CES • NW
INCORPORATED
CIVIL ENGINEERING & SURVEYING

MEMORANDUM

Date: July 30, 2019

To: Cari Hornbein, AICP
City of Olympia
From: Lori L Harvey, Senior Planner

Re: Technical Memorandum, Robinson Noble, dated 2019.06.05

Ms. Hornbein,

We have reviewed the technical memorandum prepared by Kari Thomas of Robinson Noble. We have also consulted with our client and the environmental professional. The following is our response to the identified potential environmental concerns in the memo:

Potential soil contamination from various fill materials placed on site.
The Phase II report from Robinson Noble, dated March 4, 2008, states soil samples indicated field testing of onsite material at the time of test pits, no contaminants exceeding acceptable levels was present. Since these soil samples were taken the site has remained idol with exception of illegal dumping of household/solid waste. For a short time, the property was leased and construction waste from local sources was imported. The construction waste included concrete, soil, asphalt and woody debris. In response to Thurston County Health, the concrete and asphalt was removed from the site and properly disposed of. The woody debris (stumps) and soils were tested and approved to remain on site[1]. Woody debris was chipped to use as erosion control, the soils were graded and hydroseeded.

Potential soil contamination from chemicals drum and buckets, and previously used underground storage tanks (BST) and above ground storage tanks (AST).
Historically, a 12,000 gallon below ground storage tank provided approximately 25 cubic yards of contaminated soil at the time of removal. According to a phone conversation on April 29, 2019, between the property owner's independent reviewer, Randy Herold, ENPRO Environmental, and Paul W. Stemen, Stemen Environmental, Inc[2]. Mr. Stemen described two common practices by property owners at the time, one was to degrade the petroleum concentration by spreading it on the ground (natural degradation) or accelerating the bioremediation process by adding organics (manure). It would appear since no contaminates exceeding regulatory standards nor has a stock pile been observed, one would presume either one of the two methods mentioned above was deployed.

[1] *Attachment A*
[2] *Attachment B*

Potential soil contamination from dumping into the septic system on the property

There appears to be no basis for this concern, anecdotal or otherwise. The memo references what appears to be a generic statement from the AMEC (2004) Phase I ESA[3], page 17, "Additionally, unknown substances may have been disposed of into the septic system that would remain uncharacterized without conducting further subsurface investigation beyond the scope of the Phase I assessment". As the septic tank is buried without a riser, and there is no indication of disturbance to the cover over the septic tank, is this comment suggesting additional testing different than the normal methods and practices for septic abandonment? What are we testing for? What tests are needed and whom is the regulatory agency should we contact?

Potential for settlement of soil on the subject property as a result of the breakdown of organic materials buried as fill still on the site

The project proposes extensive grading, 178,000 cubic yards of material, roughly equivalent to 4,450 truckloads of earthwork. Any material encountered within the proposed developed area during earthwork (concrete, untreated wood, large rock, etc.) is anticipated to be ground and re-mixed on site. Any inorganic materials (treated lumber, household waste, metal, tires, etc.) will be removed from the site and disposed of in accordance with local, state and federal guidelines. A geotechnical engineer will be retained to ensure there is suitable material for roadway and home construction.

Potential methane gas concerns from the breakdown of organic materials buried as fill on the site

As the memo from Robinson Noble notes "if buried wood will remain in place at the site, we recommend that a methane survey be completed to determine the extent and extent of any methane". As stated previously, any suitable material(s) encountered within the area of development will be ground and reused onsite. Unsuitable material(s) will be removed and disposed of in accordance local, state and federal guidelines. One test pit location identified by Robinson Noble is clearly within the wetland buffer of Wetland B. Is it being suggested we are to dig in the buffers?

Potential shallow, perched groundwater contamination from fill materials, leaks, or spills

The previous geotechnical reports and soils sampling yielded results below the industry standards for contamination, which would indicate no commination to water. Please specify what the regulatory agency and requirement for groundwater testing we are trying to meet.

Potential for contaminated sediment in wetland areas on the property from run off on the site and stormwater discharging outside of the permitted area

No sediment of note was identified by the project CESCL nor the wetland biologists during site visits. Historically, stormwater was collected and conveyed through a series of culverts toward the pit floor. The memo mentions offsite discharge noted by DNR on February 14, 2014[4]. The referenced memo does not discuss offsite discharge; however, it is known to have occurred. When the property was leased, an existing culvert was opened by the Lessor, allowing the pit floor to drain northerly to an adjacent property ultimately reaching an existing infiltration pond. When notified the client promptly closed the culvert so that all stormwater was retained onsite.

[3] *Attachment C*
[4] *Attachment D*

Concerns regarding the possible existence of sensitive species within the wetlands at the site and in Green Cove Creek

The Wetland and Fish and Wildlife Habitat Assessment Report, prepared by Soundview Consultants, did not identify the presence of any sensitive species within the wetlands at the site, including the absence of mud minnow. The neighboring plat Parkside, as a condition of the Hearing Examiner, prepared a mud minnow study, EnviroVector December 28, 2014[5], which noted mud minnow habitat exists at or below elevation 160. Both Green Cove Park and Parkside Plats are above this elevation. Green Cove wetlands range in elevation from 208-242.

And concerns regarding stormwater runoff impacts to Green Cove Creek

The project will be subject to the National Pollutant Discharge Elimination System issued through Washington Department of Ecology. Temporary erosion and sedimentation control Best Management Practices (BMPs) employed during site development should provide adequate protection from sediment laden stormwater discharging from the site.

Based upon all environmental studies provided, there appears to be no regulatory basis to delay the project from achieving preliminary plat approval. While the client is not opposed to completing additional testing and studies, the City needs to provide specific jurisdictional requirements and detailed direction. We are opposed to digging within wetlands, wetland buffers and areas outside of the project boundaries.

[5] *Attachment E*

ATTACHMENT A

THURSTON COUNTY
WASHINGTON
SINCE 1852

PUBLIC HEALTH AND SOCIAL SERVICES DEPARTMENT

November 16, 2015

Green Cove Park, LLC
c/o Jerry Mahan
429 29th Street NE, Suite A
Puyallup WA 98372

RE: Improper Solid Waste Handling – Former Sundberg gravel pit
- 2200 Cooper Point Rd NW, Olympia WA, 98502; Tax Parcel No.: 81700000000
- 2721 Park St NW, Olympia WA, 98502; Tax Parcel No: 74202500200

Dear Mr. Mahan:

The Thurston County Health Department conducted a follow-up site visit at your property on Friday, November 13, 2015 with Mr. Paul Edminster and Ms. Lori Harvey. The purpose of this site visit was to determine the status of the cleanup activities, as related to the Notice of Violation issued by our office on March 18, 2015.

At the time of the site visit, waste materials that had previously been brought on to the property appear to have been removed or managed in accordance with our directions:

- Brick and concrete materials have been removed
  - Receipts for disposal at Concrete Recyclers reflect ~328 tons recycled.
- Woodwaste piles have been chipped on-site, and the material has been used to control erosion of disturbed soils.
- A stockpile of stumps and rootwads remain on-site, to be used on the property wetland buffer enhancement.
  - Communication from consultant is on file.
- Small amounts of residual solid waste from cleanup and development activities will continue to be generated, and must be disposed of appropriately.

At this time, the conditions causing the violation (imported solid waste materials and piles of dumped household wastes) have been abated.

(over)

412 Lilly Rd. N.E., Olympia, Washington 98506-5132
(360) 867-2500 FAX (360) 867-2601 TDD (360) 867-2603 TDD (800) 658-6384
www.co.thurston.wa.us/health

I would like to request any receipts available from Pacific Disposal/LeMay/Waste Connections for disposal of the dumped household materials, which were managed using a 30-40-yard dumpster.

We will continue to monitor site activities, and plan to comment on further development plans submitted through the City of Olympia. If you have questions or inquiries, please contact me at (360) 867-2578. .

Respectfully,

Mark J. Koster
Thurston County Public Health and Social Services Department,
Environmental Health Division
kosterm@co.thurston.wa.us
O: (360) 867-2578

Cc: Paul Edminster, Projects West
Lori Harvey, C.E.S. NW, Inc.
File

Attachments:

- Site Photos – "Former Sundberg gravel pit – cleanup status – 11-13-2015"

Former Sundberg gravel pit —cleanup status—11/13/2015

Woody debris have been chipped on-site—residual solid waste should be disposed.

Concrete and brick were stockpiled to the left—verified as removed.

Former Sundberg gravel pit —cleanup status—11/13/2015

Chipped wood spread out, and providing erosion control for bare soil.

Another view of graded site—wood chips acting as erosion control

Former Sundberg gravel pit —cleanup status—11/13/2015

Looking north, toward edge of property—ponded water in old pit floor.

Area where imported soil piles were graded out.

Former Sundberg gravel pit —cleanup status—11/13/2015

Another view of graded imported soils.

Looking east from graded soil stockpile area.

Former Sundberg gravel pit —cleanup status—11/13/2015

Looking NE—toward soils that were not disturbed by recent site activities.

Stockpile of rootwards/stumps to be used during wetland mitigation work.

ATTACHMENT B

April 29, 2019

Mr. Jerry Mahan
437-29th Street Northeast, Suite G
Puyallup, Washington 98372

Re: Comments on Letter from Dawn Pebbles to Cari Hornbein
City of Olympia 19-0330, Green Cove Preliminary Short Plat Application,
Tax Parcels 81700000000, 74202500100, 7423500100, 74202900000, Thurston County, Project 2019100671

Dear Mr. Mahan,

You requested that I review Item 1 presented in the letter dated April 9, 2019 from Dawn Pebbles, Environmental Health Specialist, Thurston County Public Health & Social Services Department, written to Cari Hornbein, Senior Planner, City of Olympia, Community Planning & Development.

Item 1

> "1. During the 1993 site assessment by Stemen Environmental, Inc for the underground storage tank removal, it was noted that the contaminated soils would be properly stored on the site until a treatment or disposal method was decided upon. There is no documentation identifying what was decided upon or approved. The applicant must provide the treatment or disposal method that was used to handle the contaminated soils on the property."

From the Washington State Department of Ecology records (time stamped on April 5, 1993) is a three-page letter report from Paul W. Stemen (Stemen Environmental, Inc.) to Mr. Ted Sundberg, owner of the property at that time. The letter was in regards to the 12,000-gallon capacity, diesel underground storage tank removal located at 2200 Cooper Point Road N.W.

Mr. Stemen wrote:

> "Laboratory analysis results indicate that all samples taken from the tank excavation pit (samples 1-F, 2-S, 3-F) and samples from the two (2) of the excavated soil stockpiles (samples 4-P and 6-P) were well under acceptable levels established by the Department of Ecology and require no further action."
>
> "Analysis results for soil stock pile sample 5-P, indicating a level of 390 PPM Total Petroleum Hydrocarbons (TPH), were well above the acceptable action level of 200 PPM set by Ecology. This soil sample was taken from the stockpile containing soils excavated from the area near and around the fill pipe of the tank. This soil stock pile contained approximately 25 cubic yards. The soils also smelled and were visually darker than other soils. The laboratory analysis results and the visual observations of these soils are evidence of a confirmed release. It is my belief that due to the location of these contaminated soils combined with the excellent condition of the tank, that the release was the result of poor fuel handling practices rather than a leaking underground storage tank."

I reached Mr. Stemen via telephone today who vividly remembered this work conducted in 1993. He mentioned he did not remove the soil and left it to the property owner to handle. He also said it was common practice by property owners to degrade the petroleum concentration by spreading it on the ground (natural degradation) or accelerating the bioremediation process by adding organics (manure).

Furthermore, as stated in the *Phase I Environmental Site Assessment 2200 Cooper Point Road N.W. Olympia, Washington*, AMEC Earth & Environmental, Inc., April 2, 2004:

> "The former on site diesel UST, removed in 1993, represents an historic recognized environmental condition. Records of [sic] file with Ecology report that soil contamination around the fill pipe was removed and disposed off site."

And as stated in the *Phase I Environmental Site Assessment, Sundberg Estates, 2200 Cooper Point Road N.W., Olympia, Washington*, Project No. A-245-1, Ages, LLC, January 30. 2015:

> "The UST, removed from the site in 1993, represents an historic recognized environmental condition. WSDOE records indicate the contaminated soil surrounding the UST was excavated and removed from the site and the analytical results from the cleanup indicated there were not remaining contaminants."

Going back to the Stemen letter report, the one soil sample representing the diesel contaminated soil contained 390 ppm total petroleum hydrocarbons (TPH), slightly greater than the Ecology action level of 200 ppm TPH as applicable in 1993. Subsequent to 1993, Ecology increased the

action level by an order of magnitude to 2,000 ppm TPH (diesel). This action level is cited in both the *Guidance for Remediation of Petroleum Contaminated Sites,* Toxics Cleanup Program, Publication No. 10-09057, Revised June 2016, and the Model Toxics Control Act, Chapter 173-340 WAC. Therefore, using current criteria, the soil stockpile if it were to exist, should not be considered a regulated waste and soil disposition is not an issue.

Sincerely,

Randy Herold,
Environmental Professional
Certified Hazardous Materials Manager

10.0 CONCLUSIONS

AMEC performed a Phase I ESA in general conformance with the scope and limitations of ASTM E:1527-00 of the subject site in Olympia, Washington. Any exceptions to, or deletions from, this practice are described in Section 2.1 of this report.

This assessment has revealed no recognized environmental conditions in connection with the property except the following:

- One 500-gallon AST with no secondary containment located near the garage; and
- Ground staining in the vicinity of several 55-gallon oil drums in the garage, and in the truck parking area outside of the garage.

The former on site diesel UST, removed in 1993, represents an historic recognized environmental condition. Records of file with Ecology report that soil contamination around the fill pipe was removed and disposed of off site. Analytical results indicated no additional contamination in relation to the UST. Additionally, sand and gravel pit operations historically have been considered somewhat environmentally suspect land use activities due to potential releases of petroleum or other chemical substances from heavy equipment and trucks. With regard to possible releases from heavy equipment and trucks, the primary concern would be related to petroleum or other chemical substance releases of uncontrolled or catastrophic magnitude rather than from minor, localized releases. AMEC's historical and documentary research did not disclose any evidence of past catastrophic releases on the site.

Localized zones of petroleum-impacted soil in the areas of ground staining within and outside of the garage would remain uncharacterized without conducting further subsurface investigation beyond the scope of the Phase I assessment. Additionally, unknown chemical substances may have been disposed of into the septic system that would remain uncharacterized without conducting further subsurface investigation beyond the scope of the Phase I assessment.

ATTACHMENT D

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Caring for
your natural resources
... now and forever

February 14, 2014 Certified Mail # 7009 0820 0001 9056 4364

WESTBROOK INVESTMENTS LLC
429 29TH NE STE A
PUYALLUP, WA 98372-6767

RE: NOTICE OF CORRECTION, INSPECTION REPORT & PERFORMANCE SECURITY INCREASE FOR SURFACE MINE RECLAMATION PERMIT #70-010835 (SUNDBERG S & G)

Dear Permit Holder:

A review of your permit file and inspection on 2/13/2014 has been completed for the Department of Natural Resources (DNR) Surface Mine Reclamation Permit located in a portion of Section 09, Township 18 North, Range 02 West, W.M., Thurston County, Washington.

Enclosed is the Inspection Report (Form SM-7A) and Notice of Correction (Form SM-7B) for your Department of Natural Resources Surface Mine Reclamation Permit. Please review the report carefully to determine if any corrective actions are in order.

Please provide the required performance security increase from $0.00 to $35,500.00 within 30 days of 2/14/2014 or enforcement action may be initiated. The reclamation bond will periodically be adjusted up or down in order to reflect additional development or completed reclamation.

If you have any questions, or if you disagree with the report, please contact Eli Newby by calling 360-902-1621.

Sincerely,

Eli Newby
Surface Mine Reclamation Program
Division of Geology and Earth Resources

Enclosures (6)

c: File #70-010835

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

SURFACE MINE RECLAMATION INSPECTION REPORT (Form SM-7A)

Permit holder	WESTBROOK INVESTMENTS LLC	Acres permitted	11.3
Mine name	SUNDBERG S & G	Acres disturbed	7.32
County	Thurston	Depth permitted (ft)	30
Latitude / Longitude	47.0672 -122.9391	Depth mined (ft)	30
Current reclamation security	$0.00	Acres reclaimed	0
Total reclamation security required	$35,500.00		

Please provide the required performance security within 30 days of 2/14/2014 or enforcement action may be initiated.

Subsequent Use

Log Yard with Limited Use Permit Only

Has reclamation permit	Yes	Mining within permit area	No	Following reclamation schedule	Yes
Annual fees paid	Yes	Compliant with plan and permit conditions	No	Segments need reclamation	Yes
Annual report correct	No	Topsoil preserved/protected	Yes	Areas need revegetation	Yes
Map submitted with report	No	Topsoil replaced	Yes	Signs of slope instability	No
Map adequate	No	Erosion control adequate	Yes	Setbacks adequate	No
Permit boundaries marked	No				

Please provide the required reclamation plan within 60 days of 2/14/2014 or enforcement action may be initiated.

Inspection Comments

Thank you Jerry for returning my call on 2/13/14 prior to the site inspection. Much of the areas within the permit boundary have yet to be mined and are vegetated with grass, scotch broom and blackberry. I witnessed illegal dumping of wood waste occurring while on site. Vehicles are bypassing the southern gate by driving through the grass. Dumping is also occurring in front of the access gate. Steps such as dumping fines signs, trenches and berms should be taken to prevent future dumping.

A Notice of Correction is being issued due to mining disturbance beyond the permit boundary, permit document deviancies and the lack of a performance security. To regain compliance with RCW 78.44 please submit the required $35,500 performance security within 30 days (due 3/16/14). There are two ways to correct the unpermitted mining:
1. Submit a revised map set which accurately displays the 11.3 acre intended for mining within 60 days (due 4/16/14) and reclaim all unpermitted mining disturbance within the next growing season (spring seeding).
2. Submit an expanded reclamation permit application which includes all areas currently disturbed within 60 days (due 4/16/14).

Reclamation Status

Recent grade work of unpermitted mining looks good with clean imported soils spread against the northern highwall at angles less than 2H:1V. To be deemed reclaimed areas must meet minimum standards set forth by RCW 78.44.141 which includes full revegetation of slopes. Removal of dumped material will be needed for reclamation.

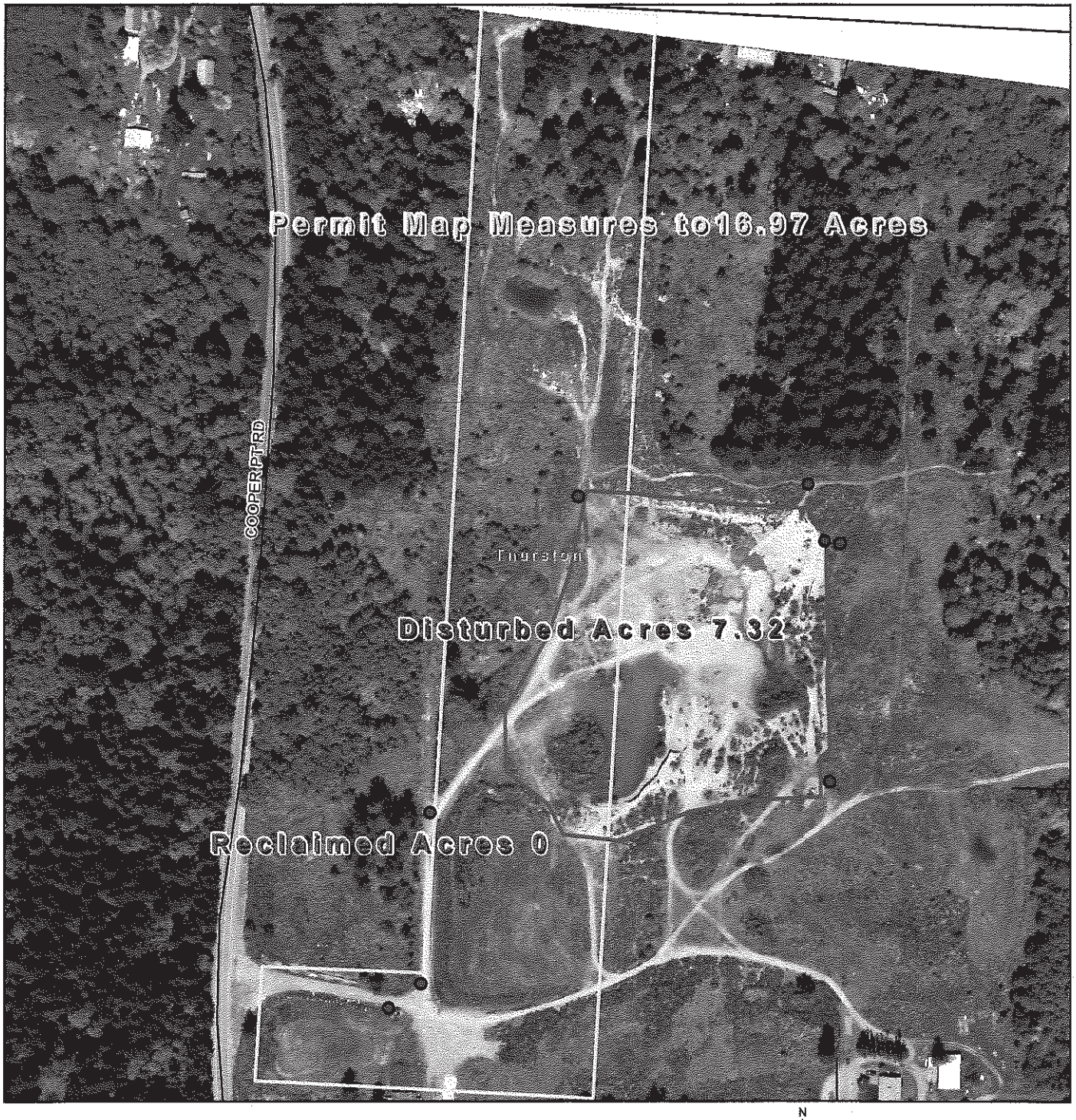
If you have questions about any of the items detailed in this inspection report, please call SMR representative Eli Newby at 360-902-1621

Date of inspection 2/13/2014
Date of Report 2/14/2014

Reclamation Permit No. 70-010835

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Aerial Photography Report



Permit# 70-0 10835

WESTBROOK INVESTMENTS LLC
SUNDBERG S & G

Inspected: 02/13/2014
by Eli Newby

Legend

- field disturbed area
- permit boundary
- reclaimed area
- GPS field points

N
W E
S

0 95 190 380 570 760
Feet

Photo Date:05/07/2012

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

NOTICE OF CORRECTIONS
(Form SM-7B)

DATE: February 14, 2014

TO: WESTBROOK INVESTMENTS LLC
429 29TH NE STE A
PUYALLUP, WA 98372-6767

RE: Surface Mining Reclamation Permit No.
70-010835
SUNDBERG S & G

FROM: Eli Newby

ADDRESS: 1111 Washington St SE
MS 47007
Olympia, WA 98504

PHONE: 360-902-1621

The Washington Department of Natural Resources (DNR) inspected your surface mine on 2/13/2014. As a result of that inspection, a report has been issued to you identifying problems with your operation that violate the Surface Mining Reclamation Act (RCW 78.44), the administrative rules promulgated thereunder (WAC 332-18), your authorized reclamation plan, or your reclamation permit. A copy of that report is included with this Notice of Correction for your convenience.

Permit #70-010835 is in violation of the following RCW's:

78.44.081
78.44.087
78.44.091
78.44.151
78.44.260

The following actions must be taken in order to achieve compliance:

Submit the required $35,500 performance security within 30 days (due 3/16/14).
Submit an expanded reclamation permit application which includes all areas currently disturbed within 60 days (due 4/16/14); or as an alternative submit a revised map set which accurately displays the 11.3 acre intended for mining within 60 days (due 4/16/14) and reclaim all unpermitted mining disturbance within the next growing season (spring seeding). The map set will need to meet the requirements of RCW 78.44.091.

The conditions identified in this Notice must be corrected no later than 3/16/2014. If you fail to correct these conditions, DNR may take further action, including an assessment of civil penalties or a suspension of surface mining.

You may request an extension of this deadline to achieve compliance, but only for good cause shown. This must done in writing. Submit a letter to the enclosed letterhead address: Attention: Eli Newby.

The Department will respond to requests for extension in writing and has discretion to either reaffirm the original deadline or establish a new deadline.

If you have any questions regaurding this Notice of Correction, or if you need advice on where to obtain technical assistance, please contact Eli Newby.

RCW 78.44.081

Reclamation permits required — Applications.

After July 1, 1993, no miner or permit holder may engage in surface mining without having first obtained a reclamation permit from the department. Operating permits issued by the department between January 1, 1971, and June 30, 1993, shall be considered reclamation permits. A separate permit shall be required for each noncontiguous surface mine. The reclamation permit shall consist of the permit forms and any exhibits attached thereto. **The permit holder shall comply with the provisions of the reclamation permit unless waived and explained in writing by the department.**

Prior to receiving a reclamation permit, an applicant must submit an application on forms provided by the department that shall contain the following information and shall be considered part of the reclamation permit:

(1) Name and address of the legal landowner, or purchaser of the land under a real estate contract;

(2) The name of the applicant and, if the applicants are corporations or other business entities, the names and addresses of their principal officers and resident agent for service of process;

(3) A reasonably accurate description of the minerals to be surface mined;

(4) Type of surface mining to be performed;

(5) Estimated starting date, date of completion, and date of completed reclamation of surface mining;

(6) Size and legal description of the permit area and maximum lateral and vertical extent of the disturbed area;

(7) Expected area to be disturbed by surface mining during (a) the next twelve months, and (b) the following twenty-four months;

(8) Any applicable SEPA documents; and

(9) Other pertinent data as required by the department.

The reclamation permit shall be granted for the period required to deplete essentially all minerals identified in the reclamation permit on the land covered by the reclamation plan. The reclamation permit shall be valid until the reclamation is complete unless the permit is canceled by the department.

RCW 78.44.087

Performance security required — Department authority.

(1) The department should ensure that a sufficient performance security is available to reclaim each surface mine permitted under this chapter. To ensure sufficient funds are available:

(a) The department shall not issue a reclamation permit, except to public or governmental agencies, until the applicant has either deposited with the department an acceptable performance security on forms prescribed by the department that is deemed adequate by the department to cover reclamation costs or has complied with the blanket performance security option in RCW 78.44.350. A public or governmental agency shall not be required to post performance security.

(b) No person may create a disturbed area that meets or exceeds the minimum threshold for a reclamation permit

purposes of surface mine reclamation. However, nothing in this section prohibits a state agency or local government from requiring a performance security when the state agency or local government is acting in its capacity as a landowner and contracting for extraction-related activities on state or local government property.

(10) The department may enter into written agreements with federal agencies in order to avoid redundant bonding of any surface mine that is located on both federal and nonfederal lands in Washington state.

RCW 78.44.091

Reclamation plans — Approval process.

An applicant shall provide a reclamation plan and copies acceptable to the department prior to obtaining a reclamation permit. The department shall have the sole authority to approve reclamation plans. Reclamation plans or modified reclamation plans submitted to the department after June 30, 1993, shall meet or exceed the minimum reclamation standards set forth in this chapter and by the department in rule. Each applicant shall also supply copies of the proposed plans and final reclamation plan approved by the department to the county, city, or town in which the mine will be located. The department shall solicit comment from local government prior to approving a reclamation plan. The reclamation plan shall include:

(1) A written narrative describing the proposed mining and reclamation scheme with:

(a) A statement of a proposed subsequent use of the land after reclamation that is consistent with the local land use designation. Approval of the reclamation plan shall not vest the proposed subsequent use of the land;

(b) If the permit holder is not the sole landowner, a copy of the conveyance or a written statement that expressly grants or reserves the right to extract minerals by surface mining methods;

(c) A simple and accurate legal description of the permit area and disturbed areas;

(d) The maximum depth of mining;

(e) A reasonably accurate description of the minerals to be mined;

(f) A description of the method of mining;

(g) A description of the sequence of mining that will provide, within limits of normal procedures of the industry, for completion of surface mining and associated disturbance on each portion of the permit area so that reclamation can be initiated at the earliest possible time on each segment of the mine;

(h) A schedule for progressive reclamation of each segment of the mine;

(i) Where mining on floodplains or in river or stream channels is contemplated, a thoroughly documented hydrogeologic evaluation that will outline measures that would protect against or would mitigate avulsion and erosion as determined by the department;

(j) Where mining is contemplated within critical aquifer recharge areas, special protection areas as defined by chapter 90.48 RCW and implementing rules, public water supply watersheds, sole source aquifers, wellhead protection areas, and designated aquifer protection areas as set forth in chapter 36.36 RCW, a thoroughly documented hydrogeologic analysis of the reclamation plan may be required; and

(k) Additional information as required by the department including but not limited to: The positions of reclamation setbacks and screening, conservation of topsoil, interim reclamation, revegetation, postmining erosion control, drainage control, slope stability, disposal of mine wastes, control of fill material, development of wetlands, ponds, lakes, and impoundments, and rehabilitation of topography.

(2) Maps of the surface mine showing:

RCW 78.44.260

Operating without permit — Penalty.

Any miner or permit holder conducting surface mining within the state of Washington without a valid reclamation permit shall be guilty of a gross misdemeanor. Surface mining outside of the permitted area shall constitute illegal mining without a valid reclamation permit. Each day of mining without a valid reclamation permit shall constitute a separate offense.

ATTACHMENT E

PARKSIDE
THURSTON COUNTY, WASHINGTON

OLYMPIC MUDMINNOW
IMPORTANT HABITATS AND SPECIES PLAN
IN THE GREEN COVE CREEK BASIN

Prepared By:

CURTIS WAMBACH, M.S.
SENIOR BIOLOGIST & PRINCIPAL
ENVIROVECTOR
LACEY, WASHINGTON

26 December 2014

360-790-1559
curtis@envirovector.com
www.envirovector.com

PARKSIDE

OLYMPIC MUDMINNOW STUDY

IMPORTANT HABITATS AND SPECECIES PLAN

IN THE GREEN COVE CREEK BASIN

Prepared For:

Rian Tuttle
The Holt Group
PO Box 87970
Vancouver, WA 98687

Prepared By:

Curtis Wambach, M.S.,
Senior Biologist and Principal
EnviroVector
Lacey, WA 98503

(360) 790-1559

www.envirovector.com

26 December 2014

1.0 INTRODUCTION

At your request, EnviroVector has prepared an Important Habitats and Species Management Plan on the Parkside Proposed Subdivision (Case #07-0040) in compliance with City of Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan* to satisfy Conditions posted in the 2 April 2008 Hearing Examiner's Decision (**Figure 1**).

This Important Habitats and Species Management Plan has been prepared to satisfy the requirements of the City of Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan*. Stream Typing is based on the City of Olympia Code Chapter 18.32.410 - *Streams - Typing System* and WAC 222-16-030 and 031. Supporting documentation is provided in:

Appendix A: Biologist qualifications for preparing the Important Habitats and Species Management Plan.
Appendix B: WDFW Olympic Mudminnow Priority Habitats and Species Management Recommendations (1991) as required under City of Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan*.
Appendix C: Photos of our extensive habitat analysis.
Appendix D: Washington State Department of Natural Resources (DNR) Stream Typing Map.
Appendix E: Olympic mudminnow (Novumbra hubbsi) in the Green Cove Creek Watershed, Thurston County, Washington: Distribution and Recommendations for Protection.

The goal of this report is to:

1. Clarify Comments recorded on the Hearing Examiner Decision.
2. Satisfy conditions of the Hearing Examiner to prepare an Important Habitats and Species Plan and Stream Typing in compliance with WDFW Olympic Mudminnow Priority Habitats and Species Management Recommendations (1991) as required under City of Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan*.
3. Illustrate the corrected stream locations as recorded using Geographic Information Systems (GPS) receiver in the field.
4. Present results of our downstream analysis of Goldcrest Creek and a small drainage leaving the southeastern corner of the property.
5. Present results of our mudminnow habitat analysis, which focuses on potential habitat 1,000 feet of the subject property, but includes the entire Green Cove Creek Basin.
6. Provide conservation measures to avoid and minimize impacts to the Olympic mudminnow based on the WDFW Olympic Mudminnow Priority Habitats and Species Management Recommendations (1991).
7. Present an impacts analysis on the Olympic mudminnow and propose appropriate conservation/mitigation measures.
8. Prepare a Cumulative Impacts Analysis as requested by the Hearing Examiner.

1.1 Species Information

The Olympic mudminnow is found in slow moving streams, wetlands, and ponds within the lowlands of southern Western Washington (**Appendix C**). The Olympic Mudminnow avoids current, which restricts the species to extremely slow-moving lowland waters (Meldrim, 1968). Extremely low tolerance to water current has restricted Olympic mudminnows to very slow moving waters within the Puget lowlands (Mongillo and Hallock, 1999). Generally, as elevation increases so does slope and water current. Thereby, this species is restricted to lowland waters with relatively flat topography.

The Washington Department of Fish and Wildlife (WDFW) Olympic Mudminnow Priority Habitats and Species Management Recommendations (**Appendix C**— please read under Habitat Requirements) states that "they [Olympic mudminnow] occur in standing or gently flowing water with:

1) A current of less than three (3) cm/sec,
2) With dense aquatic vegetation, and
3) At least several centimeters of soft mud bottom substrate".

Wydoski and Whitney (1979) describe the Olympic mudminnow habitat requirements as brownish water of bogs and swamps with a water current of less than 0.1 foot/sec, which is equivalent to the WDFW 3 cm/sec. No water flows this slowly in Goldcrest Creek south of 28th Avenue NW. The average water velocity in this small one-foot-wide drainage was measured as 18 to 36 cm/sec during the field evaluation, which is much faster than that tolerated by the mudminnow, as described in the WDFW Management Recommendations (**Table 1**). No mud bottom or aquatic vegetation occurs in this mostly graveled drainage west of the subject property in Goldcrest Creek. In fact, our GPS mapping discovered that Goldcrest Creek does not extend onto the subject property at all as the Wild Fish Conservancy testified in front of the Hearings Examiner (See **Figures 3 & 4; note: GPS-located stream follows topography**).

In addition, the Wild Fish Conservancy testified in front of the Hearings Examiner that the Olympic mudminnow occurs in Goldcrest Creek west of the subject property to wetlands located at 20th Avenue NW. However, their final 2009 report, prepared in collaboration with the Washington Department of Fish and Wildlife (WDFW), shows no presumed mudminnow presence in Goldcrest Creek west of the subject property or in wetlands at 20th Avenue NW (**Appendix E**). In fact, their final 2009 map is identical to EnviroVector (Formally PE Consultants LLC) mudminnow distribution maps of Goldcrest Creek presented to the Hearings Examiner in 2008.

The Olympic mudminnow prefers streams that are found below approximately 160 feet in elevation (Mongillo and Hallock, 1999; page 7---*Habitat Requirements*). The northern portion of the site is at approximately 160 feet in elevation and increases in elevation southward. However, the wetland that occurs on the northern portion of the subject property contains only saturated soils, not standing water. The majority of the subject property is higher in elevation than where mudminnows are typically found.

Spawning occurs from late November to June. Spawning peaks from April through May. Water temperatures during breeding season range from 50 to 64 degrees F. The Olympic mudminnow is commonly associated with other fish species. These species include; 1) reticulate sculpin, 2) three-spine stickleback, 3) and Coho salmon. The mudminnow is limited by the occurrence of exotic fish species. Some of the species may be confused with the mudminnow to the untrained eye because of a similarity of appearance.

The Olympic mudminnow can tolerate a wide range of temperature and oxygen levels; however, the species is restricted to low current and elevation. Summertime habitat requirements include: 1) cool water, 2) mud substrate, and 3) shading over the creek.

There is no information of mudminnow occurrence on the subject property. Perhaps, this is so because no water occurs on the site that would support fish presence. The current is too great in Goldcrest Creek west of the subject property to support mudminnow presence, based on WDFW stated habitat requirements. The elevation on the majority of the site is greater than that of the preferred species occurrence.

2.0 Study Area

The study area encompasses the subject property 29.27-acre subject property (Parcel #74202800000, 17.4; 74202700000, 3.2 acres; 74202700100, 2.21 acres; 74202600000, 6.46 acres) located at west of Cooper Point Road NW and north of 20th Avenue NW (Section 09, Township 18 North, and Range 02 West, Willamette Meridian) and the Green Cove Creek Basin focusing on a distance of 1,000 feet of the subject property (**Figure 1**).

3.0 BACKGROUND

A scientific evaluation has been completed by EnviroVector (Formally PE Consultants LLC) to evaluate the Green Cove Creek basin for possible Olympic mudminnow occurrence and potential mudminnow habitat (**Figure 2**). Three previous studies are dated 13th of January 2008, 31 January 2008, and April 2008. This fourth study is more comprehensive and introduces several new scientific elements, such as an expanded downstream habitat analysis and GPS mapping, to support our original scientific findings. This GPS mapping is important because it clarifies some confusion on the locations of previously mapped streams, wetlands, and mudminnow habitat. This GPS mapping study verifies that no Olympic mudminnow habitat or individual occurrence is likely on the subject property.

Potential mudminnow habitat and occurrence have been identified during this study. Our findings do not conflict with the rudimentary mudminnow distribution maps in a recent study by the WDFW on Mudminnow distribution in the Green Cove Basin (**Appendix E, Figure 2**). No documented mudminnow habitat, population, or verified individual occurrence has been identified on the subject property during this study or by the WDFW (**Appendix E; Figure 2**).

EnviroVector's qualifications to prepare the Important Habitat and Species Management Plan are presented in **Appendix A**.

4.0 METHODOLOGY

4.1 Information Review

Background information was reviewed prior to field investigation and includes the following resources:

- Washington Department of Fish and Wildlife Salmonscape database.
- Thurston County Geodata Center Maps
- Mongillo, P.E. and Hallock, M. 1999. Washington state status report for the Olympic mudminnow. Wash. Dept. Fish and Wildlife, Olympia. 36 pp.
- WDFW Management recommendations for Washington's Priority Habitats and Species 1991.
- The Coot Company (May 2005) Wetland Inventory of the Duca Property
- City of Olympia. 2002. Low-Impact Development Strategy for Green Cove Basin: A Case Study in Regulatory Protection of Aquatic Habitat in Urbanizing Watersheds
- State Department of Natural Resources (DNR) Stream Typing Map (**Appendix D**)
- The Washington Department of Fish and Wildlife. 2009. Olympic mudminnow (Novumbra hubbsi) in the Green Cove Creek Watershed, Thurston County, Washington: Distribution and Recommendations for Protection. Prepared by J. Glasglow and M Hallock (**Appendix E**).

4.2 Field Evaluation

Field Evaluations:

- 1 September 2013. Detailed evaluation of downstream drainages north and south of the subject property.
- 21 August 2013. Detailed downstream study of Green Cove Creek Basin.
- 9 August 2013. Detailed evaluation of downstream drainage south of the subject property.
- 16 April 2008. Detailed expanded downstream habitat analysis and GPS mapping on Goldcrest Creek from 20th Avenue SW to 28th Avenue SW and 1,000 feet south of the subject property following a drainage that leaves the SE corner of the subject property.
- 31 January 2008. Complete mudminnow evaluation to 1000 feet of the property and wetland evaluation to supplement Coot Company report
- 24 January 2008. Downstream analysis on Goldcrest Creek from 20th Avenue SW to 28th Avenue SW
- 11 January 2008. Preliminary mudminnow reconnaissance

Observations were made of the general plant communities, stream and wetland habitats, and the locations of potential Olympic mudminnow habitat. The on-site and off-site drainage network had been evaluated in the field to determine habitat occurrence.

Specific observations were made of:

- Relative current of flowing water
- Relative abundance of aquatic vegetation
- Characteristics of stream bottom
- Vegetative cover that would produce shade in the summertime
- Fish barriers and obstructions to fish migration or movement
- Water capacity to support fish presence

5.0 STUDY RESULTS

5.1 Review of Existing Information

DNR Classifies Goldcrest Creek as Type N (Type 5)

The Washington State Department of Natural Resources (DNR) classifies Goldcrest Creek as a Type N water west of the subject property (**Appendix D**). Type N water can translate to a Type 4 or Type 5 of the older rating system, which is similar to that of the Olympia Code (**Insert 1**). However, since Goldcrest Creek west of the subject property is a seasonal stream that becomes dry in the summer, it would be classified as a Type 5 by the State DNR.

Insert 1. State DNR Stream Typing System

Water Type	Description
Type "S" = Shoreline (formerly type 1)	Streams and waterbodies that are designated "shorelines of the state" as defined in chapter 90.58.030 RCW.
Type "F" = Fish (formerly type 2 or 3)	Streams and waterbodies that are known to be used by fish, or meet the physical criteria to be potentially used by fish. Fish streams may or may not have flowing water all year; they may be perennial or seasonal.
Type "Np" = Non-Fish Perennial (formerly type 4)	Streams that have flow year round and may have spatially intermittent dry reaches downstream of perennial flow. Type Np streams do not meet the physical criteria of a Type F stream. This also includes streams that have been proven not to contain fish using methods described in Forest Practices Board Manual Section 1Forest Practices Board Manual Section 13.
Type "Ns" = Non-Fish Seasonal (**formerly type 5**)	Streams that do not have surface flow during at least some portion of the year, and do not meet the physical criteria of a Type F stream.

WDFW Study of Mudminnow in Green Cove Basin

No Olympic mudminnows are identified to occur within 1,000 feet of the subject property in an extensive mudminnow study performed by the Washington Department of Fish and Wildlife (WDFW) (**Appendix E**). This study focused on the occurrence and distribution of the Olympic mudminnow within the Green Cove Creek basin.

The Washington Department of Fish and Wildlife (WDFW) does not presume occurrence of the Olympic Mudminnow in Goldcrest Creek west of the subject property within the Green Cove greenway (**Appendix E**). No mudminnows were identified to occur in Goldcrest Creek west of the subject property within the Green Cove greenway. However, the Olympic mudminnow was identified to occur in the wetland at 20th Avenue NW more than 1,000 feet of the subject property. General presumed occurrence was mapped east of Cooper Point Road in this drainage. However, no mudminnows were identified to occur within 1,000 feet of the subject property in this drainage.

No individual mudminnows were identified to occur at sampling point #4 located in the drainage that leaves the southeastern corner of the subject property (**Appendix E**). No presumed occurrence is identified west of Cooper Point Road in the drainage that leaves the southeastern corner of the subject property. The mudminnow is presumed to occur east of Cooper Point Road within this drainage approximately 1,000 feet of the subject property, although no individual mudminnow were identified until more than 2,000 feet downstream.

5.2 Field Results

Corrected Location of Goldcrest Creek

The correct location of Goldcrest Creek had been GPS-located during the 16 April 2008 field study to determine the actual location of the stream within the Green Cove Greenway. The correct mapping is important to determine a detailed distribution of mudminnow and its habitat in reference to the Subject property (**Figure 3**). This detailed information is necessary to clarify some questions as whether the mudminnow or its habitat occurs on the subject property or in the vicinity of the subject property.

The old, inaccurate maps show Goldcrest Creek extending onto the subject property. Our study discovered two separate drainages. One drainage originates at the onsite wetland and extends northwest toward 28th Avenue NW (**Figure 3**). The other drainage (now called Goldcrest Creek) extends through the Green Cove Greenway west of the subject property and does not extend onto the subject property like identified previously on inaccurate older maps.

Generally, the drainages follow the topography as depicted in **Figure 4**. Goldcrest Creek is located in a ravine as its topography is shown on **Figure 4**. The Creek drains to a flat wetland basin at 28th Avenue NW. The subject reach of Goldcrest Creek intermittently disappears underground near its terminus, not allowing any fish passage upstream. The small un-named drainage east of Goldcrest Creek is spring-fed and also intermittently disappears underground.

The GPS location of the actual stream reaches has been a beneficial discovery in the mapping of mudminnow distribution and feeder streams. In addition, this discovery provides reviewing agencies and researchers with the actual stream locations.

Downstream Analysis

There has been some confusion on the correct location and character of drainages and wetlands north of the subject property. Land conditions, dense vegetation, topography, and few landmarks make it difficult to determine one's exact location on the ground. That is why it is important to use the latest technology in the creation of accurate maps. Defining the drainages leaving the subject property is very important in preparing accurate maps of Olympic mudminnow habitat distribution relative to the subject property. The downstream analysis focuses on habitat requirements of the mudminnow, which consists of current less than 3 cm/sec, mud bottom, and abundant aquatic vegetation, as described in the WDFW Mudminnow Management Recommendations (See **Appendix C**—please read under habitat requirements).

Data for the downstream analysis is provided in **Table 1**. This table describes stream reach conditions on the ground at specified GPS points illustrated in **Figure 3**. The velocity of the stream in centimeters per second (cm/s or cm/sec) is presented in this table at selected GPS points. In addition, photos taken at specified GPS points are recorded in **Table 1** and are found in **Appendix C**.

The current of the subject drainages are much greater than the very slow moving water required by the Olympic mudminnow (**Table 1**). The data shows that drainages in the study area are above 30 cm/sec; which is over ten (10) times the upper limit of mudminnow habitation. According to the WDFW Management Recommendations, mudminnows inhabit waters where flow velocity is less than 3 cm/sec (**Appendix B**). The velocity of Goldcrest Creek at its flattest northern reach within the study area was recorded at 18 cm/sec, which is 6 times the upper limit. The majority of Goldcrest Creek in the study area is at 36 cm/sec, which is 12 times the upper limit. One can visualize the steam velocity from photos provided in **Appendix C** and from the relatively steep topography as seen in **Figure 4**.

No water had been observed in the ditch located south of the southeastern corner of the subject property until approximately 400 feet south of the southern property boundary during wetter months (**Table 1: GPS #15-23; Figure 3, Appendix C: Photos 8-11**). The water velocity near the 18-inch culvert inlet at Cooper Point Road, 400 feet south of the subject property, was measured at 10 cm/sec **Table 1: GPS #18; Figure 3**. Water velocity located near its outlet east of Cooper Point Road had been measured at 8 cm/sec **Table 1: GPS #19; Figure 3**, which is greater than the upper limit of this habitat requirement of 3 cm/sec (**Appendix B**). Thereby, no mudminnows are expected to occur in this reach. Some water pools downstream over 1,000 feet of the subject property.

The water velocity in the unnamed drainage north of the subject property was measured at 36 cm/sec **(Table 1: GPS #33-40; Figure 3, Appendix C: Photo 15)**, far above the range for mudminnows, based on the WDFW Mudminnow Management Recommendations (**Appendix B**). No habitat features were observed in this reach.

Table 1. Downstream Analysis for Mudminnow Habitat

GPS Number	Description	Figure	Cm/s[1]	Appendix D Photo#
Goldcrest Creek West of Subject Property Near 20th Avenue NW				
2	Wetland Mosaic mostly upland Veg, red alder (FAC), sword fern (FACU), osoberry (FACU), Salmonberry (FAC+), red elderberry (FACU), no standing water.	3	none	1
3	Same as #2	3	none	1
4	Same as #2	3	none	1 & 2
5	Same as #2 Except some skunk cabbage and water parsley in small wet patches—Wet sheen in small isolated wetland patches in wetland mosaic, no flowing water, some cedar (FAC), English holly (UPL), and clustered rose (FAC).	3	none	2
6	Mosaic wetlands---small patches of wetland surrounded by uplands, sheen of wetness on the surface GPS# 6 & 7---Skunk cabbage, water parsley, & muck soils in isolated wetland patches, no water capacity for fish presence, no flowing water.	3	none	3
7	Same as #6	3	none	3 & 4
8	Same as #6	3		3 & 4
9	Same as #6 except some springs that pop out of the ground and then disappear within small isolated wetland patches.	3	none	3 & 4
10	Springs popping out of the ground, flowing for several feet and disappearing underground in isolated wetland patches.	3	none	5
11	Same as #6	3	none	5
12	Same as #6---stream starting to form, increased number of wet-spring-fed patches. No mudminnow habitat	3	none	5
13	Fast flowing trickle of a gravel bottom spring-fed stream starts from @ ~727' N of 20th Ave NW. ~one-foot wide and less than 0.25" deep. No mudminnow habitat	3	35	6
14	Same as 13. @ ~780' north of 20th Ave NW	3	34	7
Drainage South of Subject Property				
15	Outlet from SE corner of property—Small trickle of water	3	none	8
16	Dry ditch channel downstream (south) of SE corner of property & dry open flat basin west of ditch for stormwater infiltration and treatment—no mudminnow habitat	3	none	9, 10, 11
17	Some water in ditch	3	none	No photo
18	Culvert inlet under Cooper Point Road NW Culvert Extending to E	3	10	No photo
19	Outlet of culvert extending under Cooper Point Road NW	3	8	No photo
20	Saturated soils, but no water capacity to support fish life	3	none	No photo
21	Same as #20	3	none	No photo
22	Same as #20	3	none	No photo
23	Same as #20	3	none	No photo

1. Habitat requirement of less than 3cm/sec water flow

Table 1. Continued

GPS Number	Description	Figure	Cm/s[1]	Appendix D Photo#
Goldcrest Creek Near 28th Avenue NW				
25	Break in channel, stream disappears underground for around 4 feet in distance before popping back out of the ground. No fish passage possible.	2 & 6	-----	No photo
26	Fast moving gravel bed channel ~16" wide and <0.5" deep	2 & 6	37	12
27	Fast moving gravel bed channel ~20" wide and <0.5" deep. Substrate changing to a sandy fine gravel.	2 & 6	34	13
28	Potential Mudminnow habitat starts with mud bottom and some aquatic vegetation; however, current is still much too strong for mudminnow habitation; ~4 feet wide and 1 to 4 inches deep	2 & 6	18	14
29	Muddy wetland	2 & 6	18	----
30	Same as #29	2 & 6	----	----
31	Same as #29	2 & 6	----	----
32	Outlet to reed canarygrass field and patch of cattails	2 & 6	None	----
Unnamed Stream Extending Offsite North of Onsite Wetland				
33 34 35 36 37 38 39 40	Small fast moving gravel bed stream that pops in and out of the ground. This stream is <one-foot wide and the water level is <0.5inches deep. No habitat for the Olympic mudminnow occurs in this small drainage.	2 & 6	36	15

1. Habitat requirement of less than 3cm/sec water flow

Mudminnow Distribution within 1,000 Feet Downstream of the Building Area

No Olympic mudminnow has been documented to occur within 1,000 feet downstream of the proposed construction area based on the WDFW study (**Appendix E**) and our comprehensive field study (**Figure 2**).

Goldcrest Creek. Scientific data suggests that no mudminnow occurs in the fast - flowing Goldcrest Creek within 1,000 feet west of the subject property or in small tributaries within 1,000 feet south of the subject property. Goldcrest Creek west of the subject property is a gravel-bottomed fast-flowing stream does not meet the basic criteria for preferred mudminnow habitat as described in the WDFW Olympic mudminnow Management Recommendations (**Appendix B**; **Appendix C: Photos 6 & 7 and 12**).

Goldcrest Creek west of the subject property is a one-foot wide seasonal stream that flows swiftly through a steep corridor at 18 to 36 cm/sec, which is many times greater than their upper limit of less than 3 cm/sec as described by the WDFW Olympic Mudminnow Management Recommendations (**Appendix B**; **Appendix C: Photos 6 & 7; Table 1, Figure 3**). This small seasonal stream rushes down a sloped gradient that creates a natural velocity barrier for this stagnant-water fish species. No mudminnow occurs on the mostly dry area west of the subject property at 20th Avenue NW, where small isolated patches of wetland within a larger upland area create a mosaic wetland system (**Appendix C: Photos 1-4**). These seasonally wet patches have no surface water connection to Goldcrest Creek.

Elevation and Water Velocity Barriers in Goldcrest Creek. The elevation within the Green Cove Greenway at 20th Avenue NW is at 260 feet, which is 100 feet above the elevation where this lowland species is typically found (**Figure 4**). Goldcrest Creek drops in elevation by approximately 126 feet between 20th Avenue NW and 28th Avenue NW, where the elevation is at 134 feet. This steep elevation drop is not gradual and continuous. It is a series of cascades where fast moving water falls at varying distances and in places this water sinks underground, creating a physical barrier to mudminnow passage. Thereby, elevation and water velocity create a physical barrier to mudminnow passage in Goldcrest Creek west of the subject property.

Wetland and Drainage North of Proposed Construction Area. The wetland located on the northern portion of the subject property contains no standing water that would support the Olympic mudminnow. This wetland contains only saturated soils during the wettest time of the year. This wetland drains to an ephemeral stream (flows only during storm events) that intermittently disappears underground, creating a physical barrier to mudminnow passage **Table 1: GPS #33-39; Figure 3, Appendix C: Photo 15**. In addition, elevation drops by 50-60 feet within 500 horizontal feet. This 10-12% slope drops in intervals creating an elevation and velocity barrier, preventing mudminnow passage in this ephemeral drainage.

Wetland at 28th Avenue NW. Mudminnow habitat occurs more than 1,000 feet north of the proposed development where fast moving water flows into a small wetland basin at the terminus of a sloped ravine near 28th Avenue NW (**Table 1: GPS #25-32; Figure 3, Appendix C: Photos 12-14**). A steep gradient and high water velocities create a natural physical barrier to Goldcrest Creek and other upstream tributaries of this wetland where this this small slow-water fish species cannot pass. Breaks in Goldcrest Creek and these tributaries where the water disappears underground also creates a natural physical barrier to fish passage, as these small minnow-sized fish cannot cross 4 to 10 feet of dry land.

None of the three Olympic mudminnow habitat requirements (*i.e.*, 1. slow water < 3 cm/sec, 2. mud bottom, and 3. abundant aquatic vegetation) occur in Goldcrest Creek west of the subject property or other tributaries to this wetland at 28th Avenue NW within 1,000 linear feet of the proposed building area. None of these habitat requirements occur in the small unnamed drainage located in the northeastern portion of the study area. No mudminnow habitat occurs in this drainage for approximately 1,000 linear feet downstream of the subject property.

20th Avenue NW & Cooper Point Road. No Olympic mudminnow can access the southeastern corner of the subject property through the drainage that leaves the site at 20th Avenue NE and Cooper Point Road. Water only flows south from the 18 inch culvert during very heavy winter storms. Water drops from the culvert onto riprap **Table 1: GPS #15; Figure 3, Appendix C: Photos 8**. This water flows down an approximately 20-30% slope to a basin below (See **Figure 4** for topography). This basin does not contain standing water during the wettest time of the year (**Appendix C: Photos 9 & 11**). However, during very heavy winter storms some fast flowing water occurs near the culvert under Cooper Point road approximately 500 feet south of the subject property.

East of the Cooper Point Culvert, no water capacity to support fish life occurs during the wettest time of the year until over 1,000 feet of the subject property. Fast-moving water exits this culvert during very heavy storm events creating a water velocity barrier before this water disappears underground. Saturated soils occur in this area. Water capacity for sustained fish presence in this area is unlikely during even the wettest months.

Olympic Mudminnow in the Green Cove Basin.

The subject property is located within the Green Cove Creek basin, which drains a 2,600-acre watershed located entirely in Thurston County on the west side of Olympia, Washington (**Figure 2**). Green Cove Creek is a low-gradient, slow-moving stream that extends through a series of wetlands, including Grass Lake, which is located south of 14th Avenue NW and east of Kaiser Road NW. The stream drains to Puget Sound on the northern end of Cooper Point.

Two drainages extend from the subject property that eventually confluence with Green Cove Creek. One of the two drainages conveys runoff from the southeastern corner of the subject property southward to a series of small tributaries that eventually extends to Green Cove Creek south of the subject property. Another drainage extends from a wetland located on the northern end of the subject property to Goldcrest Creek located at 28th Avenue NW. Goldcrest Creek is a tributary to Green Cove Creek. Goldcrest Creek confluences with Green Cove Creek just south of Kaiser Road NW.

EnviroVector performed a general survey of the entire Green Cove Creek basin during August and September 2013 to evaluate potential Olympic mudminnow distribution through identifying and mapping potential habitat. Results suggest that potential habitat is more extensive than that mapped by the WDFW and Wild Fish Conservancy in their basin study (**Figure 2; Appendix E**). However, both our study and the WDFW study agree that no Olympic mudminnows are presumed to occur in Goldcrest Creek west of the subject property.

Although potential Olympic mudminnow habitat appears to be extensive throughout the Greencove Creek basin, potential usable habitat is much less extensive during summer months (**Figure 5**). Many streams and wetlands within the Green Cove Creek basin dry up during summer months shrinking available habitat. During summer months, no potential mudminnow habitat occurs for 2 miles downstream south of the subject property in the Grass Lake wetlands. No water was observed during our August and September basin survey in Green Cove Creek until Kaiser Road near Evergreen Parkway, nearly 5 miles downstream of the drainage leaving the southern portion of the subject property.

Wetlands and streams located north and south of 20th Avenue NW south to Conger Avenue NW and east of Cooper Point Road were completely dry during our summer evaluation. Thereby, no mudminnows are expected to occur in this area during summer months (**Figure 5; Appendix C: Photos 17-20**). Wetlands and streams at Harrison Avenue NW were also completely dry (**Appendix C: Photo 21**). The drainage that crosses 14 Avenue NW and associated wetlands that drain to Grass Lake also was completely dry during the summer evaluation (**Appendix C: Photos 22-23**). Green Cove Creek at Kaiser Road near 14th Avenue also was completely dry (**Appendix C: Photo 24**). Water was first observed in Green Cove Creek at Kaiser Road near Evergreen Parkway almost 5 miles downstream from the southern outlet on the subject property (**Appendix C: Photo 25**). Water was observed downstream from that point on (**Appendix C: Photos 26 & 27**). However, water was observed in the wetland at 28th Avenue NW north of the subject property during the summer evaluation, suggesting that year-round mudminnow presence may occur (**Appendix C: Photo 28**).

7.0 PROPOSED PROJECT

The project consists of a subdivision containing 75 single-family lots on a 30-acre site, with associated improvements.

7.1 Potential Impacts

Direct Impacts
No significant direct impacts to the Olympic mudminnow are expected to occur as a result of this development. This project will comply with the WDFW recommendations with the Development Standards for the Green Cove Creek Basin, and the Department of Ecology Stormwater manual.

Satisfy 1991 WDFW Management Recommendations for the Olympic Mudminnow
The proposed land use shall comply with the minimum performance standards contained within the Washington Department of Wildlife Priority Habitat and Species Management Recommendations (1991) as required under OMC 18.32.315 B (**Insert 2**; **Appendix C**).

Insert 2: WDFW Management Recommendations for the Olympic Mudminnow (Appendix C)

KEY POINTS:

Habitat Requirements:

- Inhabit lake, pond and marsh habitats of coastal lowlands.
- Require currents of **less than 3cm/second** in wetlands with dense aquatic vegetation and deep, soft mud bottoms.

Management Recommendations:

- Avoid altering streams and wetlands where mudminnows occur.
- Keep livestock out of wetlands occupied by mudminnows.
- Avoid altering the flow of feeder streams.
- Avoid logging in swampy portions of the Olympic Peninsula.
- Do not introduce exotic fish into mudminnow habitat.
- Do not use rotonone where mudminnows occur.

WDFW MUDMINNOW MANAGEMENT RECOMMENDATIONS WILL BE SATISFIED BY:

- **Avoid altering streams and wetlands where mudminnows occur**
  - No alteration to stream and wetlands is proposed where mudminnow occur.
  - No mudminnows occur in the proposed land use area, on the subject property.
  - No mudminnows are likely to occur or have been documented to occur within 1000 feet downstream of the proposed Building Area.
- **Avoid altering the flow of feeder streams** (Reducing risk to mudminnow & its habitat)
  - Stormwater treatment and detention ponds are designed to release treated water at pre-development rates as if under forested conditions.
  - No discharge to Goldcrest Creek will occur as a part of the current site plan design. Stormwater will be infiltrated into the ground outside of the stream and wetland buffer area to the greatest extent possible more than 100 feet of the wetland edge.
  - The roadside and groundwater runoff leaving the site from the southeastern corner flows into what appears to be an isolated basin located south of the subject property (**Appendix C: Photo 11**). This grassy basin will provide additional stormwater treatment prior to entering mudminnow habitat.
  - If a small percentage of untreated stormwater (9% percent) is released from the site, downstream wetlands and vegetation would filter out whatever minute organics would be in this discharge before it reaches potential mudminnow habitat. Furthermore, the project engineer affirmed that any untreated stormwater release would originate from roads and roads right-of-ways, which currently release 100 percent of stormwater runoff untreated and undetained. The proposed treatment would greatly reduce this untreated and undetained runoff.
- **No trees will be removed within regulated wetland or stream buffers.**
- **No exotic fish species will be introduced**
- **No rotenone will be used.**
- **No livestock will be in streams or wetlands**

Feeder streams

No alternation to the 'flow' of feeder streams are proposed as part of this project, as the development stormwater treatment and detention ponds are designed to release treated water at pre-development rates under forested conditions. Because the project will "avoid altering the 'flow' of feeder streams, the project is in full compliance with this WDFW recommendation.

7.2 Cumulative Analysis

The 2002 LID Strategy for the Green Cove Basin specifically points out research at the University of Washington (1997) concluding that urbanization can cause irreversible habitat damage. Based on this 1997 research, standards had been adopted by the City Council (February 8, 2000) and County Commissioners (May 9, 2000) following a period of public involvement that included notification of all property owners in the watershed. This public process resulted in the adoption of the Green Cove Basin Development Standards.

These standards involve:

1. **Zoning density.**
2. **Stormwater management standards.**
3. **Seasonal grading restrictions.**
4. **Tree protection.**

These development standards have been put in place to off-set the cumulative effects of development in the Green Cove basin. The Parkside Project is in compliance with Green Cove development standards. These standards are designed to address the issue of cumulative effects associated with development in the Green Cove Basin. The City and County have addressed this issue in the past and have already taken steps to prepare development standards that address the cumulative effects of development.

The site is a very small approximately one (1) percent of the large area encompassing the Green Cove basin watershed. Development on this one small property will not significantly impact the entire 2,600 acre basin. Cumulative effects typically refer to large scale analysis of the entire basin and not one relatively small property. A cumulative analysis of the entire basin is more of a large scale process addressed through long-term planning by the City and County, who have already addressed the issue and provided the special Green Cove Basin Development Standards, which this project is in compliance.

Because the project area is a very small percentage of the large Green Cove basin and because the project is in compliance with the Green Cove Basin Development Standards, no significant cumulative effects are anticipated as a result of this proposed land use action.

The Green Cove Basin Development Standards are designed to off-set cumulative effects that could impact streams or habitat in the basin where the mudminnow occur. The Green Cove Development standards address water quality and quantity issues associated with stormwater management. Other standards benefiting mudminnow and their habitat include tree protection standards, zoning requirements, and seasonal grading restrictions.

No significant cumulative affects to the mudminnow or their habitat are expected as a result of this project, as this project will comply with the Green Cove Basin Development Standards, which are based on an exhaustive cumulative analysis of the Green Cove Basin involving factors that ultimately affect the Olympic mudminnow and its habitat. Furthermore, the project area is a very small

percentage of the large Green Cove Basin and would be a negligible percentage of impervious surfaces within the much larger basin.

7.3 Evaluation of Stormwater Release from Pond C

In front of the Hearings Examiner, there was some question on possible impacts to the Olympic mudminnow associated with potential pollutants that may be released from Stormwater Pond C. Some testimony pointed to an allowed discharge of 9% untreated stormwater. The City of Olympia and the State Department of Ecology (DOE) Stormwater Management Manuals allow the release of 9% untreated stormwater. This doesn't mean that 9% untreated stormwater will be released continually. What it does mean is when stormwater is released at least 91% of this stormwater must be treated.

The project engineer states that the existing release of runoff at the proposed location of Stormwater Pond C originates from roads and road right-of-ways. This outlet currently releases 100 percent of untreated and undetained stormwater runoff directly into the drainage at 20th Avenue NW and Cooper Point Road. Untreated and undetained road runoff is a potential threat to the Olympic mudminnow. .

The project engineer affirms that proposed Stormwater Pond C would treat at least 91% of this road and road right-of-way runoff that is currently 100% untreated. Thereby, Stormwater Pond C would provide a water quality improvement beneficial to the Olympic mudminnow.

In addition, proposed Stormwater Pond C would provide stormwater retention of runoff originating from road and road right-of-ways that currently doesn't exist, providing some protection against flash flooding that could scour streams and damage mudminnow habitat downstream. Currently, runoff at this location is ephemeral; it quickly runs off roads and road right-of-ways downslope undetained after each storm event.

The City of Olympia and the DOE Stormwater Management Manuals require the release of no more than the pre-developed rate based on a pre-developed forested condition. Even though the current release primarily originates from roads and road right-of-ways, Stormwater Pond C would be designed to mimic the release of water at a predeveloped forested condition, thereby reducing the potential of flash-flooding downstream associated with this runoff.

Specifically, minimum Requirement 7 of the City of Olympia's manual requires that discharges to streams shall match discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

Proposed Stormwater Pond C would be a two celled pond. One cell would be for treatment and the other for detention and infiltration. The City of Olympia Stormwater Manual requires the use of the Western Washington Continuous Simulation Hydrology Model (WWHM) for sizing of the stormwater facilities. The model currently utilizes historical rainfall data from 1956 thru 2011. The WWHM model does not provide for a projected annual release, rather it computes the pre-developed 2 through 100 year flow frequency values and the post-development 2

through 100 year flow frequency flows from the outlet of the proposed storm water facility.

In addition, stormwater would be released from the proposed Stormwater Pond C to a 2-acre basin south of 20th Avenue NE and west of Cooper Point Road before draining to potential mudminnow habitat some ways east of Cooper Point Road (**Appendix C: Photo 11**). This water would enter a large wetland system that would provide further treatment and detention.

The stormwater plan would treat and detain at least 91 percent of this currently untreated and undetained runoff, improving water quality and reducing potential flash flooding downstream. Improved water quality and reduced potential for flash flooding will benefit the Olympic mudminnow. If the engineers are in compliance with the DOE stormwater standards and the Green Cove Basin Development Standards, which I believe they are, no significant water quality impacts are expected to occur.

7.4 STREAM TYPING

Goldcrest Creek west of the subject property is a Type 5 stream based on the City of Olympia Code. Type 5 streams are those surface waters which meet the criteria of the Washington Department of Natural Resources, WAC 222-16-030 and 031 and are areas of perennial or intermittent seepage having short periods of spring or storm runoff and do not contain salmonid fish habitat (See **Insert 2**). Type 5 streams could dry in the summer or flow year-round. The reach of Goldcrest Creek west of the subject property could not be a Type 3 stream because 'no salmonid fish habitat occurs in this reach' (See **Insert 2**). The City of Olympia Code requires that the stream contain salmonid fish habitat in order to be classified as a Type 3. In addition, Goldcrest Creek west of the subject property is on average one-foot wide (**Appendix C; Photo 7**), which is much smaller in width than a Type 3 stream. Type 3 streams have a width of 2 feet or greater based on WAC 222-16-030 & 031. Type 4 streams are perennial non-fish bearing streams that do not dry any time of the year. From the photographs in **Appendix C**, it is very difficult to imagine this small trickle of a drainage flowing in August or September. Portions of this reach disappear underground in several areas during the winter months. It is unlikely that this reach flows year-round. This small drainage leads to Type 3 waters somewhere north of 28th Avenue NW.

No salmonid habitat or even fish-bearing water occurs in the reach of the fast flowing trickle of a drainage referred to as Goldcrest Creek located west of the subject property. No Olympic mudminnow habitat requirements occur in the reach of Goldcrest Creek west of the subject property (See photographs in **Appendix C**). Thereby, there is no possible way that the reach of Goldcrest Creek west of the subject property could be a Type 3 water.

Type 4 & 5 waters typically require a 150-foot buffer under the City of Olympia Code Chapter 18.32.435 - *Streams – Buffers* (See **Insert 3**). No portion of the proposed building area overlaps the 150-foot stream buffer. The only portion of the stream buffer that may overlap the subject property does so in the designated tree tract. No stream or buffer impacts are proposed as part of the land use plan.

Insert 2: Olympia Code Stream typing

18.32.410 - Streams - Typing System

Streams are grouped into categories according to the Washington Department of Natural Resources - Water Typing System. The criteria, definitions and methods for determining the water type of a stream are found in WAC 222-16-030 and 031 and the Stream Type Conversion Table below.

Stream Type Conversion Table	
Stream Typing (per WAC 222-16-031)	**Stream Typing (per WAC 222-16-030)**
Type 1 stream	Type "S"
Type 2 stream	Type "F"
Type 3 stream	Type "F"
Type 4 stream	Type "Np"
Type 5 stream	Type "Ns"

A. "Type 1 streams" are those surface waters which meet the criteria of the Washington Department of Natural Resources, WAC 222-16-030 and 031, as a Type 1 Water and those inventoried as "Shorelines of the State" under the Shoreline Master Program for the Thurston Region (1990), TCC 19.04, pursuant to RCW Chapter 90.58. Type 1 streams contain salmonid fish habitat.

B. "Type 2 streams" are those surface waters which meet the criteria of the Washington Department of Natural Resources, WAC 222-16-030 and 031, as a Type 2 Water. Type 2 streams contain salmonid fish habitat.

C. "Type 3 streams" are those surface waters which meet the criteria of the Washington Department of Natural Resources, WAC 222-16-030 and 031, as a Type 3 Water. Type 3 streams contain salmonid fish habitat.

D. "Type 4 streams" are those surface waters which meet the criteria of the Washington Department of Natural Resources, WAC 222-16-030 and 031, as a Type 4 Water. Type 4 streams do not contain salmonid fish habitat.

E. "Type 5 streams" are those surface waters which meet the criteria of the Washington Department of Natural Resources, WAC 222-16-030 and 031, as a Type 5 Water. These streams are areas of perennial or intermittent seepage, and ponds and drainage ways having short periods of spring or storm runoff. **Type 5 streams do not contain salmonid fish habitat.**

Insert 3. City of Olympia Stream Buffers

18.32.435 - Streams - Buffers

B. For streams where there is no ravine or where it is less than ten (10) feet in depth, maintain the existing vegetation on both sides of the stream as measured from the ordinary high watermark based upon the stream rating system in OMC 18.32.410 (refer to Figure 2):

1. Type 1 and 2 streams: 250 feet,

2. Type 3 streams: 200 feet,

3. Type 4 and 5 streams: 150 feet.

7.5 Conservation & Mitigation Plan

Recommended Avoidance Measures

- Avoid alteration to streams and wetlands where mudminnow occur
- Avoid altering the flow of feeder streams---runoff leaving the site will occur at pre-development rates.
- No trees will be removed within regulated wetland or stream buffers.
- No exotic fish species will be introduced.
- No rotenone will be used.
- No livestock will be in streams or wetlands.

City of Olympia Conservation Measures

Conservation Measures recommended by City of Olympia Municipal Code (OMC 18.32.330(C)(3)) will be implemented to minimize or avoid any adverse impacts to the important species or its habitat created by the development:

a. Establishment of buffer zones;

Wetland buffers of 100 feet have been established on the off-site wetlands associated with Goldcrest Creek located west of the subject property.

b. Preservation of important plants and trees;

No important plants and trees will be removed from the buffer areas surrounding Goldcrest Creek wetlands and other wetlands located on the northern portion of the property.

c. Limitation of access;

No access to mudminnow areas will occur on the subject property because no mudminnows occur on the subject property. No access to off-site mudminnow habitat from the site will be encouraged.

d. Seasonal restriction of construction and other activities; and

We recommend that the majority of construction will occur during the dry summer months to minimize turbid runoff and that the Best Management Practices from the latest DOE Stormwater Management Manual be applied to minimize any possibility of turbid runoff leaving the site. The Green Cove Development Standards already requires that the development occur within a construction window. The proposed project is in compliance with the Green Cove Development Standards.

e. Provisions for periodic review of the plan.

This plan will be reviewed by the City of Olympia in order to satisfy the requirements of the Important Habitats and Species Management Plan under Olympia Code Chapter 18.32.330 - Important Habitats and Species - Management Plan.

Recommended Minimization Measures

- Infiltrate stormwater to the greatest extent practicable
- No direct discharge of stormwater to streams or regulated wetlands
- Construction measures shall use the latest City and State Best Management Practices
- The proposed project will be in compliance with the Green Cove Basin Development Standards.

8.0 CONCLUSION

This report has been prepared to satisfy the requirements of the Important Habitats and Species Management Plan under Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan* and to clarify questions and comments by the Hearing Examiner. With the implementation of the conservation measures recommended in this report and compliance with the Green Cove Basin Development Standards and the Dept. of Ecology Stormwater Manual, no other mitigation is recommended and no significant impacts to the Olympic mudminnow are expected to occur as a part of this project.

No additional trees are needed to be preserved as part of this land use action based on: 1) no mudminnow habitat west of the subject property or within 1,000 feet downstream of the building area, 2) no impacts to Goldcrest Creek or its buffer, 3) no trees removed from the Goldcrest Creek buffer, 3) stormwater facilities designed to release water from the site at predevelopment rates, and 4) the project compliance with the WDFW Mudminnow Management Recommendations. (See Hearing Examiners 2 April 2008 Report/Decision Section E 36 (Page 20)

No direct impacts to mudminnow habitat are proposed as a part of this project. The project complies with all the WDFW management recommendations as required under Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan*. The project complies with the Green Cove Basin Development Standards designed to off-set the cumulative effects of development in the basin.

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Figures

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360-790-1559

Figure 1

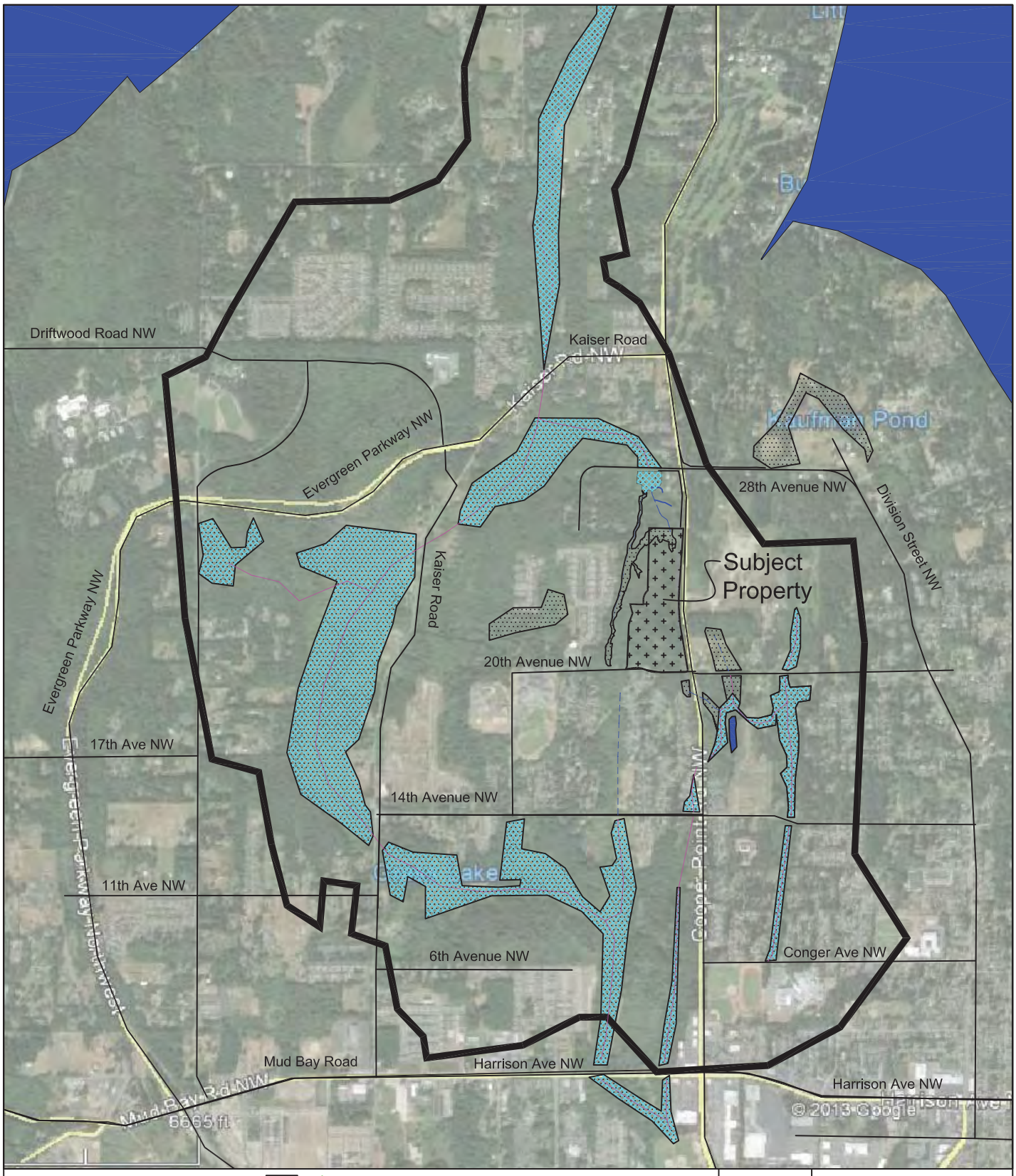
Parkside Property

Vicinity Map

Scale: 1" = 2,000'

0 2,000'

26 December 2014



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Wetlands

Potential Mudminnow Wetland Habitat in Greencove Creek Basin

Potential Mudminnow Stream Habitat in Greencove Basin

Stream Location, Not Mudminnow Habitat

Figure 2

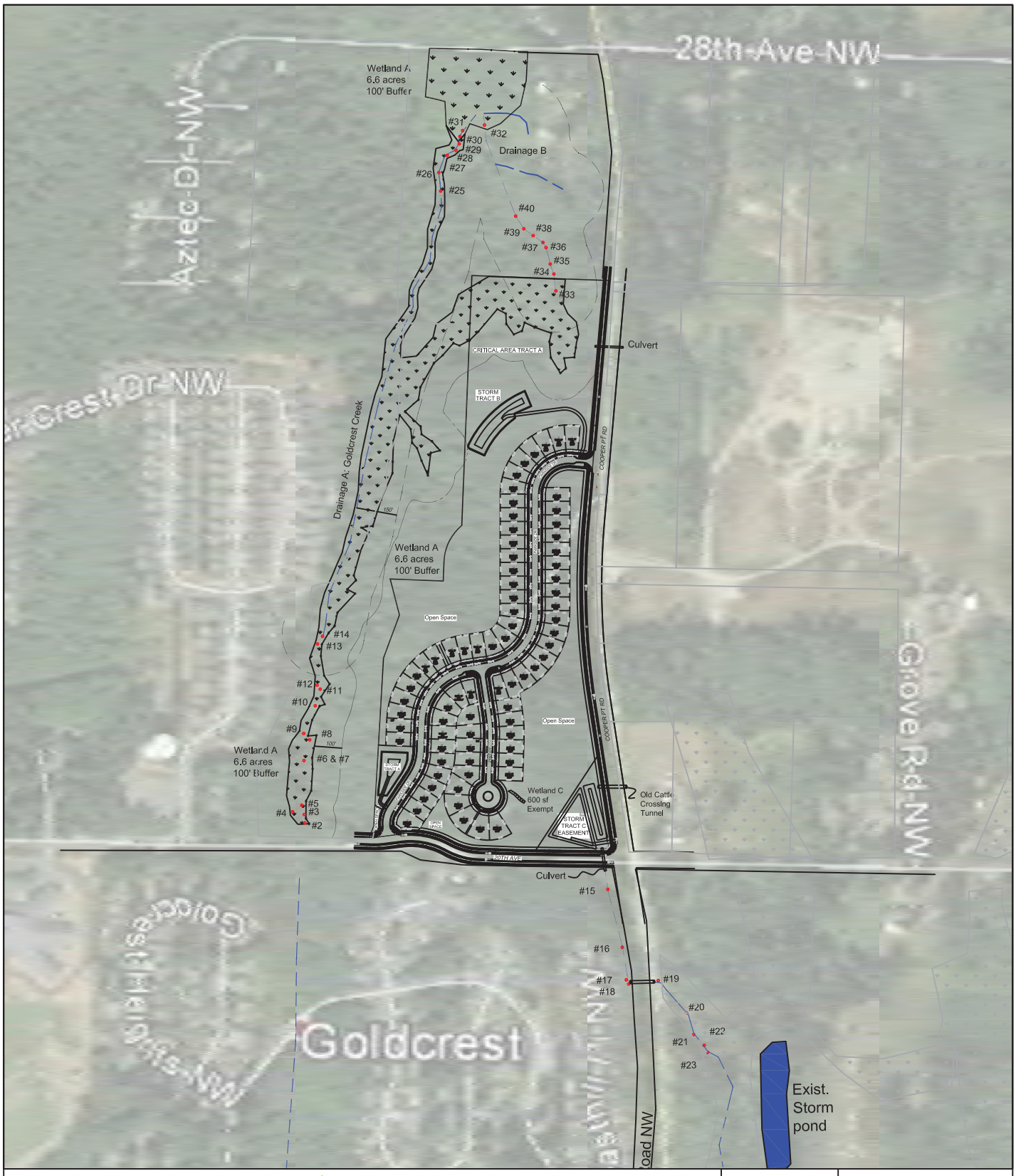
Parkside Property

Mudminnow Study Area

Scale: 1" = 2,000'

0 2,000'

26 December 2014



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Wetlands

Watercourse Locations

#1 GPS Point (See Table 1)

Figure 3

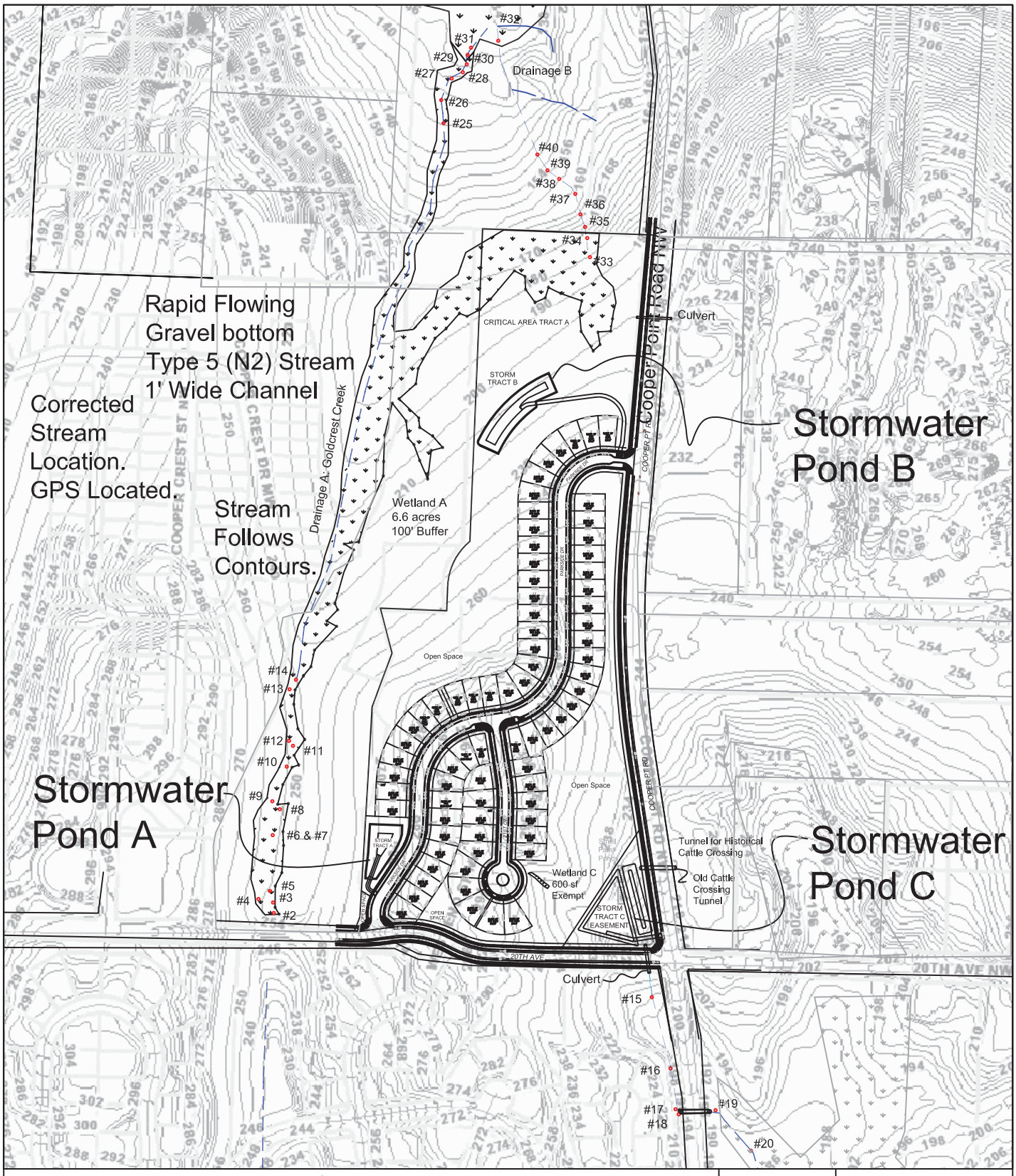
Parkside Property

Downstream Analysis

Scale: 1" = 500'

0 500'

26 December 2014



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Watercourse Locations

#1 GPS Point (See Table 1)

Figure 4

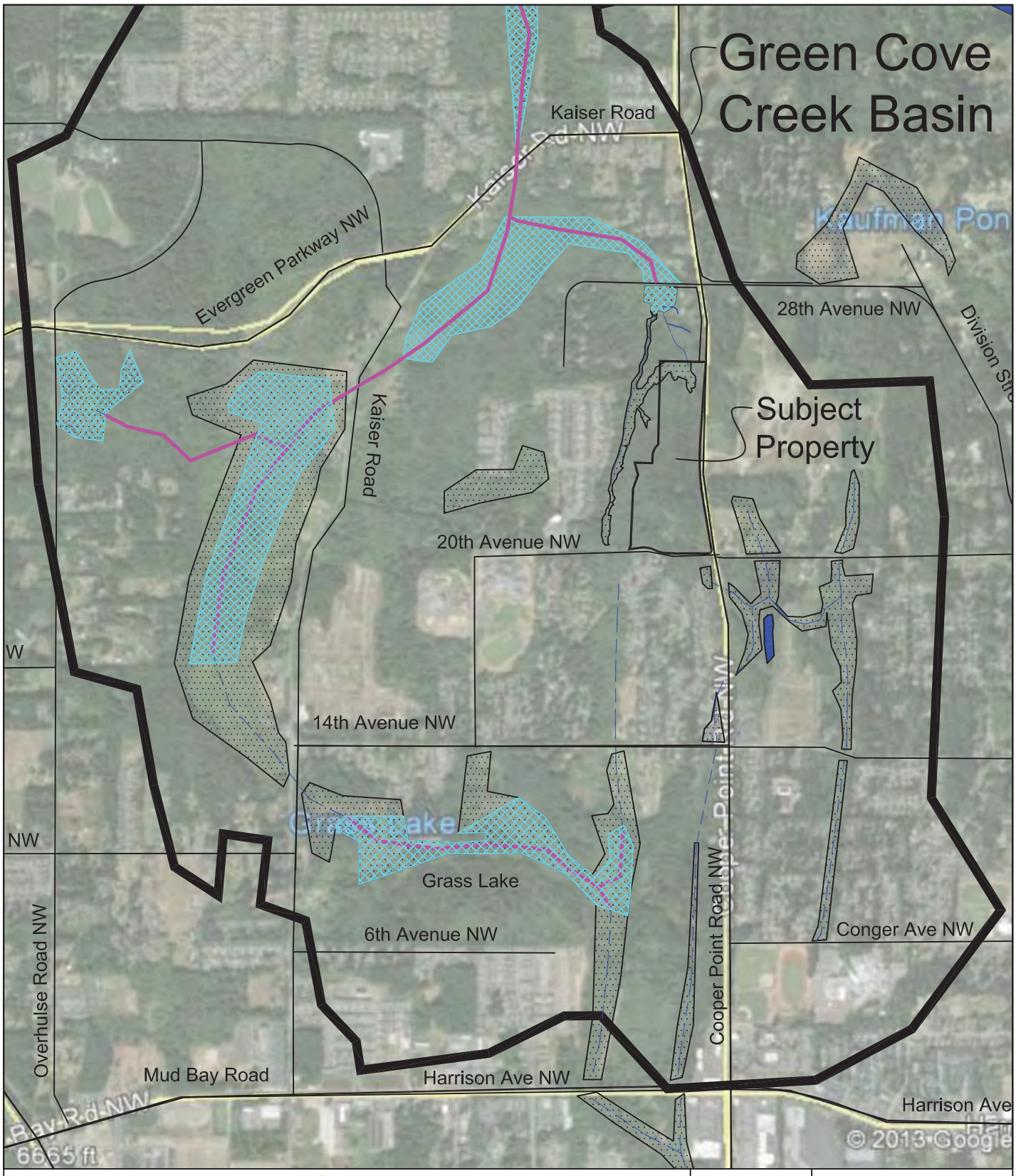
Parkside Property

Topography

Scale: 1" = 400'

0 400'

26 December 2014



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Wetlands

Potential Summer Mudminnow Wetland Habitat in Greencove Creek Basin

Potential Summer Mudminnow Stream Habitat in Greencove Basin

Streams That are Not Potential Summer Mudminnow Habitat in Greencove Creek Basin

Figure 5

Parkside Property

Potential Summer Mudminnow Habitat

Scale: 1" = 1,500'

0 1,500'

26 December 2014

APPENDIX A

BIOLOGIST QUALIFICATIONS

Statement of Qualifications

Wetlands, Water Resources & Mitigation

- Wetland Delineations, Mitigation Plans, JD Reports
- Environmental Permitting
- Hydrology & Winter Water Studies
- Stream Typing & Stream Studies
- Fishery Studies

Fish & Wildlife Studies

- Mazama Pocket Gopher Studies
- Endangered Species & Biological Evaluations
- Habitat & Fishery Assessments
- Wildlife Surveys
- Eelgrass and Marine Habitat Studies

Tree, Plant, and Vegetation Studies

- Oak Woodland Studies
- Habitat Assessment Reports
- Rare Plant Surveys
- Vegetation Mapping
- Tree Retention Plans

Environmental Permitting

- U.S. Army Corps of Engineers Permits
- NEPA, CEQA, SEPA, NPDES Water Quality
- Biological Evaluations, ESA Section 7 Consultation
- Wetland, Habitat & Wildlife Permitting
- Shoreline Management Act

INTRODUCTION

Mission Statement

EnviroVector is an environmental consulting firm that specializes in the environmental permitting of complex, multi-faceted projects involving components of wetlands, wildlife, and Federally-listed species. Our goal is to optimize usable land while protecting the resource.

About EnviroVector

EnviroVector is the next evolution of PE Consultants LLC, which incorporated in 2003 with the mission to provide a wide spectrum of professional environmental services for the land-use community. Our niche has been to provide simple and succinct solutions to complex environmental issues that involve intricate land use proposals. Our policy is to optimize usable area on a property while providing agencies with a reasonable plan for approval. Our mastery of Federal, State, and local regulatory codes liberates our Clients from the crushing restrictions of land use regulations and allows us to provide land use entitlement for land owners, small business, and developers. Our mastery of biology and environmental science allows us to prepare environmental reports approved by the regulatory Agencies. Our ultimate goal is to educate and empower our clients to succeed in their land use objectives, while providing plans that preserve and enhance the environment.

Our Values

We value our clients' investments through providing the highest quality environmental consulting services in the industry at a relatively low cost. We value the preparation of environmental regulatory documentation that preserves and enhances the natural world, thereby satisfying regulatory requirements. We value all clients the same no matter how large the project or how small the project.

Goals

Our goal is to optimize usable area maximizing land use potential for our Clients while protecting the natural resource for the environment.

Public Outreach: The Mazama Pocket Gopher Foundation (www.gopherfoundation.org)

Our dedication to the protection of environmental resources has prompted us to incorporate a non-profit organization dedicated to the preservation of the Mazama pocket gopher. Through this non-profit venture, we hope to raise public awareness on the need for habitat reserves for the protection of this species. The future survival of this State threatened species may depend on large tracts of prairie land preserved within established Mazama pocket gopher habitat reserves.

PRODUCTS & SERVICES

Wetlands	o Wetland Reports o Mitigation Plans o Mitigation Monitoring Reports o Development Feasibility Studies o Wetland Delineations o Wetland Classification o Single-family Certification o Project planning
Streams	o Stream Study Reports o Stream Delineation o Stream mitigation Plans o Fish Passage Analysis o Fish Studies
Permitting	o JARPA forms o SEPA o Shoreline Permits o Critical Areas Permits o NPDES Permits o Single-family Certification o Corps Permits—Section 7, Section 10, Section 404
Feasibility	o Development Feasibility Studies o Wetland and Stream Mitigation Feasibility o Site Planning
Hydrology	o Groundwater monitoring for wetland Hydrology o Determine High Groundwater Hazard o Winter Water Study for Septic o Groundwater management
Endangered Species	o No Effect Determination o Biological Assessment (BA) o Biological Evaluations (BE) o ESA Consultation
Wildlife	o Habitat Management Plans (HMP) o Habitat Protection Plans (HPP) o Fish and Wildlife Habitat Conservation Plans o Mazama pocket gopher (HMPs or HPPs) o Eelgrass studies o Resource harvest
Erosion Control & Water management	o Best Management Practices (BMPs) o Agricultural water management o Urban water management o Rural Water management
Hatchery/Fishery	o Fish trap permitting o Dredging permits o Hatchery consultation o Fish Studies—marine & aquatic o Eelgrass studies


PRINCIPAL

Curtis Wambach, M.S., Principal and Senior Biologist, has nearly 15 years of experience in environmental consulting and project management. Mr. Wambach obtained a Master of Science Degree in Biology from Western Washington University in 1997. After College, Mr. Wambach became a professor of Biology and Mathematics while continuing to pursue his passion for the environment through his entrepreneurial non-profit work restoring wetlands, streams, and salmon habitat.

Mr. Wambach' skills quickly earned a position at a top Seattle area consulting firm. However, his passion for serving the public, along with his extensive consulting knowledge and skills, landed a position as Permit Specialist at the Washington Department of Fish and Wildlife (WDFW), where he acted as the Agency's Consultant on the Environmental Permitting of State Projects. Flexible hours at WDFW provided the opportunity to further pursue entrepreneurial aspirations as Principal and Senior Biologist at Pacific Environmental Consultants LLC (PE Consultants LLC). PE Consultants LLC quickly became a leading consulting firm in the Southern Puget Sound area and in Western Washington.

EnviroVector was conceived while managing environmental permits for a $350 million Transmission project for Southern California Edison in 2010 & 2011. EnviroVector would utilize the culmination of Mr. Wambach's skills and experiences to expand the consulting business into an innovative new realm that utilizes a multifaceted approach harnessing advanced biology and field technique, robust analytical and statistical power, and intuitive political and people skills. The focus is to prepare documentation of unmatchable quality supported by powerful scientific analyses and superior presentation value.

In 2010 and 2011, Mr. Wambach managed environmental permits for the $350 Million Southern California Edison (SCE) Eldorado-Ivanpah Transmission Project (EITP) located along a 35 mile reach in the Mohave Desert near Las Vegas Nevada. EnviroVector can Prepare and Manage Your Section 7 Consultation, NEPA/SEPA/CEQA, Section 404/401, Wetland Jurisdictional Determinations, Wildlife Issues, Mitigation Plans & Mitigation Banking, and State and Local Permits.

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PERSONAL RESUME'

SPECIAL SKILLS:

- NEPA, CEQA, SEPA, EIS, EIR, DNS, MDNS
- Wetland Delineation, Jurisdictional Determination (JD) Reports
- Fishery Studies, Stream Typing, Fish Passage, Hatchery
- Corps Permit, NWP, Section 7, Section 10, Section 404
- Wildlife Surveys, Habitat Management Plans, Botany Surveys
- Water Quality Testing, Soils Testing, Slopes, & Geology

EXPERIENCE:

4/11-Present **EnviroVector** **Principal & Senior Biologist**

Principal and Senior Biologist of innovative firm that utilizes advanced scientific methodology and a powerful analytical arsenal to provide superior products and services. Manage environmental permitting for a myriad of large and small land use projects. Manage budgets, marketing, business development, staff training, and quality control. Prepare wetland delineation reports, wildlife reports, stream and fishery studies, hydrology reports, marine studies, biological evaluations, and Federal, State, and local permitting. Section 7 of ESA, Section 10 R&H Act, Section 404 Clean Water Act.

Address:
4333 30th Avenue SE
Lacey, WA 98501

www.envirovector.com

8/10-4/11 **Southern California Edison** **Environmental Permit Manager**

Managing the preparation, submittal, and implementation of Environmental Permits for a $350 Million Transmission Project. Manage Section 7 Consultation, NEPA/CEQA, Section 404/401, Wetland Jurisdictional Determinations, Wildlife Issues, Mitigation Plans, wildlife surveys, and State and Local Permits. Coordinate the administration of a Mitigation Bank for the Federally-threatened desert tortoise. Coordinate with consultants, contingent workers, Edison staff, and others to manage and budget environmental permits.

Address:
2244 Walnut Grove Ave
Post Office Box 800
Rosemead, CA 91770

1/03-4/11 **PE Consultants LLC** **Principal & Senior Biologist**

Senior Biologist and Principal of forward-thinking full-service small environmental consulting firm. Manage projects and employees, as well as interface with clients and agencies for the approval of complex environmental permitting through innovative solutions. Manage budgets, marketing, business development, staff training, and quality control. Prepare wetland delineation reports, wildlife reports, stream and fishery studies, hydrology reports, marine studies, biological evaluations, and Federal, State, and local permitting. Section 7 of ESA, Section 10 R&H Act, Section 404 Clean Water Act.

Address:
4333 30th Avenue SE
Lacey, WA 98501

www.peconsultants.net

12/03-8/06 **Wash. Dept. of Fish &Wildlife** **Permit Specialist, Biologist**

Managed Federal, State, and local environmental permitting for WDFW projects throughout the State of Washington. Projects included docks, boat launches, marine mammals, endangered species, roads, bridges, habitat restoration, hatchery maintenance and construction, fish wears & traps, stream restoration, channel dredging, resource harvest, and fishing floats. Every project involved Corps permit & Section 404, Section 7, or Section 10.

Address:
600 Capitol Way North
Olympia, WA 98501

12/99-1/03 **Talasaea Consultants LLC** **Environmental Consultant**

Performed field studies and prepared technical reports and permitting for environmental projects associated with land use. Performed wetland, wildlife, hydrology, and endangered species studies and prepared associated technical reports and Federal, State, and local permitting. Sections 404, 10, & 7.

Address:
15020 Bear Creek Rd NE,
Woodinville, WA 98077

EDUCATION:

Master of Science **Biology, Western Washington University** 6/97
Wildlife Biology, Entomology, Botany, Zoology, Statistics, Population Biology, and Mathematical Modeling of Ecosystem Dynamics.

Bachelor of Science **Biology, Western Washington University** 6/95
Biology of ecosystems focusing on wildlife ecology and interactions with environmental limiting factors.

Special Training & Certifications:

- Wetlands Certification Program, University of Washington
- Cultural Resources Training Certificate form Washington Stat
- Society of Wetland Scientists Certifications
- Biological Assessment Training, WSDOT & US Army Corps

WETLANDS & WATER RESOURCES

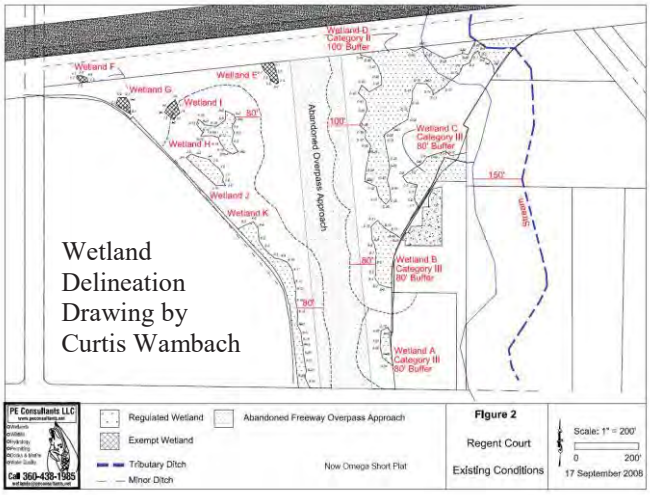
(Annotated Description of Selected Projects)

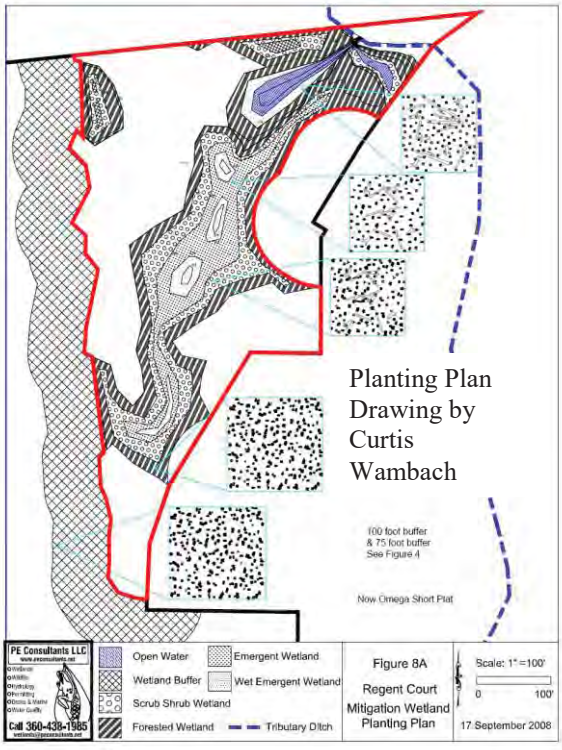
Omega Urban Village.

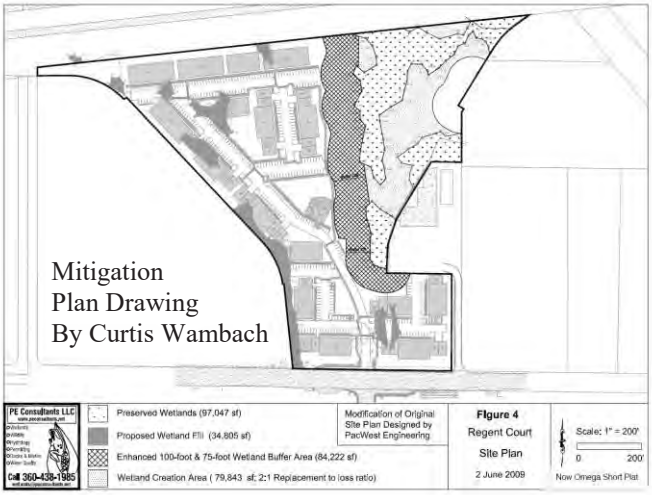
17 Acres. 2010. Wetland Delineation Report and Mitigation Plan

Twelve wetlands delineated on 17-acre Department of Transportation abandoned Highway 512 overpass proposed for 1,700 unit multi-family housing development. Prepared a wetland mitigation plan approved by Pierce County replacing 34,805 sf of impacted low quality wetlands with the creation of a 79,843 sf high quality wetland system. This created wetland connects previously unconnected wetlands to form one larger contiguous and higher quality wetland system. Created wetlands are associated with a salmon stream, flood plain, and riparian area, which would be enhanced as part of the mitigation plan.

1. Wetlands
2. Streams and Fishery
3. Hydrology Studies







WETLANDS

(Annotated Description of Selected Projects)

Klein Family, City of Blaine. 45 acres. 2010. Commercial/Industrial. Wetland Mitigation
Performed Wetland Delineation 7 Mitigation Report, bald eagle plan, site planning, and wetland mitigation on commercial/industrial multi-use site adjacent to the City of Blaine Airport.

Best Fish Company. 80-acres. 2010. Fish Processing & Multi-use. Wetland Report
Performed wetland delineation and prepared Wetland Delineation Report on 80-acre forested property in Mason County. Two large Category II wetlands had been identified and delineated on the property. Buffer averaging was applied and wetland mitigation was proposed for unavoidable wetland fill associated with a road crossing.

Valley Nut and Bolt. 13 Acres. 2010. Commercial Development. Wetland Report & Mitigation Plan
Prepared a wetland delineation report as part of the permit process for a proposed 13-acre commercial development. Less than an acre of wetland creation is proposed to off-set impacts to wetland & salmon stream.

Kwan Property. 140 acres. 2009. Commercial. Wetland Delineation Report & Mitigation Plan
Prepared Wetland Mitigation Report on 140 acres. Identified and delineated 12 wetlands. Wetland impacts totaled 3.7 acres in favor of 7.6 acres of wetland creation. The mitigation consists of contiguous multi-celled wetland system with six (6) vegetation classes, flow control structures to manually adjust the desired water regime for quick hydrology corrections, and water features stepping down in elevation creating an aesthetic value.

Landeros Property, Snohomish County. 2009. Commercial. Wetland Mitigation Plan
Restoration of 11,320 sf of wetland buffer through planting native plant species to off-set impacts of large commercial building.

Panoramic View. 279 Acres. 2009. 1,277-unit Subdivision. Wetland Study Report
Identified and delineated wetland located on a 279-acre site in Thurston County. Site plan designed to avoid wetland and buffer impacts.

Copperleaf. 3.71 Acres. 2008. Commercial. Wetland Delineation Report and Mitigation Report
Prepared wetland mitigation plan to mitigate 5,255 sf of low quality wetland impacts for the creation of a 10,510 sf high-value wetland system. Two small low-quality wet patches of reed canarygrass were filled to optimize usable area for the proposed commercial development. Portions of the larger wetland were re-shaped to allow maximum build-out of the site. This plan was approved by Pierce County.

Chinook Landing. 12.56 Acres. 2008. Subdivision. Wetland Delineation Report and Mitigation Report

Delineated three (3) wetlands totaling 12.56 acres on the 39-acre subject property as part of a 99-unit residential subdivision. Phase 1 of the project would avoid all wetland and buffer impacts, thereby not requiring mitigation.

Black Lake Industrial Park. 13 Acres. 2009. Commercial/Industrial. Wetland Delineation Report

Prepared a wetland delineation report as part of the permit process for a proposed 13.04 acre commercial/industrial renovation. Site facilities were proposed for renovation and remodeling to modernize the site use.

Newman Property. 22.75 Acres. 2009. Building Violation. Wetland Verification Report

Delineated seven (7) wetlands located on the 22.75-acre subject property in an effort to determine impacts associated with un-permitted building expansion. Prepared wetland verification report to conclude that no wetland impacts have occurred associated with the building expansion. Approved by Pierce County.

Mani Property. 39 Acres. 2009. Wetland Study Report/Stream Study

Prepared Wetland Study Report and stream study on a 39-acre forested property as part of the permit process for a boundary line adjustment. Delineated and classified wetlands based on the Department of Ecology Wetland Identification Manual & Wetland Rating System. Rated Type 2 stream on the subject property associated with on-site wetlands. Part of the project involved the delisting of Yelm Ditch as a DNR-listed stream.

STREAMS & FISHERY

(Annotated Description of Selected Projects)

Canyon Industries, Whatcom County. 2009. Stream Study
Prepared stream study report and long term maintenance plan to resolve stream degradation caused by massive loads of sedimentation originating from upstream erosion. Prepared a long term solution allowing emergency actions to prevent sedimentation, while satisfying a DNR stop work order.

Simpson Lumber, City of Shelton. 2009. Rail Bridge Replacement. Habitat Study
Performed habitat study that allowed the replacement of a rail bridge over Goldsborough Creek. Proposed conservation measures that would protect salmon and other fish use on site and downstream.

Parkside, City of Tumwater. 2008. Subdivision. Mud Minnow Study Report
Prepared Olympic mudminnow report associated with proposed land use action approved by City of Tumwater. Downstream study determined that no impacts to the Olympic mud minnow would occur.

City of Marysville. 2006. Stream Typing and Fish Passage Study
Assisted the City of Marysville in stream typing within new City annexation. Used various methods, including seining and minnow traps, to determine fish use as a part of stream typing study.

Rattlesnake Creek, Asotin County. 2005. WDFW Access Bridge Replacement
Performed habitat study and Biological Evaluation to allowing the replacement of a Washington Department of Fish and Wildlife access bridge over Rattlesnake Creek.

Kenmore Boat Launch. 2006. WDFW Boat Launch Access Area Renovation
Performed habitat study and Biological Evaluation allowing the renovation of a Washington Department of Fish and Wildlife boat launch access area on the Sammamish River.

Hatchery & Dredging Projects.
Prepared stream and fish studies as part of the environmental permitting requirements for hatchery construction, feasibility, maintenance, repair, channel dredging, fish access, and the construction of pollution abatement ponds throughout the State of Washington.

Fish and Wildlife Refuge Areas
Prepared environmental documentation and permitting for: 1) dike maintenance, repair, and replacement at the Skagit wildlife refuge, 2) restoration of Irondale Beach, 3) maintenance of fish rearing channels on upper Skagit River, 4) bridge construction and replacement for nature trails in Sinlahekin Wildlife Area in Okanogan County, 5) construction of fishing access float within Columbia River Scenic Area.

Fish Wear and Fish Trap Permitting & Environmental Documentation

Prepared Federal, State, and local environmental permitting and documentation required by the Washington Department of Fish and Wildlife to construct fish wears across rivers, install fish traps, harvest fish, and to allow incidental take of endangered species throughout the State of Washington.

Grandy Creek Hatchery, Skagit River. Steelhead Acclimation Facility Feasibility. HMP

Preparation of a Habitat Management Plan addressing impacts to wildlife and wildlife habitat associated with the construction of a hatchery facility. Project involved complex impacts and issues associated with the construction of a new hatchery on the Skagit River, WA. Analysis involved ecology impacts, financial impacts, and political involvement, as well as terrestrial stream/river buffer impacts. Mitigation involved the elimination of Himalayan blackberry and Japanese knotweed to the specification that I have developed through experimentation at other project sites. After invasive weeds have been eliminated, a variety of native plant species will be installed within the 10-acre mitigation area. Plant species chosen will be fast growing and compete with invasive plant species. Functional values assessment was performed on sensitive areas buffer to determine baseline conditions and to compare projected mitigated values.

Leque Island Habitat Restoration. Snohomish County. Habitat Management Plan

Restore 200- acre diked and farmed island back into saltwater marsh. Identify, catalog, and characterize habitat as a part of the restoration design to determine existing conditions of the site. Map wetlands, streams, and wildlife habitat, as well as identify and inventory wildlife species found at the site. Dikes will be breached and part of the island will be transformed back into wetland (saltmarsh) habitat.

Spencer Island Restoration. Snohomish County. Habitat Assessment & Monitoring Plan

Restore Farmland to Tidally-influenced Freshwater Wetland Habitat. Identify, catalog, and characterize wildlife and wildlife habitat as a part of the restoration design to determine existing conditions of the site. Developed planning plan to restore wildlife habitat on the island. Map wetlands, streams, and wildlife habitat, as well as identify and inventory wildlife species found at the site. Dikes will be breached and part of the island will be transformed back into tidally influenced freshwater wetland habitat.

APPENDIX B

WDFW Olympic Mudminnow PHS Management Recommendations (1991) as required under City of Olympia Code Chapter 18.32.330 - *Important Habitats and Species - Management Plan*.

Washington Department of Wildlife
Management Recommendations for Priority Species

Novumbra hubbsi

Olympic Mudminnow

RANGE: Found entirely within portions of the Olympic Peninsula and central western Washington.

WASHINGTON DISTRIBUTION: Distributed in rivers of the Chehalis River drainage, Deschutes River drainage, Olympic coastal drainages as far north as the Queets River, Lake Ozette, Puyallup Creek and Skookum Creek.

HABITAT REQUIREMENTS: Olympic mudminnows inhabit lotic (pertaining to running water), pond and marsh habitats in the coastal lowlands. They occur in standing or gently flowing water with a current of less than three cm per second, with dense aquatic vegetation, and at least several centimeters of soft mud bottom substrate (Hagen et al. 1972, Harris 1974, Wydoski and Whitney 1979). The type of bottom substrate is especially important to these fish and must be composed of fine silt with a high organic content. Mudminnows are not found in swampy habitats created by recent siltation, or where water flow has been restricted by logging debris (Harris 1974).

Olympic mudminnows breed from early March to mid-June. Male fish defend territories in clumps of vegetation, including seasonally flooded reed-canary grass, or over carpets of moss; females lay their eggs on the bottom substrate (Hagen et al. 1972; Beecher, pers. comm.). They feed on a variety of aquatic invertebrates and molluscs.

LIMITING FACTORS: The presence of introduced predatory fish probably limits Olympic mudminnows (Beecher and Fernan 1983).

MANAGEMENT RECOMMENDATIONS: Olympic mudminnows are most threatened by reduction or deleterious changes to the habitat within their limited range. Alterations to wetlands where these fish occur should not take place. Such alterations include draining, filling or channelizing a wetland, clearing vegetation and connecting stagnant or slow moving waters with fast moving streams. Where Olympic mudminnows are found on agricultural lands, fences should be constructed so that livestock does not denude the vegetation.

Indirect, detrimental effects to Olympic mudminnows should be considered during logging operations. Practices which change the flow patterns of feeder streams or contribute debris to swampy habitats should be avoided. Logging in swampy portions of the Olympic Peninsula should not occur.

Olympic mudminnows may be excluded from some areas by non-native fishes (Beecher and Fernan 1983). Bass, catfish and other non-native fishes should not be introduced where mudminnows occur. Rotonone and other chemical agents that adversely affect fish should not be applied to waters occupied by mudminnows.

REFERENCES:

Beecher, H.A. and R.F. Fernan. 1983. Fishes of oxbow lakes of Washington. Northwest Sci. 57(2):125-131.

Harris, C.K. 1974. The geographical distribution and habitat of the Olympic mudminnow, *Novumbra hubbsi* (Schultz). Unpublished report, College of Fisheries, Univ. of Wash., Seattle.

Hagen, D.W., G.E.E. Moodie, and P.F. Moodie. 1972. Territoriality and courtship in the Olympic mudminnow, *Novumbra hubbsi*. Can. J. Zoo. 50(8):1111-1115.

Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. Univ. of Wash. Press, Seattle. 220pp.

KEY POINTS:

Habitat Requirements:

- Inhabit lake, pond and marsh habitats of coastal lowlands.
- Require currents of less than 3cm/second in wetlands with dense aquatic vegetation and deep, soft mud bottoms.

Management Recommendations:

- Avoid altering streams and wetlands where mudminnows occur.
- Keep livestock out of wetlands occupied by mudminnows.
- Avoid altering the flow of feeder streams.
- Avoid logging in swampy portions of the Olympic Peninsula.
- Do not introduce exotic fish into mudminnow habitat.
- Do not use rotonone where mudminnows occur.

APPENDIX C

PHOTOS

Photo 1. Southwestern portion of Study Area GPS# 2-5. , mosaic wetlands---small patches of wetland surrounded by uplands, sheen of wetness on the surface GPS# 5---Mostly upland vegetation in area: Sword fern (FACU), red elderberry (FACU), salamonberry (FAC+), and osoberry (FACU). No mudminnow habitat---no water capacity to support fish habitation.

Photo 2. Southwestern portion of Study Area, mosaic wetlands---small patches of wetland surrounded by uplands, sheen of wetness on the surface GPS# 5---Mostly upland vegetation in area: Sword fern (FACU), red elderberry (FACU), salamonberry (FAC+), and osoberry (FACU). No mudminnow habitat---no water capacity to support fish habitation.

(GPS # 6-9, See Table 1 & Figure 3)

Photo 3. Southwestern portion of Study Area, mosaic wetlands---small patches of wetland surrounded by uplands, sheen of wetness on the surface GPS# 6 & 7---Skunk cabbage, water parsley, & muck soils in isolated wetland patches, no water capacity for fish presence, no flowing water, no standing water.

(GPS # 26, See Table 1 & Figure 3)

Photo 4. Same as Photo 3.

(GPS # 10-12, See Table 1 & Figure 3)

Photo 5. Springs popping out of the ground and flowing for several feet within isolated wetland patches contain in mosaic wetlands. No mudminnow habitat in isolated spring-fed wetland patches.

Photo 6. Fast flowing trickle of a gravel bottom stream starts at approximately 727 feet north of 20th Ave NW, as measured by a Hipman measuring device. The stream is one-foot wide and less than 0.25 inch deep. No mudminnow habitat

Photo 7. Fast flowing trickle of a gravel bottom stream at approximately 780 feet north of 20th Ave NW, as measured by a Hipman measuring device. The stream is one-foot wide and less than 0.25 inch deep. No mudminnow habitat

(GPS # 15, See Table 1 & Figure 3)

Photo 8. Outlet from SE corner of property at southern side of 20th Ave NW

(GPS # 16, See Table 1 & Figure 3)

Photo 9. Dry ditch channel downstream (south) of SE corner of property—no mudminow habitat

(GPS # 18, See Table 1 & Figure 3)

Photo 10. Dry ditch channel downstream (south) of SE corner of property—no mudminow habitat

(GPS # 15-18, See Table 1 & Figure 3)

Photo 11. Dry open flat basin west of ditch for stormwater infiltration and treatment—no mudminnow habitat

(GPS # 26, See Table 1 & Figure 3)

Photo 12. Fast moving gravel bed stream Averages ~16” wide and <0.5” deep. Goldcrest Creek north of Subject property.

(GPS # 27, See Table 1 & Figure 3)

Photo 13. Fast moving gravel bed channel Averages ~20” wide and <0.5” deep Substrate changing to a sandy fine gravel. Goldcrest Creek north of subject property.

(GPS # 28, See Table 1 & Figure 3)

Photo 14. Potential Mudminnow habitat starts with slower moving, mud bottom stream, ~4 feet wide and 1 to 4 inches deep, except the current is too fast (18cm/sec), not the less than 3cm/sec preferred by this species. Goldcrest creek north of subject property.

(GPS # 33-39, See Table 1 & Figure 3)

Photo 15. Small fast flowing gravel side channel pops in and out of ground, ~one-foot wide and <0.5" deep. Unnamed drainage from onsite wetland that extends north of subject property.

Photo 16. Remnant of filled in cattle tunnel across Cooper Point Road from subject property

Photo 17. Dry wetland & stream south of 20th Avenue East of Cooper Point Road

Photo 18. Dry wetland & stream North of 20th Avenue East of Cooper Point Road

Photo 19: Dry ditch & wetland S of 20th & E of Cooper Point

Photo 20: Dry ditch at 14th Ave E of Cooper Point RD

Photo 21: Dry Wetland & Stream at Harrison Ave NW

Photo 22: Dry ditch at 14th Ave west of Cooper Point RD

Photo 23: Dry stream at 14th Ave west of Cooper Point RD

Photo 24: Dry Green Cove Creek at Kaiser Rd near 14th Ave NW

Photo 25: First evidence of water in Green Cove Creek
Almost 5 miles downstream of the Subject Property
At Kaiser Road near Evergreen Parkway NW

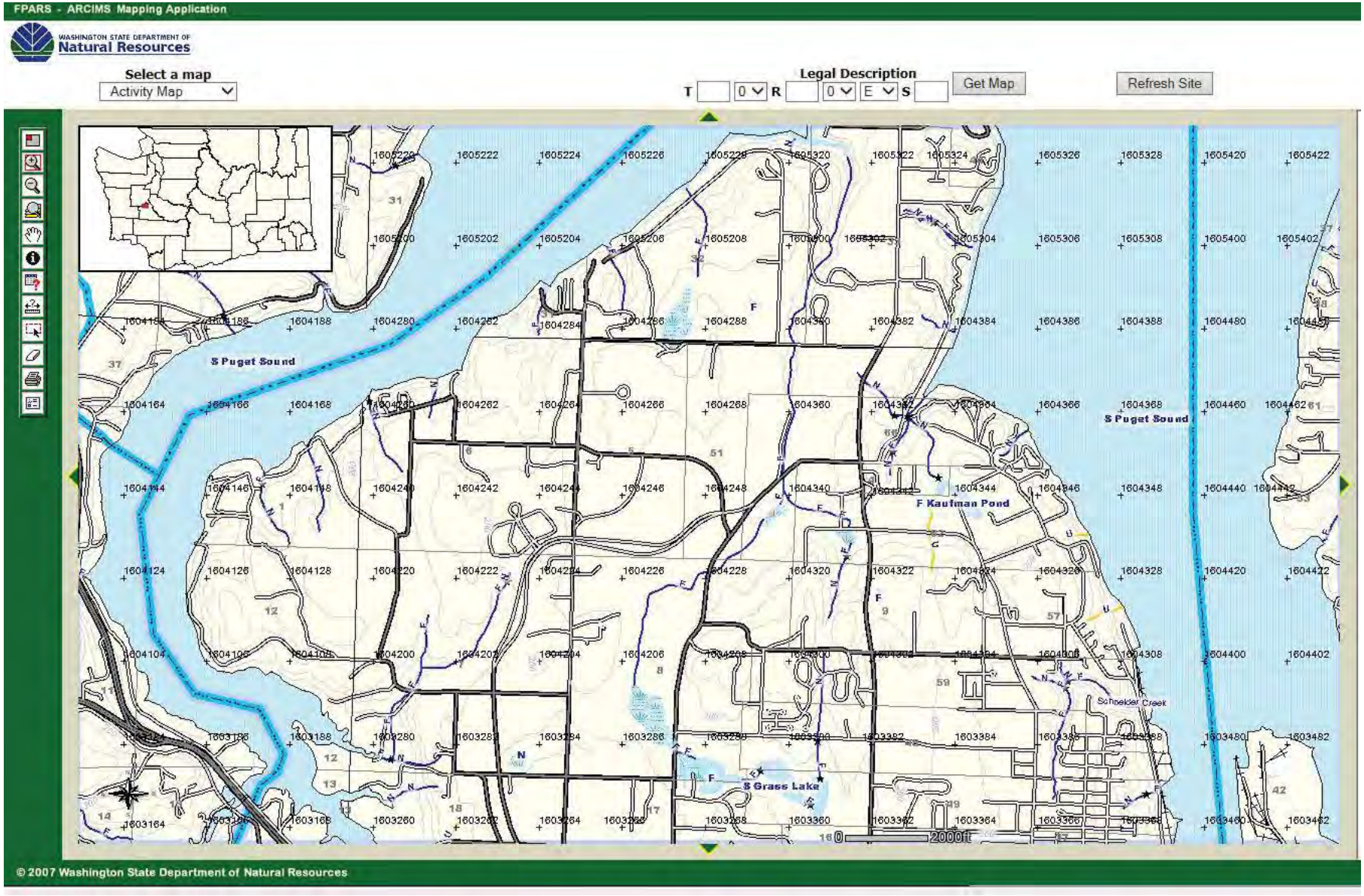
Photo 26: Wetland at Evergreen Parkway and Overhulse Road NW

Photo 27: Kaiser Road North of Subject Property
Flowing water & associated wetlands

Photo 28: 28th Avenue NW north of Subject Property
Water in ditch and slowly flowing through culvert.

APPENDIX D

DNR Stream Typing Map


FPARS - ARCIMS Mapping Application
WASHINGTON STATE DEPARTMENT OF
Natural Resources
Select a map
Activity Map
Legal Description
T 0 R 0 E S
Get Map
Refresh Site
S Puget Sound
S Puget Sound
F Kaufman Pond
Schneider Creek
S Grass Lake
2000ft
© 2007 Washington State Department of Natural Resources

APPENDIX E

Olympic mudminnow (*Novumbra hubbsi*) in the Green Cove Creek Watershed, Thurston County, Washington:
Distribution and Recommendations for Protection

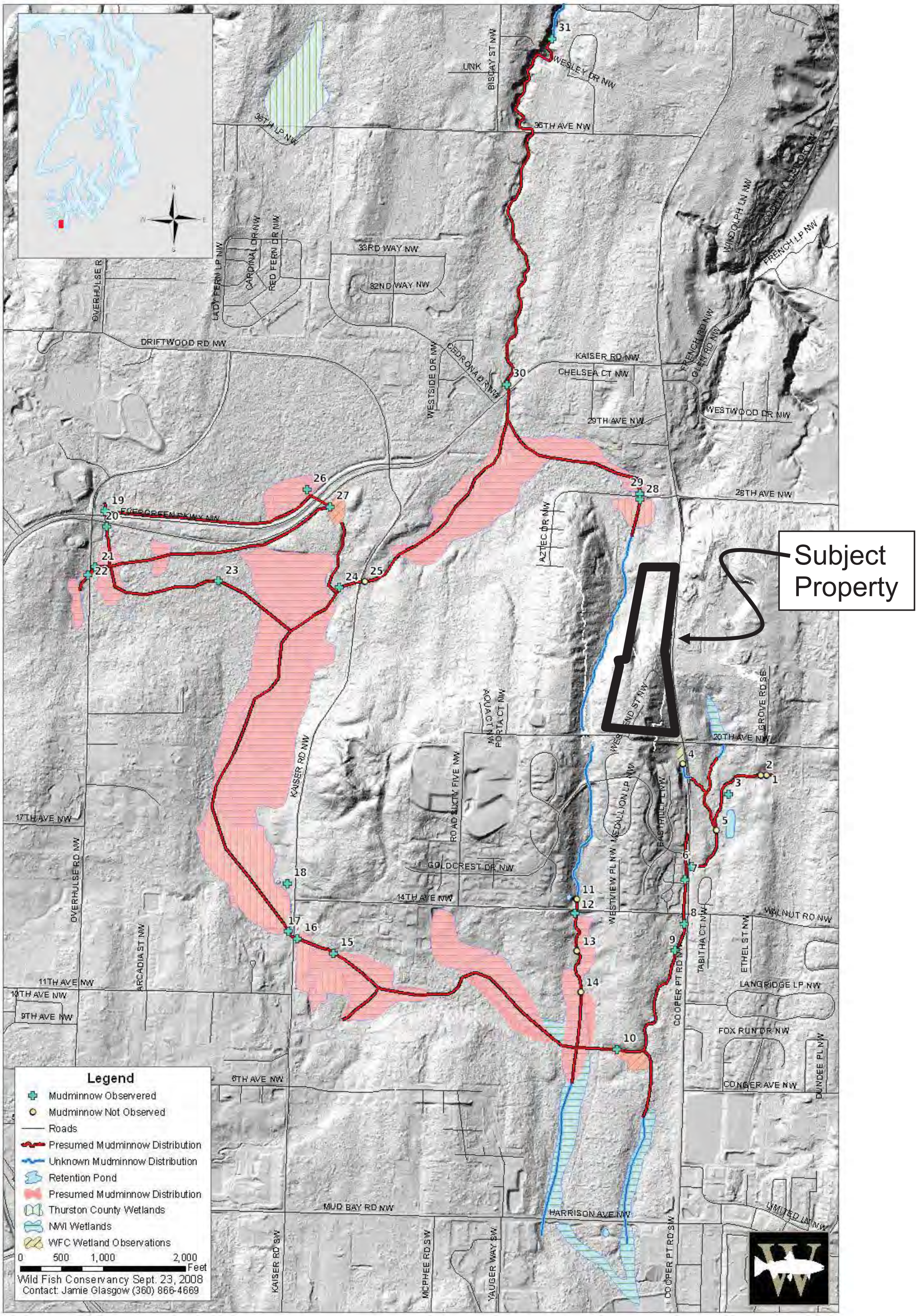
By

Jamie Glasgow
Wild Fish Conservancy
15629 Main Street NE
Duvall, Washington 98019

And

Molly Hallock
Washington Department of Fish and Wildlife
Fish Program
Inland Division
600 Capitol Way N.
Olympia, Washington 98501-1091

December 2009


Subject Property
Legend
Mudminnow Observered
Mudminnow Not Observed
Roads
Presumed Mudminnow Distribution
Unknown Mudminnow Distribution
Retention Pond
Presumed Mudminnow Distribution
Thurston County Wetlands
NWI Wetlands
WFC Wetland Observations
0 500 1,000 2,000 Feet
Wild Fish Conservancy Sept. 23, 2008
Contact: Jamie Glasgow (360) 866-4669
DRIFTWOOD RD NW
KAISER RD NW
28TH AVE NW
29TH AVE NW
36TH AVE NW
20TH AVE NW
17TH AVE NW
14TH AVE NW
11TH AVE NW
10TH AVE NW
9TH AVE NW
6TH AVE NW
MUD BAY RD NW
HARRISON AVE NW
COOPER PT RD NW
COOPER PT RD SW
OVERHULSE RD NW
KAISER RD SW
MCPHEE RD SW
YAUGER WAY SW
EVERGREEN PKWY NW
WALNUT RD NW
GOLDCREST DR NW
CONGER AVE NW
FOX RUN DR NW
LANGRIDGE LP NW
WESTWOOD DR NW
FRENCH LP NW
33RD WAY NW
32ND WAY NW
WESLEY DR NW
BISCAY ST NW
CHELSEA CT NW
WESTSIDE DR NW
CEDRONA DR NW
LADY FERN LP NW
CARDINAL DR NW
RED FERN DR NW
AZTEC DR NW
ROAD SIXTY FIVE NW
GROVE RD SE
TABITHA CT NW
ETHEL ST NW
DUNDEE PL NW
ARCADIA ST NW
WESTVIEW PL NW
MEDALLION LP NW
LIMITED LN NW

GreenWildfish Conservancy