Glacial Till type soils with silty sand with gravel and cobbles in a dense condition.

5) Summarize existing and proposed land use/condition
See table provided on previous page.

6) Describe modeling inputs
Modeling inputs include using 1.82 acres of existing as fully forested. This include the offsite improvement areas.
Modeling inputs into KCRTS is included in the Appendix.

7) Model results
See KCRTS Retention/Detention Facility output provided in the Appendix.

8) Describe design criteria for flow control facilities
The KCRTS Runoff Time Series Program was utilized to size the detention facility. The detention vault was sized for a Level 2 flow control based upon requirements of the 2009 KCSWDM as Amended by the City of Kirkland. Please refer to the KCRTS computations attached to the Appendix. Based on a level 2 flow control requirements, the vault volume required is 20,020 cubic feet of live storage.

9) Summarize dimensions of flow control facilities: volume, length, width, depth, orifice sizes, bottom elevation, overflow elevation, etc. (Note: To be recalculated with onsite LID pervious concrete after initial submittal.)

Type of Facility:	Detention Vault	
Facility Length:	85.80	ft
Facility Width:	26.00	ft
Facility Area:	2231.	sq. ft
Effective Storage Depth:	9.00	ft
Stage 0 Elevation:	392.50	ft
Storage Volume:	20077.	cu. ft
Riser Head:	9.00	ft
Riser Diameter:	18.00	inches
Number of orifices:	2	

Orifice #	Height (ft)	Diameter (in)	Full Head Discharge (CFS)	Pipe Diameter (in)
1	0.00	0.63	0.032	
2	5.30	1.10	0.063	4.0

10) Amended soil (Ecology BMP T5.13) is required for all landscaped areas on project sites 1 acre or larger.

Each project site is less than 1 acre for the North iCap Finn Hill Project and the South iCap Finn Hill Project. These projects are being submitted separately, but the detention vault is combined to ease future maintenance. The project still intends to amend the soils to allow for compost water retention in landscaped onsite and offsite areas.

E. Conveyance Design:

The conveyance design will be finalized during the final engineering design for the construction documents/construction permit. Various sub-basin and other contributing areas will be mapped, calculated and analyzed for conveyance and backwater. The proposed slopes designed during the preliminary phase indicate adequate site and pipe slopes will discharge to the 82nd Avenue street system with plenty of fall from one end of the plat to the other end.

1) Pipe sizing:
   See statement above. Will be provided for final.

2) Area draining to each structure:
   See statement above. Will be provided for final.

3) HGL calculations for all conveyance:
   See statement above. Will be provided for final.

F. Construction Stormwater Pollution Prevention Plan (CSWPPP)

1) ESC Plan and SWPPP report shall be provided for the final design.

2) Stormwater Pollution Prevention and Spill Plan (SWPPS) – applicable for project sites 1 acre or larger

   The SWPPS is not required for the Finn Hill North Short Plat since the project is less than 1 acre in size.
   The SWPPS is not required for the Finn Hill South Short Plat since the project is less than 1 acre in size.

G. Water Quality Design:

1) Summarize new proposed PGIS and PGPS

The pollution generating impervious surfaces (PGIS) for both projects are similar. Each has offsite new impervious areas including additional access road and frontage widening. There is not any proposed pollution generating pervious surfaces for these two projects. The total PGIS for the north short plat is 0.458 acres of which 0.129 acres are offsite impervious areas. The total PGIS for the south short plat is slightly larger due to the new ingress/egress road proposed for the lots. The south total PGIS is 0.517 acres of which 0.209 acres is the new offsite impervious areas.

2) Summarize treatment level required (basic, enhanced, oil control)

The treatment level proposed and required for the project is a basic treatment.

3) Describe contaminants of concern

There are no pre existing known contaminants of concern on the project sites and proposed project shall only be producing more PGIS that will be mitigated for with a vault.

4) Describe proposed source control measures if applicable

Proposed source control will include covering stockpiles with plastic and ensuring no contaminated storage tanks are present without the proper safety protocols.

5) Model results

5,453.3 cubic feet of dead storage required. (See following sheet's calculations.)

6) Describe design criteria for water quality facilities

The water quality facility proposed is a combined wet vault and includes sloped bottom, proper hatch/grate areas, ingress/egress to the inlet and outlet, and a driveway cut with gravel for maintenance.

7) Summarize dimensions of water quality facilities: volume, length, width, depth, orifice sizes, bottom elevation, overflow elevation, vegetation type, etc.

Wetvault Facility Design									
Finn Hill (South) Short Plat									
Date:	15-Oct-15								
Wetpool Analysis for Water Quality Treatment:									
Step 1.)	Determine Volume Factor, f.								
	Basin size			f =	3	Consult WQ requirements (Section 1.2.8)			
Step 2.)	Determine rainfall R for mean annual storm								
	Rainfall (R)				0.039	(feet), Req'd from Figure 6.4.1.A, page 6-71			
Step 3.)	Calculate runoff from mean annual storm								
	Vr = (0.9Ai + 0.25 Atg +0.10 Atf + 0.01 Aog) x R								
	A i = tributary area of impervious surface				42,471	(sf)	Determine Now		
	Atg = tributary area of till grass				31,450	(sf)	Determine Now		
	Atf = tributary area of till forest				5227.2	(sf)	Determine Now		
	Aog = tributary area of outwash grass					(sf)	Determine Now		
	R = rainfall from mean annual storm					(ft)	Determine Now		
	Vr = volume of runoff from mean annual storm				1,817.76	(cf)	From Step 2		
Step 4.)	Calculate water quality volume required based on Wetpool methodology								
	Vb = fVr								
	f = Volume factor				3	unitless	From Step 1		
	Vr = Volume of runoff, mean annual storm				1,817.76	(cf)	From Step 3		
	Vb = Volume of wetvault req. for wq treatment				5,453.28	(cf)			

H. Operations & Maintenance manual.

1) Projects with privately maintained drainage facilities shall submit a O&M manual that must be kept on-site, and transferred with the property to the new owner. Include the responsible party for maintenance, a long-term maintenance schedule, and blank maintenance activity log sheets (to be filled in by owner).

2) For certain technologies, COK may require additional assurances that maintenance can and will be done (for example, COK requires a long term maintenance contract if filter cartridges are used). It is understood by the developer that these contracts shall be entered into for this project.