

# **Surface Water Management and Drainage Concerns in the Finn Hill/Holmes Point Neighborhood**



**Finn Hill Neighborhood Alliance**

**Kirkland, Washington**

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Finn Hill Neighborhood Alliance**

## Executive Summary

From Dec-2011 to May-2012, residents of Finn Hill collected information about surface water concerns in our Kirkland, Washington neighborhood. Data collection methods included field reconnaissance, telephone interviews, e-mail correspondence, and a targeted Internet survey.

Our results and recommendations for the Finn Hill neighborhood are similar to those published by the Puget Sound Action Team and the Puget Sound Partnership for watersheds across the Puget Sound basin. Initial results of our project are summarized in five categories of surface water issues. We include recommended actions for each category:

**Juanita Drive and proximity** - Juanita Drive and other impervious surfaces are the primary sources of polluted runoff in the Finn Hill neighborhood. Because of the high number of car miles driven on Juanita Drive, runoff from the road is a major contributor of contaminated surface water to neighborhood streams and to Lake Washington. We request additional information about surface water conveyance features on Juanita Drive. We plan to use that information to design mitigation projects to improve water quality in several strategic locations.

**Denny Creek** – We propose a capital improvement project to Daylight the creek crossing under Juanita Drive, and to install check dams to slow water flow downstream of the road and to improve fish habitat. Include a walking or biking trail under Juanita Drive as part of the daylighting project. Remove the culvert at the beaver ponds in Big Finn Hill Park, repair or modify culvert inlets to mitigate flooding of residences near the creek, and repair or replace storm water conveyance features.

**Repair old infrastructure** - Storm water retention ponds throughout the neighborhood need maintenance or repair. Homemade flumes and tight line configurations are prone to leaks and catastrophic failure; they should be inspected and repaired or replaced, as necessary. The crumbling concrete bulkhead in O.O. Denny Park should be removed.

**Concerns raised by individual land owners** – These concerns include mud slides, rogue runoff, and culvert inlets that are prone to failure. Most of these issues are currently self-managed by residents with solutions installed and maintained at personal expense. Recommendations include a combination of City maintenance or repair of existing systems, and education of homeowners about the effects of surface water outfall to their neighbors.

**Best practices for low impact development** - We provide several examples of poorly implemented surface water management in new residential developments. We recommend that the City consider extending the special district zoning overlay for the entire neighborhood. Currently, the special district overlay applies to a portion of the Finn Hill neighborhood west of Juanita Drive.

Communication with Kirkland Public Works is underway to discuss results and recommendations. Solutions will be discussed and implemented on an ongoing basis. Solutions will be funded by the Finn Hill Neighborhood Alliance, private funding, grant money, the City of Kirkland, and other government agencies.

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## Introduction

The everyday American landscape is a vast and confusing mix of terra incognita. Most of us who live in urban or suburban environments have activity patterns that traverse complex landscapes layered with tracts, strips, roadways, culverts, sediment ponds, and noise walls. Residential design patterns – no longer uniform or predictable - are described by city planners with terms like boomburg, pork chop, privatopia, and “parsley ‘round the pig.”

As rural areas yield to growing human populations, building density increases and planning requirements are modified to accommodate growth. As growth continues, impervious areas increase in size, and human activities add pressure to remaining open space.

The results of typical development patterns include increased pollution, loss of wildlife, declining water quality, and trade-offs that erode attributes we typically associate with quality of life. In spite of these trends, there is hope: with conscious effort from a willing, informed community, negative patterns can be recognized, described, and reversed. This project is a demonstration of informed hope to work on a small scale to reverse a trend that is common in the Puget Sound area, and to share results and lessons learned with other neighborhoods across western Washington.

Most communities in the Puget Sound area are subject to similar dynamics: Due to increasing areas of impervious surface and decreasing forest cover, runoff is the number one threat to water quality. Puget Sound Keepers recognizes that because the Puget Sound basin is massive (Figure 1), we should manage surface water at the scale of individual watersheds.

The Puget Sound Action Team has a technical guidance manual for low impact development in the Puget Sound area. Their recommended priorities for watershed-level management of surface water runoff and water quality are:

- Low impact development (LID).
- Monitoring to determine whether trends show improvement or decline with regard to key indicators of water quality.
- Identifying mitigation methods that make a difference.
- Continually updating and refining the LID Technical Guidance Manual.

The Puget Sound Action Team recommends these specific actions to protect and preserve the environment:

- Prevent runoff through best practices for LID.
- Monitoring and education to identify specific hot spots and fix them.
- Address combined sewer outfalls to storm water systems.
- Small-scale solutions and innovations like rain gardens and cisterns.
- Include storm water planning as part of development planning.
- Include citizens and neighborhood groups whenever possible to encourage transparency, accountability, and to track trends and results.

- Develop best practices, share information, and multiply individual actions.
- Utilize the Puget Sound Partnership - <http://www.psp.wa.gov/> - as a partner organization.



Figure 1. Puget country, the westernmost piece of the Pacific Northwest, is a natural drainage basin, its waters running into the grand inland sea, Puget Sound.

The Finn Hill neighborhood in Kirkland, Washington is located on the northeast corner of Lake Washington (Figure 2), approximately ten miles from downtown Seattle. Compared to many other neighborhoods in the Seattle metropolitan area, Finn Hill is a neighborhood with extensive open space.

In June 2011, Finn Hill was annexed into the city of Kirkland, Washington, adding a new neighborhood of approximately 6 square miles and 15,000 residents to the city. Kirkland is now approximately 17 square miles with a population of about 80,000 people.

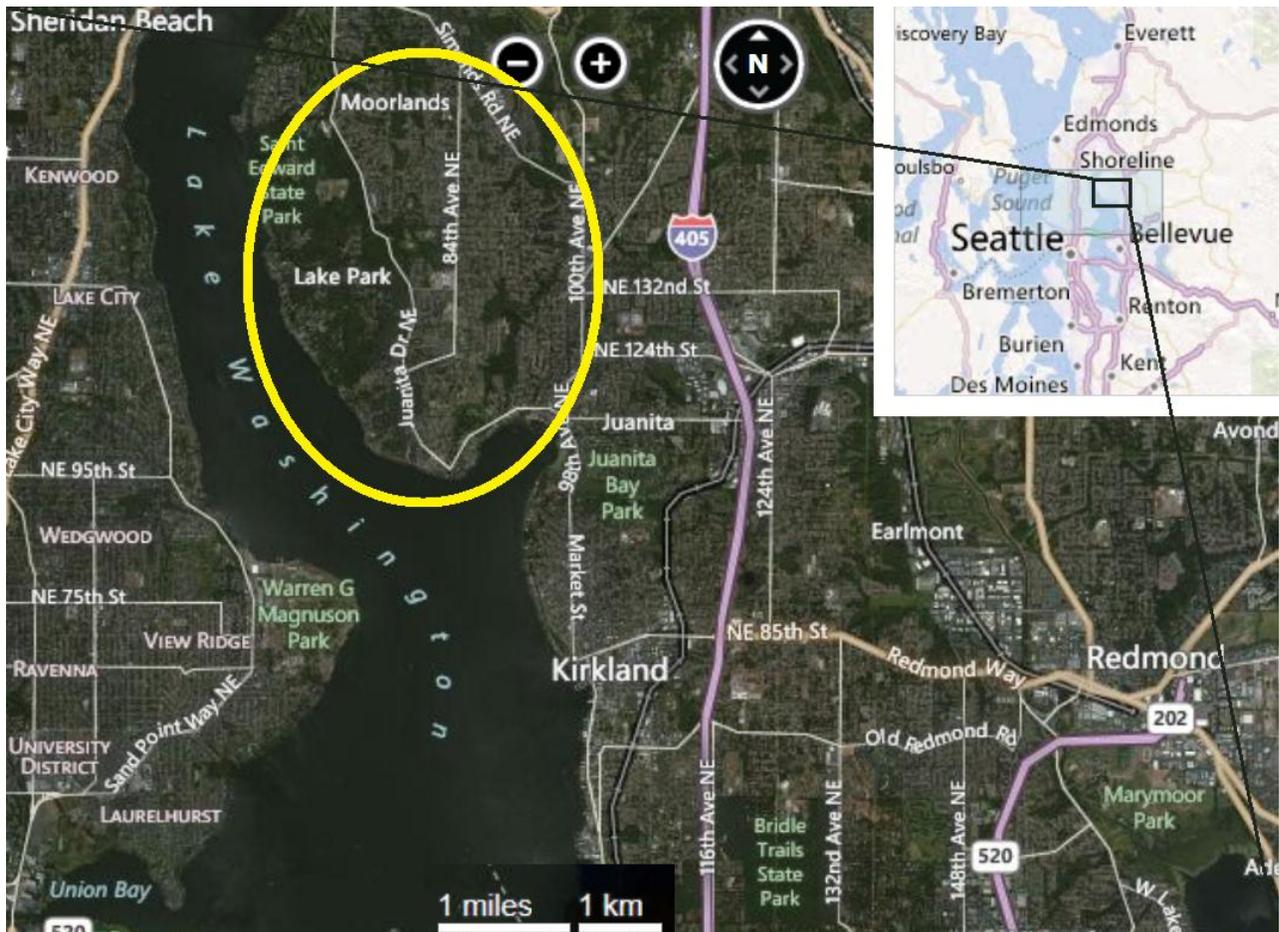


Figure 2. The Finn Hill neighborhood, circled in yellow, is located in the northwest corner of Kirkland, Washington, approximately ten miles from downtown Seattle.

In November 2011, a neighborhood surface water study was undertaken by Finn Hill residents in cooperation with Kirkland Public Works.

Objectives of this study were to:

- Assist Kirkland Public Works to update their surface water master plan, a multi-year working document to manage and improve surface water within the city.
- Help Kirkland Public Works to identify surface water areas of concern according to residents of Finn Hill.
- Identify potential capital improvement projects for the Finn Hill neighborhood.



The web of relatedness of land, water, and living things – major ecosystems in the Puget Sound basin. Diagram by Michael Emerson.

## Methods

Information was collected from residents who replied to a Finn Hill neighborhood e-mail announcement, completed an online survey hosted by Survey Monkey (<http://www.surveymonkey.com/s/3CPF7M7>), or requested assistance via word of mouth. Residents arranged a site visit to describe, map, and photograph surface water concerns. At the time of the site visit, possible solutions were discussed with residents.

Emphasis has been placed on small-scale improvements designed and implemented – wherever possible - by neighborhood residents and small work parties. For larger projects, we will utilize Kirkland Public Works maintenance processes, we will propose capital improvement projects, or we will apply for grants.

## Results

The following list represents categories of surface water concerns in Kirkland's Finn Hill neighborhood, including some that date back to recommendations in the 2007 O.O. Denny Creek Watershed Study.

1. **Juanita Drive and proximity** - Juanita Drive and other roadways are the primary sources of polluted runoff in the Finn Hill neighborhood. Because of the high number of car miles driven on this road, runoff is a major contributor of contaminated surface water that drains into Denny Creek and Lake Washington.

We request additional information about surface water conveyance features on Juanita Drive, specifically: We would like a complete surface water conveyance schematic for Juanita Drive between Spud Fish and Chips in Juanita and Arrowhead Elementary School just north of the Kirkland city limit. We will use the schematic to develop a heat map of areas where remediation will have the greatest benefit.

2. **Denny Creek** – Daylight the creek crossing under Juanita Drive. Install check dams to slow water flow downstream of the road and improve fish habitat. Include a walking or biking trail under Juanita Drive as part of the daylighting project to improve public safety. Remove the culvert at the beaver ponds in Big Finn Hill Park, repair or modify culvert inlets to mitigate flooding of residences near the creek, and repair or replace storm water conveyance features that do not function correctly.

Note that the 2007 watershed study conducted in and around the Denny Creek watershed included standards-based testing of Denny Creek. This index of biological integrity used a model of known parameters that indicate habitat quality for salmon: water temperature, dissolved oxygen, turbidity, seasonal flow characteristics, and macro invertebrate sampling.

Results in 2007 indicated that Denny Creek provides viable salmon habitat and presently supports native cut-throat trout. The challenge faced by residents, land managers, and city planners in this watershed is to slow or eliminate the decline of habitat quality that results from increased traffic and human activities like residential development.

3. **Repair old infrastructure** - Storm water retention ponds throughout the neighborhood need maintenance or repair. Homemade flumes and tight line configurations are prone to leaks and catastrophic failure; they should be inspected and repaired or replaced, as necessary. The crumbling concrete bulkhead in O.O. Denny Park should be removed. There is an old wooden water tank at the north end of Holmes Point Drive that should be investigated and probably dismantled.
4. **Concerns raised by individual land owners** - Mud slides, rogue runoff through open space and private property, and culvert inlets that are prone to failure. Most of these

issues are currently self-managed by residents with sandbags, hand-dug trenches, French drains, and sump systems installed and maintained at personal expense. Solutions include a combination of City maintenance or repair of existing systems, and education of homeowners about the effects of surface water outfall to their neighbors.

5. **Best practices for low impact development** - We provide several examples of poorly implemented surface water management in new residential developments, and recommend discussion about extending the special district zoning overlay for the Finn Hill neighborhood.

The following sections outline specific results and recommendations for each major category:

## Juanita Drive and Proximity

Juanita Drive bisects the Finn Hill neighborhood with a two lane boulevard with wide shoulders on both sides. Juanita Drive is the biggest source of polluted runoff in the Finn Hill neighborhood. Additionally, new residential developments have created additional impermeable surfaces where mitigation of surface water runoff is inadequate. For example, in Chatham Ridge and Kirkwood developments, runoff in downhill areas has increased significantly, negatively affecting Juanita Woodlands. New muddy spots and large bogs have formed, causing mature trees to fall, some near roadways and residences.

In conjunction with retrofitting large impermeable surfaces in key areas, Juanita Drive is the feature in our neighborhood that, if managed appropriately, could result in the most significant improvement to water quality.

- For Juanita Drive:
  - Obtain a complete ditch, culvert, and conveyance schematic from the City of Kirkland for Juanita Drive between Spud Fish 'n Chips and Arrowhead Elementary.
  - Determine the number of point source outfalls – managed pipes - to creek and the lake.
  - Current number of vehicle miles per year for 2005 – 2010?
  - Percent increase in vehicle miles per year as a result of 2012 bridge tolling?
  - Daylight Juanita Drive at 122<sup>nd</sup> Ave at Whiskey Creek. This is in the Juanita Woodlands.
  - Revise culverts and point source sites as indicated by inspection of current ditches, culverts, and conveyance. Add octopus or other passive scrubbers to filter surface water.
  - Improve outflow to lake through addition of octopus or other passive scrubbers to filter surface water.
    - Discuss expectations and realistic goals for making Finn Hill a case study for on-site, passive water treatment.
    - Use Juanita Drive schematic to develop a heat map of areas with:
      1. High percentage of impermeable surface.
      2. Significant vertical relief.
      3. A single point of outfall to the creek or lake.
      4. Obtain baseline data for current water quality.
      5. Implement a targeted number of passive scrubber mechanisms to treat water before it enters the creek or lake.
      6. Measure improvements, develop recommendations and best practices for additional retrofit candidates.

- Pursue grant funding for a \$25,000 pilot study.
- Eventually include multiple outfall pipes to lake along Juanita, Finn Hill, and Holmes Point.
- Note that St. Edward State Park watersheds are examples of untrammelled creeks in our area. They offer a great baseline, for comparison of water quality.

## Denny Creek Watershed

### Daylight Denny Creek under Juanita Drive

- Improve fish passage upstream from Juanita Drive, improve fish habitat.
- Install check dams to reduce flow velocity to reduce mud slides, scouring of creek substrate, improve habitat for macro invertebrates.
- Allow wildlife movement across Juanita Drive.
- Bridge would allow pedestrian and bike passage under the roadway, offer a great improvement to public safety in an area with high speed traffic and lots of bike riders.
- Reduce human/traffic conflicts, and reduce the number of wildlife strikes on the road.
- Consider wildlife underpass at Juanita Drive and 122<sup>nd</sup>.
- To do:
  - Research similar, recently funded CIP proposals.
  - Get an engineering requirements project, design review for the project.
  - Review CIP project list with FHNA.

### Beaver pond at Big Finn Hill Park

- Remove old culvert at beaver ponds.
- Build bridge and boardwalks - FHNA (Lou Berner) and EMBA (Tom Fitzpatrick) are working on plans with Kirkland and KC Parks. However, the culvert should be removed before the bridge and boardwalks are installed. Culvert removal could cost >\$50k.
- Manage as a riparian area - active beaver habitat, heron, kingfisher, and songbird nesting areas. Daylighting the creek at Juanita Drive would improve fish passage upstream from the road.
- This is an active multiple use area utilized by hundreds of park visitors each month, year round.

### Lacrosse Field Conversion at Big Finn Hill Park

- King County Surface Water Management issued a repair order for the bioswale and retention pond. See inspection report dated Oct-2010 (Appendix C).
  - This backlog of maintenance tasks is now part of the field turf conversion at the soccer field.
  - Communicated with Nancy Cox at City of Kirkland about this in Oct-2011.
  - Restated concerns as part of public comments to Kirkland as part of the SEPA determination of non-significance for the field turf project; submitted by e-mail on 21-Dec-2011 by Scott Morris.

- Consider outfall of retention pond to de-watered tributary at west end of soccer field. This would mitigate flooding of residences currently stuck in the mud for many months of the year.

## Repair Old Infrastructure

Storm water retention ponds throughout the neighborhood are in need of maintenance or repair. Across the Finn Hill neighborhood, there are 50 or more of these installations.

	
<p>Cut bank in retention pond indicates siltation.</p>	<p>The outflow pipe is almost silted over.</p>

Homemade flumes and tight line configurations are prone to leaks and catastrophic failure.


<p>A homemade flume routes surface water runoff down a steep slope from the top of Finn Hill in Kirkland, Washington. There are many similar jerry-rigged pipes flowing off of the west side of Finn Hill, where rogue runoff and poorly managed systems lead to flooding of residences at the bottom of the hill.</p>



This old water tower over an abandoned well at the north end of Holmes Point Drive near 64<sup>th</sup> Terrace NE should be inspected and, if not in use, dismantled.

## Removal of concrete bulkhead at North End of OO Denny Beach

- Tracked by King County.
- Partially funded by King County, permitting is underway.
- Needs funding for balance of budget to complete the project.
- Need planning for shoreline restoration.



The crumbling, concrete bulkhead along the lake shore in O.O. Denny Park should be removed. King County has begun the permitting process for a project to remove it.

## Bridges, trails, and walkways

- Trail and bridge across Denny Creek west of 132nd (across street from LDS church).
  - Alex Brunnenkant is doing this as a Juanita HS service project.
- Trail between BFH soccer field and wooden bridge across Denny Creek - needs 5 water bars.
  - Completed Nov-2011 by Lou Berner, Rinneke Dierken, Mike Crandell, and Finn Hill Junior High School EAS students.
- Trail from FHJH and Thoreau Elementary - needs new bridge to accommodate foot and bike traffic, reduce encounters between beavers and humans.
  - Proposed solution by Evergreen Mountain Bike Alliance.

## Opportunities to Work with Existing “Green Kirkland Partnership” Programs

- NWF backyard wildlife habitat certification program
- Organic gardening concepts
- IPM – integrated pest management techniques
- Rain gardens
- Cisterns
- Chickens and poultry
- Herb gardening
- Pea patches
- Community compost
- Community fire wood
- Rain barrels
- Pesticide-free schools
- Household medicine recovery
- Storm drain marking
- Property-scale runoff management
- Adopt a storm drain

In order to move forward, each project should have an owner, a schedule of events, a budget request, and identified sources of funding.

### Concerns Raised by Individual Landowners

Includes mitigating risk of landslides and unmanaged, runaway surface flow where work can be done within a single property or along a single street, and issues where solutions must be implemented on neighboring, uphill properties.

### Residential Issues

Mud slide mitigation: need funding source and community involvement to:

- Pursue grant money to purchase and plant native trees to stabilize unstable slopes.
- Create a decision tree:
  1. Assess topography and soil, consider impacts from upstream.
  2. Assess existing surface drainage and downspouts.
  3. Possible recommendations:
    - Re-route outflow from downspouts.
    - Re-route flow from upstream sources.
    - Plant big leaf maples et al. and native groundcover to stabilize soil.
  4. Processes for monitoring and follow-up.

# Best Practices for Low Impact Development

## Low-Impact Development

The example below illustrates poor implementation of surface water management in a new residential development. Specifically, building density is high and the percentage of impermeable surface is very high. All downspouts and surface water conveyance are routed to a single vault on the southwest corner of the development with little or no flow control.



Recommendations for low impact development:

- Consider extending the Holmes Point code “Special District Overlay” to the entire Finn Hill neighborhood.
  - The intent of the existing residential code addendum is to manage the impact of development in the overlay area, specifically regarding significant trees and preservation of impermeable surfaces.
  - Extending this code addendum to expand the area affected by additional development restrictions would help to preserve the existing character of the Finn Hill Neighborhood.

- The effect of this action would be to acknowledge that the Finn Hill neighborhood has unique qualities and characteristics that make it different from other suburban neighborhoods, and that these qualities and characteristics should be preserved through additional code restrictions.
- Increase LID code and requirements for residential and commercial development to require on-site treatment of runoff through aquifer recharge, rain gardens, or cisterns. Current conveyance to the existing storm water management system has overwhelmed the system, resulting in rogue runoff and negative environmental impact.
- Consider an engineering review of Chatham Ridge and Kirkwood to develop recommendations to mitigate increased surface water flow downstream, especially in Juanita Woodlands. Presence of root rot in many Douglas fir trees in Juanita Woodlands makes them more prone to falling on roadways or homes, especially during wet and windy months.

## Literature Review and Recommended Reading

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## Appendix A – Report Data from Individual Land Owners

The following twenty-five issues were reported by individuals in the Finn Hill neighborhood, some by e-mail or word-of-mouth, most by a Survey Monkey survey that went out to all e-mail addresses on the FHNA e-mail distribution list. For a pointer to the survey, see the Methods section of this report.

Note to Kirkland Public Works: How will these issues be prioritized and scheduled? Can you present at an upcoming FHNA neighborhood meeting to discuss your plans?

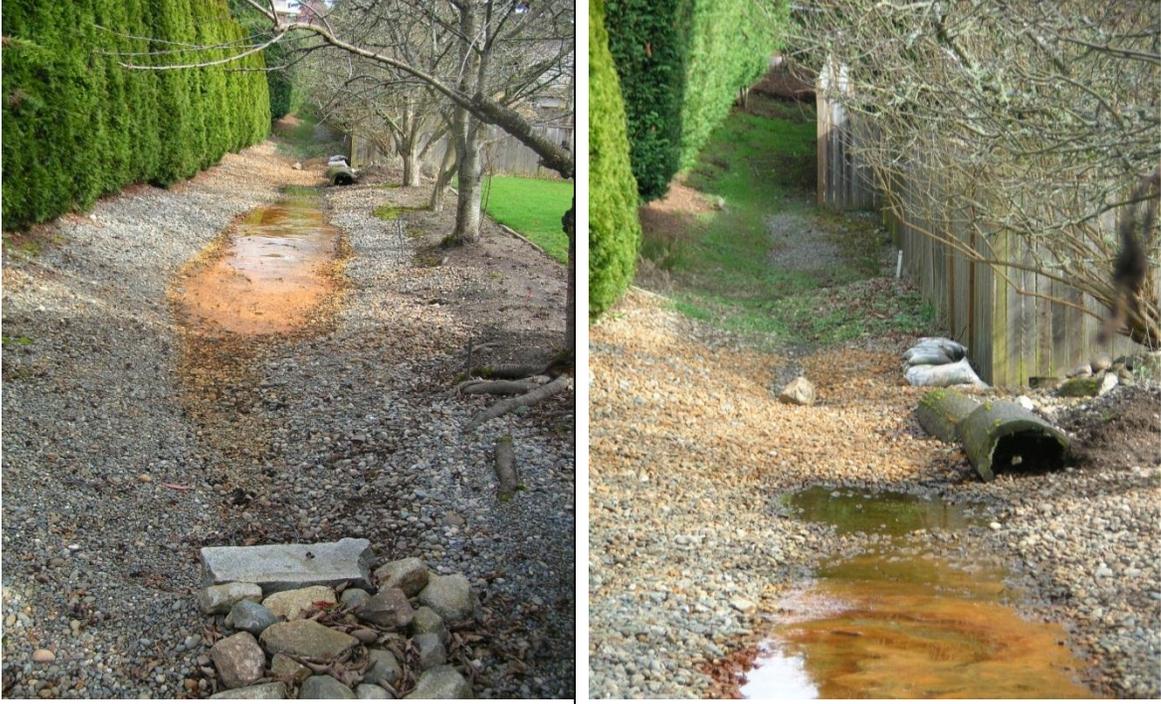
### Anonymous – Juanita sidewalk

Owner – Anonymous	Contact: none
Address: NE 140 <sup>th</sup> Street and 100 <sup>th</sup> Ave NE	Survey response? No
Description – sidewalk low spot at 140 <sup>th</sup> street and 100 <sup>th</sup> avenue in Juanita pools to an extent that it blocks pedestrian crossing in wet weather.	
Solution – Needs gravel or improved drainage to prevent pooling.	
	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works          Action – Add gravel or improve drainage to prevent pooling over sidewalk.          Date complete -</p>	

**Volchock**

Owner – Tony Volchock	Contact: 425.821.8818, tmv8818@aol.com
Address: 12801 Juanita Drive NE 98034	Survey response? No
<p>Description – House and deck are close to the edge of a steep, north-facing embankment, the tributary of Denny Creek that flows down NE 128<sup>th</sup> Street. Downspouts drain to soil, some are routed away from structures. Several shallow mudslides have eroded the hillside close to his deck.</p>	
<p>Solution – Ensure that all downspouts route runoff well away from the house, preferably to the bottom of the ravine, or at least well west of the deck. Plant native trees and shrubs to stabilize the hillside.</p>	
	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works: Site visit, education, mitigation plan. Owner – FHNA: Education, plant native shrubs Action – Education, plant native shrubs Date complete -</p>	

## Keyes

<p>Owner – Cami Keyes</p>	<p>Contact: 425.825.0404, keyescom@comcast.net</p>
<p>Address: 8126 NE 115th Court, 98034</p>	<p>Survey response? #2 Project map: yes</p>
<p>Description – Surface runoff from new construction uphill drains through her property. She has installed &gt;\$10k in French drains and a sump system, which works fairly well most of the time. Lack of proper drainage between homes and on street uphill. See attached materials from King County site inspection (Appendix D).</p>	
<p>Solution – Ensure that the existing perf drain and swale between residences has adequate slope and that the drain stays clear. This will take the pressure off of Ms. Keyes’ ad hoc solution.</p>	
	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Inspect perf drain, dredge swale, clear drain to improve drainage to the existing conveyance. Date complete –</p>	

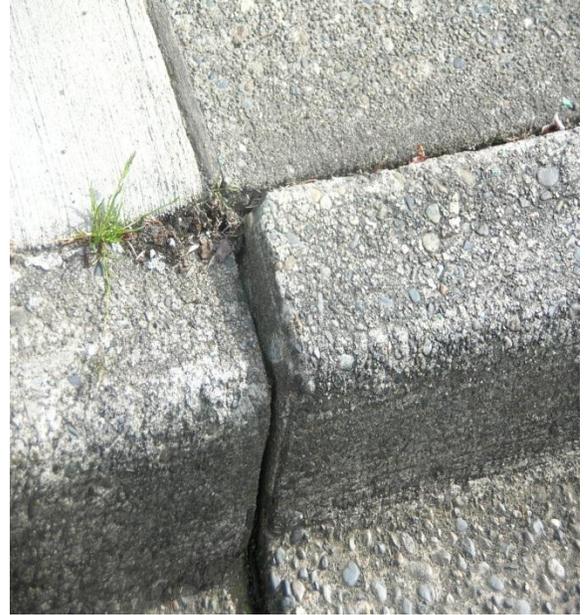
## Raven

Owner – Warren Raven	Contact: 425.766.5041
Address: 12833 Holiday Drive NE	Survey response? #3
Description – flooded crawl space, possibly from foundation being below the level of the road, or below the water table. Likely that improved routing of downspouts will improve the situation.	
Solution – Site visit to inspect downspouts.	
Mitigation plan:  Owner – Kirkland Public Works Action – Education, recommend self-remediation. Date complete -	

## Levition

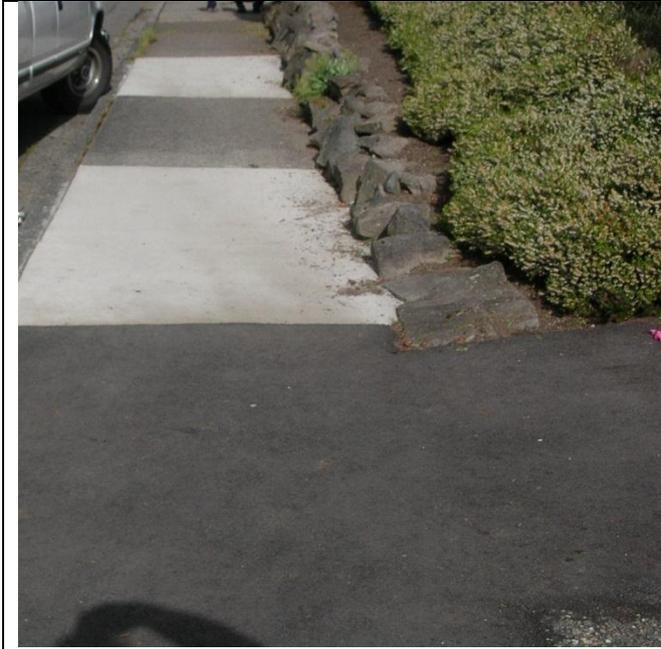
Owner – Linda Leviton	Contact: becalmer@aol.com
Address: 11635 91st Place NE, unit 1B Goat Hill neighborhood	Survey response? #4
<p>Description – Drainage is a historic problem and the new construction has exacerbated all the drainage issues of the street. The Manichuri construction is on wetlands that has historically been the run off location of Goat Hill. In spite of numerous county tries at mitigating the problem, there is a constant stream of run off.</p> <p>Significant volumes of soil and debris wash downslope into storm drains.</p>	
Solution – Monitoring, education, LID, rain gardens and cisterns where feasible.	
	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Monitoring, education, LID, rain gardens and cisterns where feasible. Date complete –</p>	

**Terpstra**

<p>Owner – Kristin Terpstra</p>	<p>Contact: klt@tecx.net</p>
<p>Address: 9601 NE 141<sup>st</sup> Place</p>	<p>Survey response? #5</p>
<p>Description – Water is flowing under the street, sidewalks, and driveways past 6-8 residences. It may be caused by a spring or a disconnected or damaged storm water conveyance. Water seeps through the pavement, sidewalks and curbs are buckling, and a sinkhole has formed. King County has patched individual areas without addressing the root cause.</p>	
<p>Solution – Inspection and repair of storm water conveyance.</p>	
	
<p>Storm water is flowing under the street and sidewalk, undercutting the sub-surface material. Erosion under the sidewalk and street is causing driveway, sidewalk, and curb collapses, and has resulted in sinkhole formation.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works          Action – Inspect and repair storm water conveyance          Complete –</p>	

Continued on next page →

## Terpstra (continued)



King County has patched driveways and sidewalks without addressing the root cause: rogue runoff under the street and sidewalk. Several residents have replaced their driveways at their own expense.



At left, water often seeps through the asphalt and runs down the street. At right, in winter, water seeps through the asphalt and creates a slick spot where water freezes on the street. Copious applications of salt and a traffic cone attempt to mitigate the hazard to traffic and pedestrians.

## Dierken

<p>Owner – Rinneke Dierken</p>	<p>Contact: <a href="mailto:rinneked@hotmail.com">rinneked@hotmail.com</a> 425-823-9731</p>
<p>Address: 12840 76th Ave NE</p>	<p>Survey response? #6</p>
<p>Description – We live above Denny Creek at the top of its ravine. Across the ravine from us, on the Juanita Drive side of the creek, there have been ongoing mudslides due to a storm drain dumping a high volume of rainwater all at once due to rainstorms. The resulting "waterfall" pours from a drain pipe and eats away at the slope. A tree has fallen into the ravine recently because of the mudslides caused by the rushing water.</p>	
<p>Solution – Inspection of storm water conveyance features. Route storm water to retention ponds for time release into watershed instead of allowing it to flow full force into the creek.</p>	
	
<p>A large section of the Denny Creek watershed is a lethal combination of storm water dynamics: mostly impervious residential development, significant vertical relief, very few surface water remediation features, and close proximity to Denny Creek.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works, FHNA Action – Complete the storm water conveyance schema diagram between Spud Fish n’ Chips and Arrowhead Elementary School. Identify areas where mitigation efforts will have the greatest benefits, implement solutions. Complete -</p>	

## Goldsmith

Owner – Grant Goldsmith	Contact: 425 820 7576 425 780 0291  grantgoldsmith@hotmail.com
Address: Finn Hill	Survey response? #7
Description – any nonpermeable surface that directs water into storm drain rather than retention; It has been a problem for a long time; Heavy metals not take from run off before past into habitats.	
Solution – Education.	
Mitigation plan:  Owner – Kirkland Public Works, FHNA Action – Implement a holistic approach to surface water management per LID technical manual guidelines. Complete –	

## Good, Williams

Owner – Vicki Good, Joe Williams	Contact: Good – 425-823-5747 <a href="mailto:vicki.good@comcast.net">vicki.good@comcast.net</a>  Williams – 425-820-4990 <a href="mailto:jtwgearhead@gmail.com">jtwgearhead@gmail.com</a>
Address: 13323 69 <sup>th</sup> Ave NE 98034 And 13304 69 Ave NE 98034	Survey response? #8 Good, #10 Williams
Description – Drainage along 69 <sup>th</sup> Ave NE is not good, and several residences are located below street level, causing potential drainage problems.	
Solution – If surface water flow can be improved, it will relieve pressure on foundations and crawl spaces in the area, and reduce mud along the road.	
Mitigation plan:  Owner – Kirkland Public Works Action – Inspect drainage and conveyance along 69th Ave NE, make recommendations, educate residents, as necessary. Complete –	

**Truhan**

<p>Owner – Big Finn Hill Park</p>	<p>Contact: KC Parks? DOT? KPW?</p>
<p>Address: Near NE 133<sup>rd</sup> Street and 72<sup>nd</sup> NE.</p>	<p>Survey response? #9 Project map: yes</p>
<p>Description – Originally installed as part of a five lot residential development, about 2010.</p>	
<p>Solution – Install an updated culvert inlet to keep it clear of debris.</p>	
	
<p>Looking east – upstream – along the culvert.</p>	<p>The inlet is in there somewhere...</p>
	
<p>Detailed view of the culvert inlet.</p>	<p>Proposed solution to keep the inlet clear.</p>
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Install cage over culvert inlet Complete –</p>	

## Chinn

Owner – Frank Chin	Contact: 425-266-0993 <a href="mailto:franklin.c.chinn@boeing.com">franklin.c.chinn@boeing.com</a>
Address: 14400 91 <sup>st</sup> Ave NE	Survey response? #12
Description – Mud slide above Simonds Road in the resident’s back yard or behind their fence.	
Solution – Possibly planting native vegetation to stabilize the soil. I have left several voice mail messages and have stopped by to knock on the door. I have not seen the site due to lack of contact with the resident.	
Mitigation plan:  Owner – Unknown Action – Try to make contact with the resident. Complete –	

## Ayoub

Owner – Dan Ayoub	Contact: 425 285 9682 <a href="mailto:dan.ayoub@gmail.com">dan.ayoub@gmail.com</a>
Address: 6628 NE 129 <sup>th</sup> St 98034	Survey response? #14
Description – Storm drain overflows and floods his yard. Driveway and yard slope toward house.	
Solution – Inspect drainage along road, recommend changes to improve conveyance of runoff.	
	
Mitigation plan:  Owner – Kirkland Public Works Action – Site visit, education about self-mitigation. Complete –	

Miller

Owner – Ted Miller	Contact: <a href="mailto:Ptmiller1@Earthlink.net">Ptmiller1@Earthlink.net</a> 425 823 1839
Address: 11553 Holmes Point Drive	Survey response? #15
	
Description – Surface water flows across his property. An additional drain was added several years ago, but it is still a problem.	
Solution – Storm water catchment on the east side of Champagne Point Road should convey water down the east side of the road instead of directing it across the road here. There is a larger culvert about 200 feet north that should convey this water to the lake.	
Mitigation plan:  Owner – Unknown Action – Change conveyance to keep water moving down the east side of the street. Complete –	

## Morris

Owner – Scott Morris	Contact: <a href="mailto:Scott.Morris@trilogy-international.com">Scott.Morris@trilogy-international.com</a> 206-972-9493
Address: Juanita Woodlands	Survey response? #16
<p>Description – Surface water from the new Chatham Ridge residential development flows through Juanita Woodlands, pooling in the forest, killing trees. This new runoff is creating an inordinate amount of runoff from impermeable surfaces in the new development. Storm water may be flowing to Chatham Ridge from the new Kirkwood development at 84<sup>th</sup> Avenue and NE 124<sup>th</sup> Street. Does Public Works have details?</p>	
<p>Solution – Site inspection at Chatham Ridge, adjust control valve to reduce discharge. Educate property managers, as necessary.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Site inspection at Chatham Ridge, adjust control valve to reduce discharge. Educate property managers, as necessary. Complete –</p>	

## Sandass

Owner – Dick Sandass	Contact: <a href="mailto:eride@msn.com">eride@msn.com</a> 425 823 2145
Address: Holmes Pont, Lake Washington	Survey response? #17
Description – During significant rain events, a 50’ swath of silt and contaminants lines the Lake Washington shoreline.	
Solution – Requires a systematic approach, not a piecemeal one. Shoreline Master Plan resources include only 200’ of lake shore in their scope. Problem originates at top of watershed, involves much more than just the lake shore.	
Mitigation calendar:  Owner – Kirkland Public Works, FHNA Action – Implement a holistic approach to surface water management per LID technical manual guidelines. Complete –	

## Smith, Winter

<p>Owner –Mark Smith, Mitch and Connie Winter</p>	<p>Contact: <a href="mailto:mjsmith01@hotmail.com">mjsmith01@hotmail.com</a> 425 821-1394 Mitch Winter <a href="mailto:ka7yer@comcast.net">ka7yer@comcast.net</a></p>
<p>Address: NE 143<sup>rd</sup> Street, west of 84<sup>th</sup> Avenue, 98034</p>	<p>Survey response? Smith #13, Winter #18</p>
<p>Description – During winter or whenever there are heavy rains, a creek forms in yards on the north side of NE 143<sup>rd</sup> Street. Some neighbors catch the water and, via their own piping or ad hoc solutions, move it to the next neighbor. Other people do not do anything and water builds up and it comes back up to street level during rain events.</p>	
<p>Solution – Site visit to look at ad hoc solutions, inspection of existing storm water conveyance, repair of conveyance damaged by recent utility work, education.</p>	
	
<p>Residents along 143<sup>rd</sup> street have a long history of surface water problems. Utility work in the 1990's cut off access to storm water conveyance between the south-facing front yards and a major culvert next to the street. As a result, back yards – like the one pictured above – routinely flood during significant rainfall events.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Site visit to look at ad hoc solutions, inspection of existing storm water conveyance, repair or upgrade of conveyance damaged by recent utility work, education. Complete –</p>	

**Kirchner**

<p>Owner – Rainer and Linda Kirchner</p>	<p>Contact: lindarainer@yahoo.com</p>
<p>Address: 13433 78<sup>th</sup> Place NE 98034</p>	<p>Survey response? No. e-mail.</p>
<p>Description – Heavy rainfall events results in debris washing down Denny Creek, which clogs the culvert inlet under their driveway. The clogged culvert then floods the yard and results in standing water approaching the house. Note that the existing bioswale and retention pond for the BFH soccer field de-watered a tributary of Denny Creek, increasing pressure on the surface water conveyance past this residence. At times, the creek overflows the two culverts pictured below.</p>	
<p>Solution – Site inspection and discussion with home owners. Install a cage over culvert inlet.</p>	
	
<p>The existing culvert inlet is open so it gets clogged with debris during storms.</p>	<p>A cage over the culvert inlet will prevent debris from causing flooding during high water.</p>
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works          Action – Improve stream flow through existing culvert, prevent clogging.          Consider routing overflow from the retention pond at BFH Park to the de-watered tributary of Denny Creek at the west end of the soccer field.          Complete –</p>	

## Lystad

Owner – Rolf Lystad	Contact: rolfstad@aol.com
Address: 11109 Champagne Point Road NE 98034	Survey response? Personal contact.
<p>Description – New construction uphill from the residence has exacerbated an already stressed surface water situation. New homes run their downspouts to the edge of the property where, previously, runoff would have percolated into the ground.</p>	
<p>Solution – Negotiate with neighbors to re-think their runoff management strategy. Downspouts in their case should be routed into the storm water system, not to the downhill edge of the property.</p>	
<p>Recent residential construction near Champagne Point has put additional stress on storm water conveyance structures put in place by existing residents.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works          Action – Site inspection, education          Complete –</p>	

**Johnson**

<p>Owner – Larry Johnson</p>	<p>Contact: None.</p>
<p>Address: 6060 NE 135<sup>th</sup> Street 98034</p>	<p>Survey response? No.</p>
<p>Description – Large pond and concrete dam on his property. Rogue runoff from the top of Finn Hill flows from residential developments through open space to ditches and culverts, eventually flowing across his property and then to the lake.</p>	
	
<p>This 75-foot concrete dam has a control structure that allows formation of a pond. It has been used in the past as a trout pond and skating rink. A flow control upstream can be used to reduce water sent into this area.</p>	
<p>Solution – Use the control structure upstream to divert some of the runoff to the conveyance east of Holmes Point Drive, routing it south to a culvert and managed pipe into the lake.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works          Action – Manage runoff at upstream control structure.          Complete –</p>	

## VonAllmen

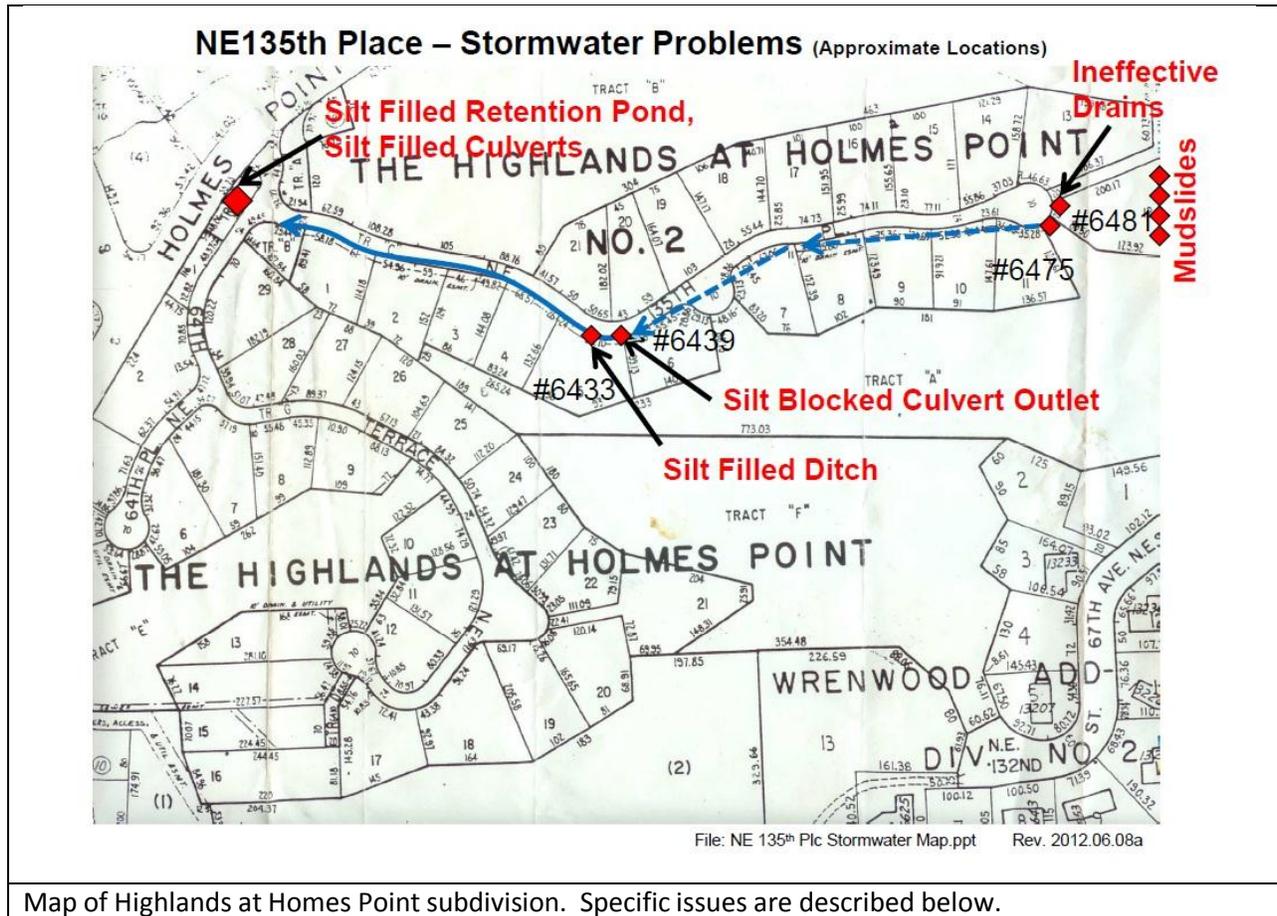
<p>Owner – Jacki vonAllmen</p>	<p>Contact: <a href="mailto:jvonallmen@overthelake.com">jvonallmen@overthelake.com</a></p>
<p>Address: 11144 Champagne Point Rd NE 98034</p>	<p>Survey response? Personal contact.</p>
<p>Description – Culvert routes drainage under the street near the parked car, and then down to the left over a steep embankment. Instead, conveyance should probably continue along the ditch on the right side of the street to a managed pipe that flows into the lake.</p>	
<p>Solution – Site inspection, change conveyance flow that currently directs flow under the street to, instead, continue down the east side of the street.</p>	
	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works          Action – Site inspection, change conveyance flow that currently directs flow under the street to, instead, continue down the east side of the street.          Complete -</p>	

## Various residences east of Holmes Point Drive

Owner – Natalie Danielson and others	Contact: <a href="mailto:natalieoutloud@gmail.com">natalieoutloud@gmail.com</a> 425.417.6173
Address: 13148 Holmes Point Drive	Survey response? Personal contact
Description – Several residences east of HPD regularly have problems with rogue runoff. Many residents have ad hoc plans in place: tarps, bricks, sump pumps, and sand bags.	
Solution – Need Kirkland assistance to develop mitigation plans, implement solutions.	
	
The residences inside the red circle have been significantly impacted by runoff from the top of Finn Hill. In many cases, uphill residences simply route their surface water runoff to the edge of the hill, allowing it to flow downhill at the expense of neighbors to the west.	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works  Action – Site inspections, interviews, mapping underground conveyance and retention structures, education, help with mitigation plans.  Complete -</p>	

## Highlands Subdivision at Holmes Point

These issues are all related to a watershed drainage system encompassing NE 135th Place and areas east. They are listed in order of the water flow, east to west. Please see the map below.



Map of Highlands at Homes Point subdivision. Specific issues are described below.

**Highlands Subdivision at Holmes Point (continued - 6481):**

<p>Owner – Mic Fite</p>	<p>Contact: Mic Fite <a href="mailto:micfite@comcast.net">micfite@comcast.net</a> 425-283-9506</p>
<p>Address: 6481 NE 135th Place 98034</p>	<p>Survey response? E-mail</p>
<p>Description – Runoff from uphill properties has caused severe mudslides and have damaged the house. Also, during heavy rain debris from uphill clogs the culvert inlet, water overflows, flooding the street and undermining the driveway.</p>	
	
<p>Solution – Control surface run off from uphill properties and streets. Engineer the drainage system to handle current conditions. Install larger diameter culvert with grate under the driveway.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Control surface run off from uphill properties and streets. Install larger diameter culvert with grate under the driveway. Complete –</p>	

**Highlands Subdivision at Holmes Point (continued - 6475):**

<p>Owner – Mic Fite</p>	<p>Contact: Mic Fite <a href="mailto:micfite@comcast.net">micfite@comcast.net</a> 425-283-9506</p>
<p>Address: 6475 NE 135th Place 98034</p>	<p>Survey response? E-mail</p>
<p>Description – The drainage ditch is silted up and overflows into the street during heavy rain.</p>	
	
<p>Solution – vacuum out the silt</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – vacuum out the silt Complete –</p>	

**Highlands Subdivision at Holmes Point (continued - 6439):**

Owner – Mic Fite	Contact: Mic Fite <a href="mailto:micfite@comcast.net">micfite@comcast.net</a> 425-283-9506
Address: 6439 NE 135th Place 98034	Survey response? E-mail
<p>Description – <b>← TOP PRIORITY</b>                  The drain pipe is 90% blocked with silt. This severely limits the flow during rain and forces the excess water to overflow the inlets at #6475/#6481 and washes water and debris down the street.</p>	
	
Solution – Vacuum and flush out the silt	
Mitigation plan:  Owner – Kirkland Public Works Action – Vacuum and flush out the silt Complete –	

**Highlands Subdivision at Holmes Point (continued - 6433):**

Owner – Mic Fite	Contact: Mic Fite <a href="mailto:micfite@comcast.net">micfite@comcast.net</a> 425-283-9506
Address: 6433 NE 135th Place 98034	Survey response? E-mail
Description – The drainage ditch is silted up and collapsing.	
Solution – Vacuum out the silt and re-line the ditch with rock	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works  Action – Vacuum out the silt and re-line the ditch with rock  Complete –</p>	

**Highlands Subdivision at Holmes Point (continued - entrance):**

<p>Owner – Mic Fite</p>	<p>Contact: Mic Fite <a href="mailto:micfite@comcast.net">micfite@comcast.net</a> 425-283-9506</p>
<p>Address: Retention Pond at the entrance to The Highlands subdivision</p>	<p>Survey response? E-mail</p>
<p>Description – : The pond is severely silted up reducing its capacity; and the culvert that feeds into it is 2/3rds silted up; as well as the out flow culverts.</p>	
	
<p>Solution – Dig out the retention pond to its original depth. Vacuum and flush out the silt that is blocking the pipes.</p>	
<p>Mitigation plan:</p> <p>Owner – Kirkland Public Works Action – Dig out the retention pond to its original depth. Vacuum and flush out the silt that is blocking the pipes. Complete –</p>	

## Appendix B – Summary letter sent to Kirkland Public Works, Feb-2012



February 13, 2012

### VIA E-MAIL

Jenny Gaus, Surface Water Engineering Supervisor  
Kirkland Public Works, City of Kirkland  
123 Fifth Avenue  
Kirkland, Washington 98033-6189

### RE: 2012 Kirkland Surface Water Master Plan

Dear Ms. Gaus:

This letter is in response to your request for information about surface water concerns among residents of Kirkland's Finn Hill neighborhood. Thank you for the opportunity to provide input to the City. The following list represents categories of surface water concerns in Kirkland's Finn Hill neighborhood, including some that date back to recommendations in the 2007 O.O. Denny Creek Watershed Study.

- **Denny Creek** – Removing a problematic culvert to remediate flooding in Big Finn Hill Park.
- **Juanita Drive** – Understanding the surface water schematic, reducing point-source pollution to improve water quality, daylighting creek crossings to remove barriers to fish passage.
- **Open space** – Inspection and repair of storm water retention ponds, removing the old concrete bulkhead from the lake shore in O.O. Denny Park.
- **Low impact development** – Best practices for surface water management for new development.
- **Residential issues** – Includes mitigating risk of landslides and unmanaged, runaway surface flow where work can be done within a single property, and issues where solutions must be implemented on neighboring, uphill properties.

Per our previous conversation, let's plan to meet in early Mar-2012 to discuss specific details and a timeline for implementing solutions. I will be in touch to arrange a meeting time.  
Respectfully,

Lou Berner, FHNA Director  
Finn Hill Neighborhood Alliance

Cc: Scott Morris, FHNA President  
Jeff Hoerth, FHNA Communications Committee Chair

## Appendix C – King County Inspection Report for Big Finn Hill Park Drainage System



**King County**  
Department of Natural Resources and Parks  
**Water and Land Resources Division**  
201 South Jackson Street, Suite 600  
Seattle, WA 98104-3855  
**206-296-6519** 206-296-0192 Fax

COPY

November 29, 2010

Parks Maintenance  
KC Parks MS:KSC-NR-0700  
201 S Jackson #700  
Seattle, WA 98104

**RE: Big Finn Hill Park - 8106 NE 138th St - D97125**

Dear Property Owner :

The King County Water and Land Resources Division monitors storm drainage facilities within privately maintained developments to reduce flooding and improve water quality. By conducting drainage facility inspections, we are able to spot drainage system problems and alert property owners to these problems which, if not corrected, could cause flooding, degrade water quality, and create potential liability problems. King County Code Chapter 9.04.120 requires property owners to maintain stormwater drainage facilities on their properties to King County standards.

On Tuesday, November 16, 2010 Drainage Investigator Mike Malnerich visited your drainage system and found some items needing maintenance. Enclosed for your convenience is a work list of those items and a sketch of your facility. **You will qualify for a Surface Water Management fee discount if these problems are corrected before January 13, 2011 and required pollution prevention best management practices (BMPs) are implemented.** Please complete the work, sign, and return the enclosed Maintenance Correction List to the King County Water and Land Resources Division at the above address, Attn: Tom Lew. If you need assistance or have questions, please call 206-296-1900.

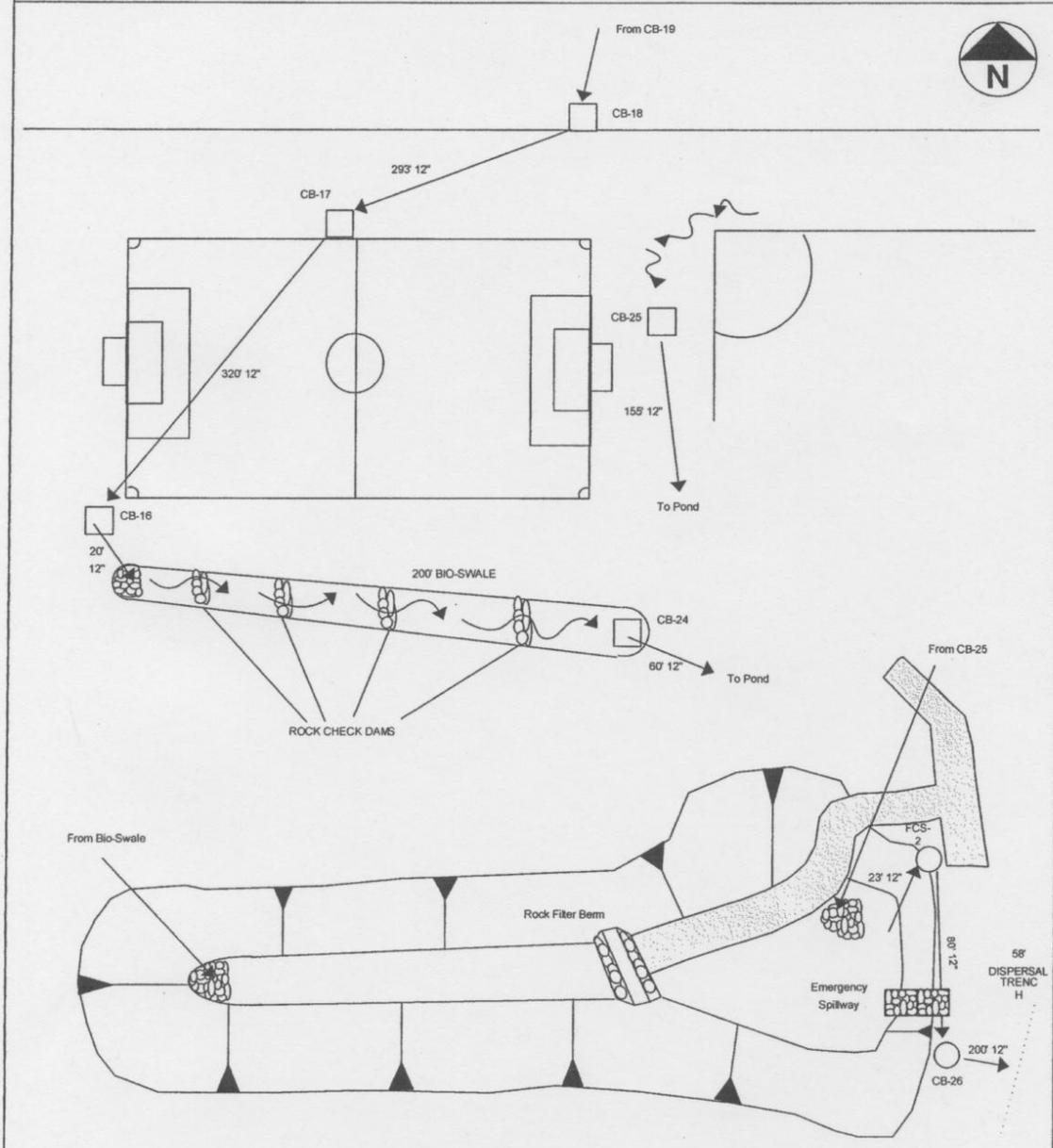
The enclosed work list contains maintenance items that are functionally critical to the performance of this facility. **If these maintenance items are not addressed by the date specified above, your facility will be in violation of King County Code, which means the County may issue a Citation or Notice and Order as authorized in King County Code Chapters 9.04 and 23.20. A Citation carries a minimum civil penalty of \$100. A Notice and Order carries a minimum civil penalty of \$500 plus daily fines for each day the violation is unresolved.**



**KING COUNTY**  
Department of Natural Resources  
Water and Land Resource Division

PROJECT NO.	D97125		
PROJECT	Big Finn Hill Park IV		
LOCATION	NE 138th		
KROLL PAGE	416	SUB BASIN	Juanita Crk
TB PAGE	506 A3	TYPE	Pond
MAINT. DIVISION	1	DATE	12-19-00
OUT OF SERVICE	—	INITIALS	CJT

### FACILITY SKETCH SHEET



Maintenance Corrections List  
 Facility Number D97125  
 Page 3

By January 13, 2011 please make the following corrections, sign the form, and return to WLR Stormwater Services Section (201 Jackson St., Suite 600, Seattle WA 98104-3855).

Any changes to the MCL must be approved by the Manager of WLR Stormwater Services Section, or his or her designee, and noted on this form.

(To better interpret this Maintenance Correction List, please refer to the enclosed diagram.)

Item	Completed
Clean Conveyance CB/MH - Excessive sediment is affecting the operation of the following catch basin(s) and must be removed and disposed of in accordance with applicable regulations : CB-19, CB-20	
Maintain Conveyance Ditch - Vegetation is reducing the free movement of water in the trench. Cut and remove vegetation from site. Restore trench as required on approved plans. Clear vegetation/blackberries to expose dispersal trench and access path to trench.	
Hand Brushing - Vegetation is impeding flows in the biofiltration swale (bioswale). Remove nuisance vegetation from site. Cut sapplings to ground level, leave not spikes. Cut vegetation/blackberries. Remove clippings from site.	
Tree Removal - Remove trees that either impede maintenance activity or appear to be dead, diseased, or damaged. Cut sapplings to ground level, leave not spikes. Cut vegetation/blackberries. Remove clippings from site.	
Restore Pond - Remove trees from the pond's emergency overflow spillway. If tree is less than 4 inches in diameter, the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.	
Repair Control Structure - Locate and expose the following buried or paved over control structure catch basin: CS/CB-2	
Repair Conveyance CB/MH - Locate and expose the following buried or paved over catch basins: CB-17, CB-26	
Maintain Bioswale - Bioswale appears to have standing water in it. Possible solutions for this problem are as follows: 1. Remove any sediment or trash blocking swale. 2. Improve the grade from head to foot of swale. 3. Remove clogged check dams. 4. Add underdrains. 5. Convert to a wet biofiltration swale. First check dam at inlet end of Bio-swale is plugged. Remove material and replace check dam.	
Maintain Bioswale - Bioswale vegetation is too sparse. Determine the cause of poor vegetative growth, such as too much shading. After correcting the cause, re-plant with plugs, seeds, or sod into loosened fertile soil.	
Water Quality Requirements - A water quality site consultation needs to be conducted. This consultation will identify potential sources of stormwater pollution and provide you with guidance on the required Best Management Practices (BMPs) in order to comply with King County's water quality code and to qualify for a fee reduction. You will be contacted by one of our water quality engineers to schedule a consultation or you may call (206) 296-1900 to request a consultation.	

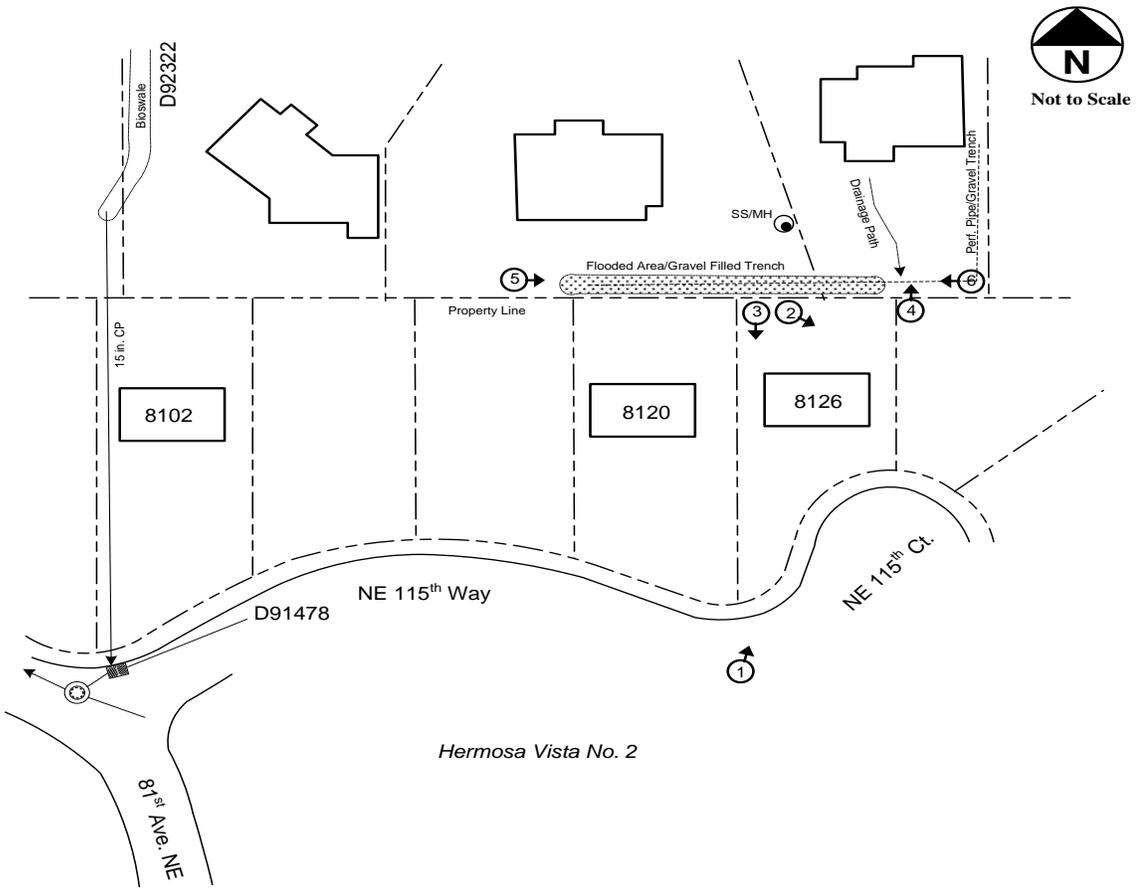
The stand pipe in the pond needs to be removed. It does not show up on approved plans and may have been put in place as part of the erosion control measure when pond was constructed.

# Appendix D – King County Drainage Investigation Report from Cami Keyes' residence

 <p><b>KING COUNTY</b> Department of Natural Resources <b>Water and Land Resource Division</b></p> <p><b>DRAINAGE INVESTIGATION REPORT</b> <b>FIELD INVESTIGATION</b></p>	FILE NO. <u>2010-0729</u>
	NAME <u>Cami Keyes</u>
	ADDRESS <u>8126 NE 115<sup>th</sup> Ct.</u>
	PHONE <u>425-241-1267</u> TB PAGE <u>506A6</u>
	KROLL PAGE <u>420E</u> DATE RECEIVED <u>12/13/10</u>
MAINT. DIVISION <u>1</u> INITIALS: <u>NK</u>	

Conducted site investigation on 12/28/2010. The weather was clear and dry. This is the same problem identified in previous DIR 97-1252, 0662 and 98-0374. Ground water continues to pool along the north fence line of the residence and the neighboring property to the west (8120). The previous investigations note that a perf.-pipe was installed in a pea gravel filled trench along the north line of both properties. The pipe and trench are on the neighboring properties to the north. Drainage was pooling above the trench and was flowing westerly to a point near the northwest corner of 8120 where the flow infiltrated. I could not determine just how far the perf.-pipe and trench extended to the west. However, approx. 280 ft. westerly from the northwest corner of 8120 there is a bioswale and 15 in. CP conveyance system that flows to a catch basin in front of 8102 NE 115<sup>th</sup> Way. It appears that the perf.-pipe and trench do not extend to this conveyance system.

*Hermosa Vista No. 2*

## Revision History

Date	Description	Mailed to DL
12-Nov-2011	Draft list of issues	No
17-Dec-2011	Created e-mail distribution list	No
11-Jan-2012	Draft document, kickoff e-mail message	Yes
17-Jan-2012	Updated e-mail DL, included recommendations from watershed team, drainage site described by Teresa.	No
21-Jan-2012	Sent request for information about initial list of surface water hot spots.	Subset
23-Jan-2012	Added Executive Summary, Recommendations, Literature Review. Updated details for Teresa and Tony, Linda and Rainer.	Yes
30-Jan-2012	Added information from day in field on 28-Jan-2012, began updating project map, created appendices for photos	Yes
13-Feb-2012	Sent summary letter to Kirkland Public Works. See Appendix A.	
18-Feb-2012	Updated with details from visits to Timberlake, 72 <sup>nd</sup> at BFHP, and mud slide above Simonds Road	No
20-Feb-2012	Complete draft for presentation to Kirkland Public Works	Yes
27-May-2012	Updated with photos and notes from field work	No
3-Jun-2012	Updated draft for public comments	No
8-Jun-2012	Updated with comments from public meeting	Yes
13-Jun-2012	Incorporated new issues, comments, suggestions from e-mail review.	No
15-Jun-2012	Version 1.0 provided to Kirkland Public Works	Yes

## Acknowledgements

I would like to thank the board of directors from the Finn Hill Neighborhood Alliance (formerly the Denny Creek Neighborhood Alliance) for sponsoring this project and providing funding. I would also like to thank Jenny Gaus from Kirkland Public Works for her encouragement and valuable feedback. She provided the inspiration for the project and validated early results and recommendations from my field work. George Ploudre has been involved in every aspect of this project.