From: Willihnganz, Gary [mailto:gary.willihnganz@intel.com]
Sent: Tuesday, July 01, 2014 10:23 AM
To: Andreades, Debra; Boone, Evan
Cc: Chris Robinson; Knepper, Todd
Subject: Open Comments regarding LU 14-0031 from FHNA - Rebuttal

Debra/Evan-

On Friday morning, June 27th, we received a revised engineering report from JT Smith that consistent of 108 pages of material. While it appears the strategy for water dissipation is consistent with our neighborhood discussions with JT Smith, we have revised our open comments within the rebuttal period with an additional addendum in the attached document highlighted in yellow.

With regard to water dissipation, we are concerned that the focus of the engineering work may be overemphasizing water infiltration in the engineering efforts. As we have stated both publicly and with JT Smith, the neighborhood's top priority for water dissipation is to replicate the existing natural water flow that occurs on the property today that is a combination of water runoff and in ground infiltration. The property impact downstream can only be minimized by this natural replication.

In addition to the water management systems within the development, the FHNA remains keenly interested in any neighborhood impacts from the next phase of engineering and development plans related to:
- Street lighting: light pollution and stand location
- Landscape planting: visual break points around the development and maturity of the surrounding trees
- Roadway speed attenuation: around the neighboring sections of Knaus/Goodall (185th).
- Neighborhood walk/bike path safety: ensuring safety of pedestrians and bikers in areas without paths with the increased traffic to the area

Sincerely,

Gary Willihnganz
FHNA Board

CC:
Chris Robinson, FHNA Board President
Todd Knepper, LO City Engineer

EXHIBIT G-3
LU 14-0031

DATE: July 1, 2014
(revisions since the 6/27/14 version are highlighted in yellow)

PROJECT: 314126-Master Plan Review for ILU 14_0031 (The Highlands)

SUBJECT: Summary of Storm Drainage Master Plan Peer Review and Comments

TO: Gary Willihnganz
Forest Heights Neighborhood Association (FHNA)
EMAIL: gary.willihnganz@intel.com

FROM: Josh Lighthipe, PE
KPFF Consulting Engineers
EMAIL: josh.lighthipe@kpffcivil.com

The purpose of this memo is three-fold:

1. Summarize KPFF's peer review comments and recommendations on the Storm Drainage Master Plan for The Highlands (ILU 14_0031) with specific focus on the critical stormwater design elements that could directly impact the downstream neighbors' properties, streets, and historic drainage ways.
2. Provide comments and recommendations on the preliminary drainage design presented by JT Smith for improvements to the public storm drainage system where it discharges into the existing drainage way between tax lots 601 (Barry Waterfield's property) and tax lot 1800 (Gary Willihnganz's property).
3. Identify additional downstream ditches and drainage ways that are recommended to also be improved as part of this development project.

1. Summary of Storm Drainage Master Plan Review

This peer review of the storm drainage master plan is based mostly on discussions with Kathleen Freeman of 3J Consulting and Jesse Nemec of JT Smith Companies on June 19, 2014, at Gary Willihnganz's house and from brief review of the Storm Drainage Report by 3J Consulting, Inc., dated June 18, 2014.

The overall storm design appears well thought out and generally conservative to err on the side of reducing impacts downstream. However, the following are some comments and questions regarding portions of the storm modeling and design with some recommendations to be implemented as part of the final design.

1.1 It appears from the detention sizing tables for the southwest and southeast detention tanks that the release rate is assumed to be constant despite varying storage depths of the tank. Generally a stage/storage/discharge type of analysis is needed to accurately size a detention facility since the flow through an orifice increases with head pressure.

Recommendations: Verify that this sizing methodology actually stores the necessary volumes without overtopping while releasing at a viable rate as the tank storage depth increases.

1.2 While it is understood that Lake Oswego requires the rational method to be used for sizing detention facilities; that method yields larger flow rates generally. For example the 10-year pre-developed flow for the southeast detention facility is 0.34 cfs as stated in the report, but using the Santa Barbara Urban Hydrograph (SBUH) method and similar variables (CN=74 and the same Time of concentration, Tc) yields 0.11 cfs from the 10-year pre-developed release rate.

Recommendations:

1.2.1. Use the SBUH or some other a more typically accepted method for stormwater runoff modeling for determining maximum allowable stormwater release rate and sizing of the detention galley.

1.2.2. Also model the pre and post development flows for the 2 and 5 year storm events to see if those flows will exceed the existing rates. Since drainage to open channel drainage ways are more susceptible to erosion from higher than normal flows it is recommended that the post developed peak flows do not exceed the pre-developed rates for the 2 and 5 year storm events in addition to the 10-year and larger storm events.

1.3 As stated in the report, each private lot once developed will be required to provide their own storm planter and infiltration gallery for treatment and full infiltration of runoff from that lot's impervious surfaces. Additionally, a storm lateral will be provided to each lot to connect to these galleries to allow them to overflow into the public storm system in an event that exceeds the capacity of the gallery. Since there will likely to be extensive terracing of each lot to create level buildable areas and the position of the driveways are part of the current master plan, some additional forethought as to the best location of the rain gardens and infiltration gallery would help ensure they function as intended without causing issues to the other lots.

Recommendations:

1.3.1. Indicate zones on the final master plan for approximate locations of each infiltration gallery and rain garden. Perhaps a zone 20-feet wide close to the mid-point of each lot, aligned with the storm lateral, and fairly close to the central right-of-way roads.

1.3.2. Locations of the zones ideally should be placed where they would align with the existing general flow patterns of the pre-developed site to reduce the possibility of new groundwater springs popping up where they never had existed before.

1.4 Each lot's infiltration gallery is defined by DEQ as an Underground Injection Control (UIC) facility which will unnaturally surcharge the subgrade of the ground in that area. Since the soils are known to drain poorly and the ground slopes rather steeply to the south, infiltrated water may tend to reappear as spring water somewhere else.

Recommendations:

1.4.1. Provide deeper geotechnical boring logs to determine if a more impermeable layer lies just below the shallower boring tests.

1.4.2. Installing an impermeable liner around the downhill sides of all infiltration galleries to help limit horizontal flow.

1.4.3. Also do the same with the rain gardens.

1.4.4. Where possible, place the rain gardens directly over the infiltration galleries or add a sub-drainage pipe under the rain garden that drains to the infiltration galleries to ensure they drain to a deeper subgrade layer before fully infiltrating.

1.4.5. Additionally, where rain gardens need to be placed close to the property line, on the uphill side of a retaining wall or building, or some other sensitive area, they should be fully lined. Fully lined rain gardens should be designed as flow-through facilities with an underdrain layer containing a perforated pipe that recollects the treated water and drains it to the infiltration gallery.

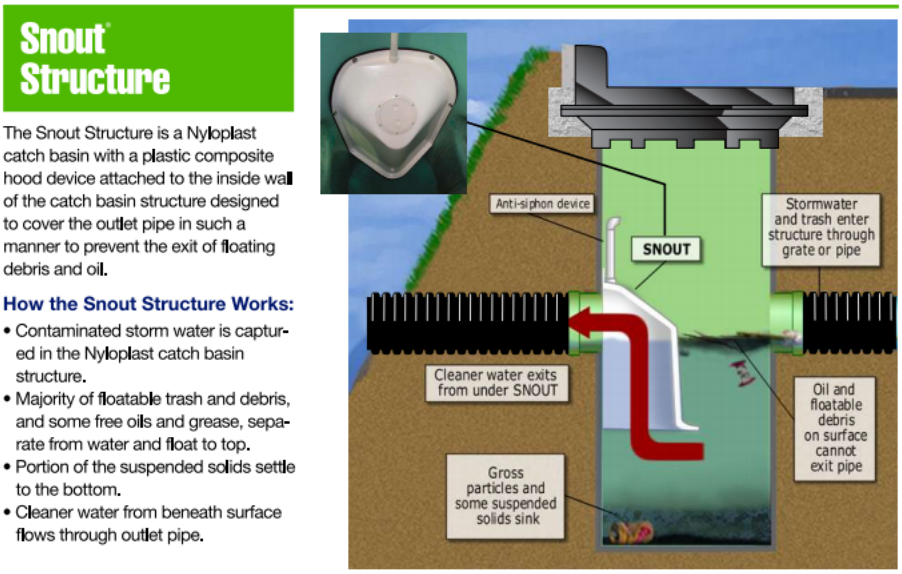
1.4.6. As a "final line of defense" strategy, which may be more effective than the previously mentioned recommendations for limiting lateral groundwater flow offsite, install a continuous subdrainage cut-off trench beneath the SW Knaus Road north ditch/swale line. The cut-off trench would be designed similar to a perimeter foundation drain, and composed of a drainage fabric lined trench with a perforated drain pipe at the bottom that slopes to drain at 0.5% minimum to the storm system. The trench would be backfilled with an open graded drainage rock and would extend up to 18-inches below the top of ground within the swale. The trench depth should be installed as deep as possible to intercept as much lateral flowing groundwater as possible, yet shallow enough to gravity drain to the storm system. There should be 2 separate cut-off trenches roughly positioned to capture lateral sub-surface runoff from each of the existing east and west basins, and drain to their respective discharge points. Refer to attached Exhibit C for a sketch of where this cut-off trench should be located and what it might look like.

2. Storm Drainage Improvements at the Existing Drainage Way

At the meeting at Gary Willihnganz's house on June 19, 2014, Jesse Nemec of JT Smith Companies presented a preliminary design for improvements to the public storm drainage system where it discharges into the existing drainage way between tax lot 601 (Barry Waterfield's property) and tax lot 1800 (Gary Willihnganz's property). The basic proposed design would collect the existing drainage from the east and west gutter lines on the south side of SW Knaus Road as well as the runoff from the north side of the street and the Highlands subdivision into one sedimentation manhole (essentially a manhole with a sump, usually 4-feet deep) to collect sediment prior to discharging to the existing drainage way south through Gary Willihnganz's property. Jesse also mentioned that they were proposing to reinstall the discharge pipe at a flatter slope to reduce the incoming flow velocity into the channel to reduce the sediment build up at the outfall location. Additionally, this approach would abandon a second outfall pipe that flows through Barry Waterfield's property and connects to the drainage channel 15-feet feet south of the main outfall.

This appears to be the best approach to providing an upgraded outfall and KPFF supports the plan with the following comments and recommendations:

2.1 In addition to the sump, the sedimentation manhole should also contain a sediment trap, ideally using a Snout® type product to minimize downstream discharge of sediment and debris, and to ensure that maintenance can be easily performed by City crews. See image of Snout® product within a similar drainage structure below.



2.2 Periodic maintenance by the City of Lake Oswego to remove sediment, oil and floatable debris from this sedimentation manhole will be necessary. From the onset, we would recommend it be inspected and cleaned out 3-4 times per year adjusted for rainfall until a consistent maintenance program can be determined.

2.3 While lessening the pitch of the outfall storm pipe from the sedimentation manhole into the drainage way will help decrease the flow velocity, it is KPFF's opinion that it is unnecessary as long as the sediment trapping device is installed per recommendation 2.1.

2.4 Additionally, lowering the channel grade (as proposed by JT Smith) directly beneath the existing pipe outfall would allow the pipe to more freely drain. Adding some additional rip-rap rock protection in the immediate area is also recommended to ensure the flow energy is fully dissipated to protect the downstream drainage way.

3. Additional Recommended Downstream Improvements

Based on a site walk through the neighborhood with Gary Willihnganz following the June 19, 2014, meeting, several areas of concern along the downstream drainage ways and ditches were noted. The following are the issues and recommendations for each of the areas of concern observed. Refer to the attached Exhibit A for their locations and Exhibit B for some photos of them.

3.1 The drainage way flowing though Gary Willihnganz property appears to have some shallower points where it could be possible for water to "jump" its banks and flow out of the channel.

<u>Recommendation:</u> Improve and deepen drainage channel to ensure it can handle required drainage capacity.

3.2 This portion of the drainage way is not managed by the City of Lake Oswego or anyone as far as we know. The flow connection to Nettle Creek indicated on the Exhibit A was assumed, but from the topography it appears likely.

Recommendation: Visually inspect this portion of the drainage way at least to Nettle Creek if not farther to determine if any erosion or channel capacity issues exist.

3.3 This is the point at which street runoff and all upstream drainage discharges out of pipe outfall and flows across bare ground and beyond the street right-of-way. Round river rock appears to have been placed to slow runoff, but has migrated and significant signs of erosion are apparent throughout area.

Recommendation: Construct defined drainage channel with adequate rip-rap rock armoring and check dams if needed to prevent scouring that connects the drainage flow to the culvert opening (Area 3.4).

3.4 Surface drainage enters culvert here. Culvert appears semi-plugged.

Recommendation: Install ditch inlet type of structure over culvert opening to limit potential clogging.

3.5 Drainage flows off roadway and misses street catch basin. It appears a neighbor tried to fix this by installing a short fence berm to redirect flows to catch basin.

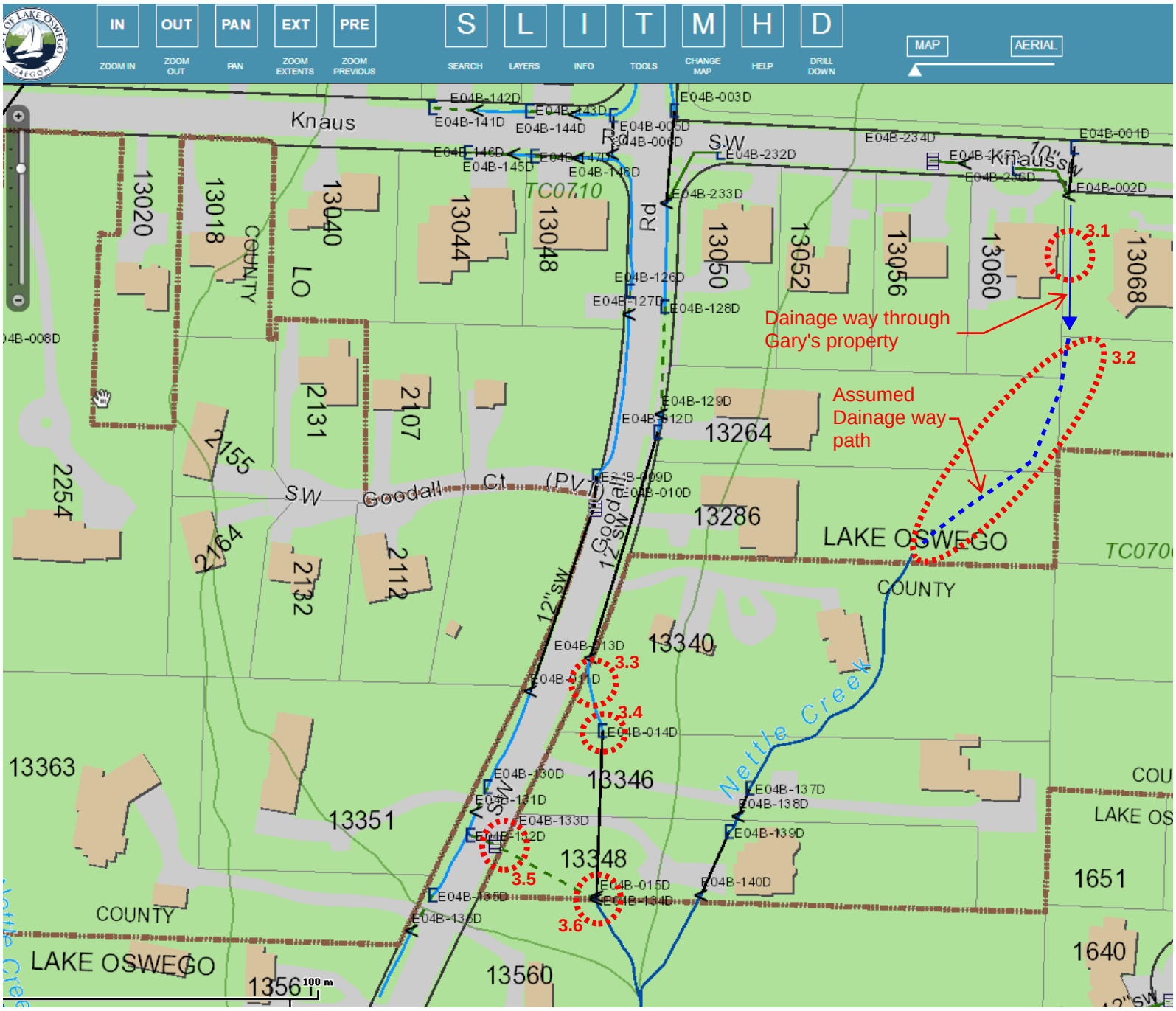
Recommendation: Construct a more permanent and effective solution for this area to collect street runoff and convey it to the catch basin.

3.6 Multiple culverts outfall here into concrete trough. Downstream of trough, significant signs of erosion are visible.

Recommendation: This area should be protected with appropriate amount of rip-rap to prevent further downstream erosion.

COPIES:
Todd Knepper, City of Lake Oswego
Jesse Nemec, JT Smith Companies
Kathleen Freeman, 3J Consulting Inc.

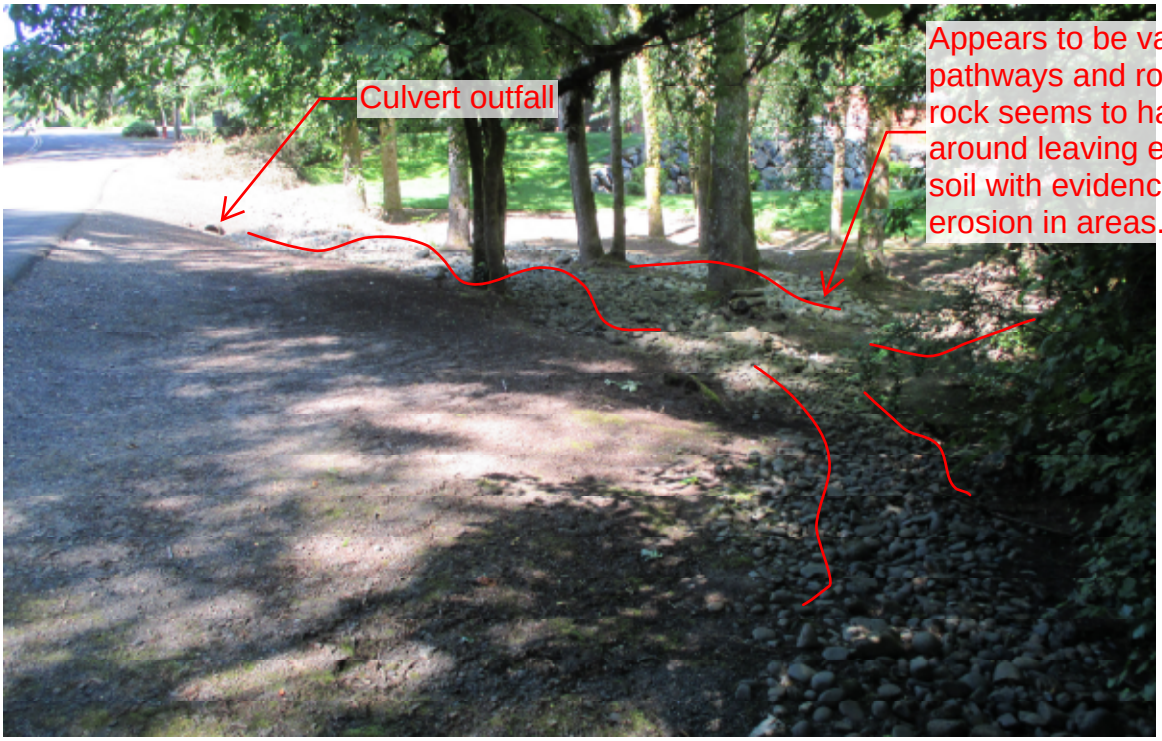
EXHIBIT A: Downstream Drainage Areas of Concern



Legend

Area of Concern

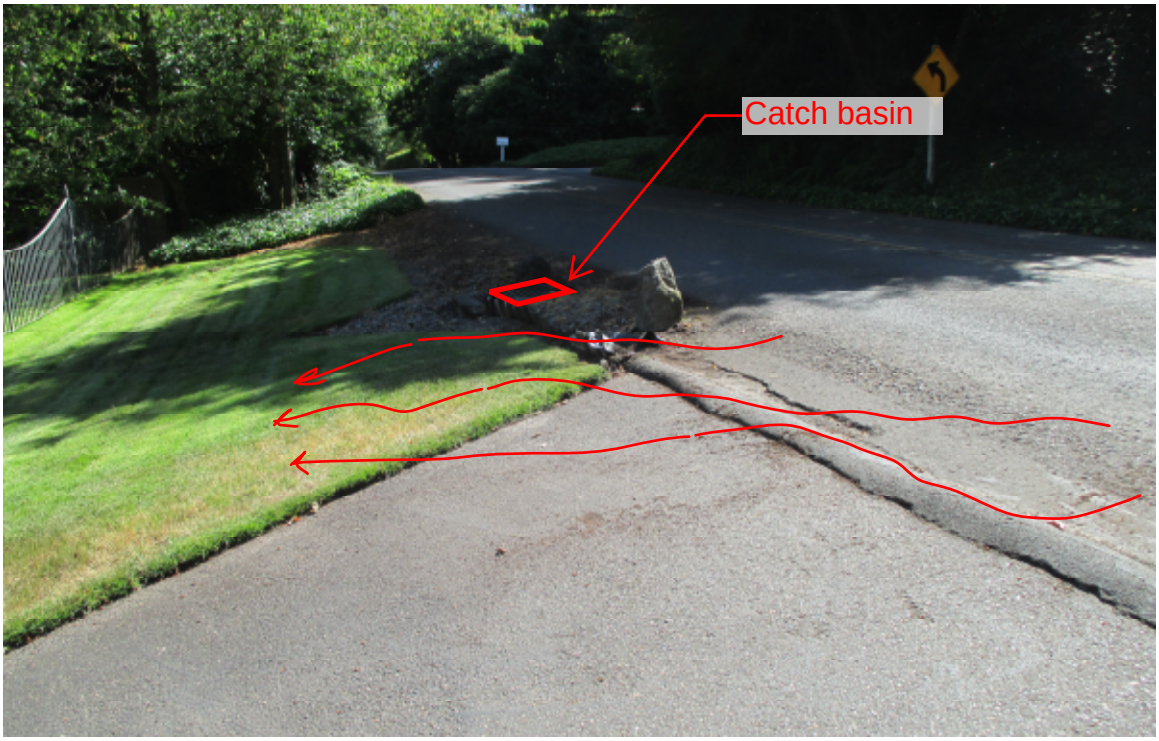
EXHIBIT B: Pictures of Areas of Concern



Area 3.3 - Culvert outfall to an undefined channel with evidence of erosion

Area 3.4 - Upstream end of culvert through private property appears semi-clogged

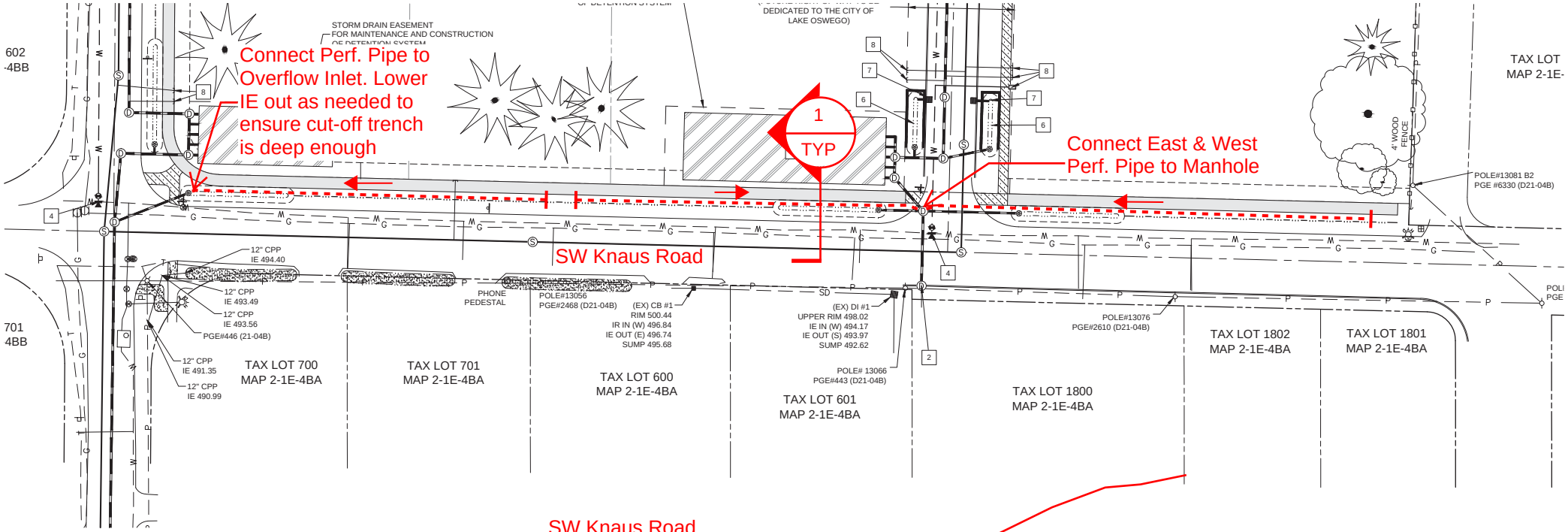
EXHIBIT B: Pictures of Areas of Concern, cont.

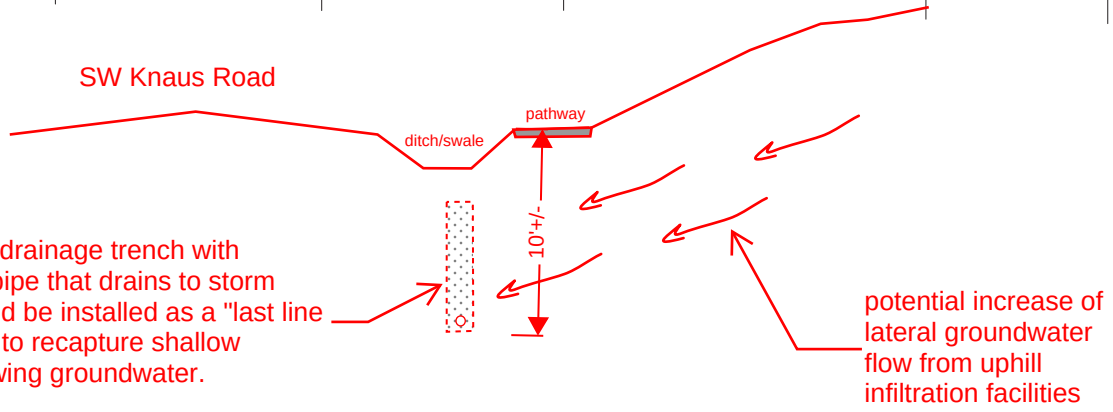


Area 3.5 - Roadway runoff missing CB

Area 3.6 - Outfalls into concrete through with significant erosion downstream

EXHIBIT C: Cut-off Trench Strategy to Protect Downhill Properties





SECTION 1 - Cut-off Sub-drainage Trench