The purpose of this memorandum is to outline revised mitigation measures for proposed clearing of native forest vegetation within the right-of-way of NE Union Hill Road, located the east of the Gunshy Manor Farm property’s north driveway entrance and exit at 20005 NE Union Hill Road in unincorporated King County. The proposed clearing has been revised to correspond to required sight distance from a new driveway west of the existing driveway for the Gunshy Manor Farm property. The proposed driveway is located approximately 200 feet west of the existing north driveway entrance. This memo also addresses comments from King County Department of Permitting and Environmental Review (DPER) staff upon review of our previous Critical Area Report for the project (Raedeke Associates, Inc. 2016) and existing site conditions.

The project area lies within a portion of the NE Union Hill Road right-of-way that abuts portions of the north and northeast edges of Tax Parcel No.s 0825069013 and 0825069067, which are the northernmost parcels of Gunshy Manor. This places the project area in Section 8, Township 25 North, Range 6 East, W.M. The Sight Distance Exhibit prepared by ESM Consulting Engineers, LLC, received on July 16, 2018, shows the project area for proposed sight distance clearing.

PROJECT DESCRIPTION

The project involves clearing of existing native forest vegetation within the right-of-way to improve entering and stopping sight distance visibility from the existing driveway. The goal of the proposed removal of vegetation is sight distance improvement to meet applicable sight distance standards set forth in King County’s 2016 Road Design and Construction Standards in order to reduce traffic accident risks along and in the vicinity of
NE Union Hill Road’s substandard curve that lies to the east of the above-mentioned Gunshy Manor driveway. Transpo Group (2018) has determined the geometric extent of the view corridor needed to meet King County sight distance standards, standards for “entering sight distance” and “stopping sight distance” that are currently not met due to the existing vegetative conditions of the view corridor between the north end of the Gunshy Manor Farm north parcel driveway and NE Union Hill Road to the east and southeast of the driveway’s intersection with that road.

The project area is primarily within the heavily vegetated forest area that lies within the King County right-of-way, immediately south and southwest of a sharp curve in NE Union Hill Road to the east of the Gunshy Manor Farm’s north parcel driveway entrance and exit. More specifically, the project area, which lies to the northwest of a proposed “entering sight distance line” (the line labeled on the Buffer Mitigation Plan Sheet 1 as the “45 MPH ESD LINE”) to the south and southwest edge of NE Union Hill Road, is roughly triangular in shape. The project area has a maximum width of up to 50 feet from the southwest edge of the roadway to the entering sight distance line. The length of the portion of the entering sight distance line that defines the south edge of the project area is approximately 430 feet long, 370 of which is within the buffer of Martin Creek.

All of the project area lies within the NE Union Hill Road right-of-way, and almost all of it lies within the 165-foot-wide buffer of a portion of the stream (Martin Creek) that traverses the site. The project site, including the stream and associated buffer, is discussed in more detail in our Critical Areas Report (Raedeke Associates, Inc. 2016).

For purposes of this evaluation, we assume as a “worst-case” scenario that vegetation removal for the sight distance improvement project will involve cutting most of the overstory trees within the project area to meet King County sight distance standards. Several of the larger trees, as identified on the Buffer Mitigation Plan Sheet 1, would be retained, with lower limbs pruned as needed to provide sight lines. Also as part of that worst case scenario, we assume the following:

1. The project will include cutting, trimming, or pruning of all shrubs and all other low understory vegetation within the project area down to a level that is approximately one foot below the level of all applicable sight lines, as needed, to meet King County sight distance standards;

2. Concerning overstory trees that will be cut down, (a) the stumps and roots will be left in place and (b) up to six of the resulting logs (minimum 20 feet long and 12 inches diameter at the large end) will be placed on the forest floor and left within the project area to avoid or minimize soil disturbance and provide wildlife habitat features;
(3) To the extent that particular specimens of shrubs and other understory vegetation within the project area are found not to exceed a level that is one foot below the level of the required sight lines, such shrubs and other low understory vegetation would be retained; and

(4) No soil disturbance, grinding of stumps, or placement of wood chips would occur within or immediately adjacent to the OHWM line on each side of Martin Creek, so as to avoid the need for state or federal permits authorizing the disposal of dredge or fill material within waters of the state or waters of the U.S.

MITIGATION

Compensatory mitigation for the impacts to the buffer vegetation of Martin Creek includes two components: (1) plantings within the buffer and along the stream channel to restore areas disturbed during removal and pruning of trees and shrubs, including areas where invasive species are to be removed, as needed, and (2) replacement of “significant” trees, as defined by King County (2016) code, that are to be removed within the stream buffer. With the avoidance and minimization measures as outlined in the Critical Areas Report (Raedeke Associates, Inc. 2016), actual vegetation removal (cutting, trimming, pruning, and limbing) may prove to be less extensive than under the assumed worst-case scenario described above and in the Critical Areas Report. If the actual vegetation removal proves to be less extensive than assumed, the final mitigation plan may be revised accordingly in consultation with King County DPER after the vegetation removal has been completed and before the final mitigation plan is fully implemented.

Buffer Disturbance

The attached Buffer Mitigation plans (Sheets 1 through 3) outline the proposed planting plans (revised from the March 2017 submittal) to re-vegetate or enhance the buffer areas following tree and shrub removal and pruning. The planting plan assumes disturbance could occur anywhere within the shaded sight distance area as shown on Sheet 1. The plan specifies planting of low ground cover plants at an approximate average spacing of 8 feet, recognizing that planting densities may vary across the site based on extent of disturbance and density of retained existing ground cover. Ground cover plants include salal (Gaultheria shallon), holly-leaved Oregon grape (Mahonia aquifolium), pineland swordfern (Polystichum munitum), and common snowberry (Symphoricarpos albus). The plan also includes planting of shrubs along a small portion of the northwest side of Martin Creek to provide additional shading and vegetative cover, at a standard spacing of 5 feet. These shrubs include clustered rose (Rosa pisocarpa), western thimbleberry (Rubus parviflorus), and salmon raspberry (Rubus spectabilis). Sheet 3 of the attached plans outline details regarding general notes and conditions, as well as monitoring and maintenance.
The plan includes leaving up to three logs within the sight distance area from the trees that are cut down. The trees would be dropped in place in a naturalistic pattern and trimmed of branches that may interfere with the sight lines. Branches trimmed off would be removed from the site. The downed trees would be cut into lengths so the remaining logs are at least 20 feet long and 12 inches diameter at the large end.

**Monitoring Plan**

This plan includes a systematic monitoring program of the riparian and buffer mitigation areas to evaluate the success of the mitigation effort. The results of the monitoring will be used to develop any needed modifications and/or alterations of the site in subsequent years. The purposes of the monitoring program are: (1) to document physical and biological characteristics of the mitigation area, and (2) to ensure that the goals and objectives comply with permit specifications. The monitoring process would consist of three distinct phases: (1) construction monitoring; (2) compliance monitoring; and (3) long-term monitoring. The “time-zero” or baseline composition, structure, and cover abundance would be documented during the compliance monitoring phase. The long-term monitoring program would document the survival of planted vegetation and rates of colonization by other plants (i.e., in planted areas) over a three-year period after installation of the riparian and buffer mitigation has been completed. These phases are outlined in detail on Sheet 3 of the plan.

**Performance Standards**

Specific performance standards to be used in the three-year long-term monitoring are the following:

- 100% survival of all planted vegetation (shrubs and groundcovers) in the riparian and buffer mitigation and tree replacement areas following completion of the first year after planting. All plantings that do not survive during the first year must be replaced with the same or similar species and specifications. Upon installation of replacement plantings at the conclusion of the first year, the 100% survival performance standard will be considered to be met;

- 85% survival of all planted vegetation (shrubs, and groundcovers) in the enhanced buffer and tree replacement areas following completion of each year after planting. Sufficient plantings will be replaced, as necessary, with the same or similar species and specifications in order to meet the 85% survival standard;

- There will be no more than 10% cover by Himalayan blackberry or other invasive plant species, as identified by the project biologist at any time during the three-year monitoring period within the area of buffer mitigation and tree replacement.
Contingency Plan

Contingency plans are needed if post-mitigation monitoring shows that objectives and performance standards have not been met. It should be noted, however, that it is not possible to develop a detailed contingency plan until the specific problems that need to be addressed are known. It would be unproductive to try to anticipate all possible problems and their solutions at this time.

Common problems, both human and natural, that might arise can be identified and general recommendations for remedy proposed. For example, after the second year, plant communities within the restored and enhanced areas may not be established at acceptable levels. It may be necessary to replant with new or different stock, provide additional watering or irrigation during critical seasons, or augment the soil.

If monitoring reveals a significant deviation from predicted impact or a failure of mitigation requirements, the applicant shall implement an approved contingency plan. The contingency plan constitutes new mitigation and is subject to all mitigation requirements, including a monitoring plan and financial guarantee.

Replacement of Significant Trees

The proposed plan specifies retention of two large western red cedars (Thuja plicata) in the sight distance area, and one smaller cedar (indicated in green on Sheet 1 of the attached Buffer Mitigation Plan). A line of fir trees that were previously planted along within the right-of-way between the existing and proposed driveway may be retained and lower limbs pruned, pending review by King County Department of Transportation. For purposes of the current plan, it is assumed the rest of the trees mapped in the sight distance area, totaling approximately 13 trees, including 3 trees along the east side of the driveway, would be removed. Of these, 11 trees to be removed from within the stream buffer area meet King County’s (2016) definition as “significant trees,” which include conifers at least 8 inches diameter at breast height (dbh, measured at 4.5 feet above the ground) and deciduous trees at least 12 inches dbh. We anticipate that the tree removal process would occur in stages in coordination with King County Department of Transportation staff, and more significant trees may be able to be retained, with lower limbs removed to provide adequate sight lines.

King County typically requires replacement of significant trees removed from critical area buffers at a 3:1 ratio (Ms. Laura Casey, King County DPER, pers. comm., March 22, 2017). Thus, with 11 significant trees to be removed from the buffer, 33 replacement trees are required as compensation. The property owner proposes to plant the replacement trees along the south side of Farm Ditch 3, a Type F water (Talasaea Consultants, Inc. 2016) along the Gunshy Farm property boundary southwest of the sight distance clearing area (see Sheet 2 of the attached buffer mitigation plans). The proposed plantings would consist of a mixture of Douglas fir and western red cedar (aka western red arborvitae). These trees would be planted at the same time as the low cover plantings in the sight
distance area, and survival would be monitored along with the low cover plantings, as outlined above.

LIMITATIONS

We have prepared this document for the exclusive use of The Estate of Barbara J. Nelson and its consultants. No other person or agency may rely upon the information, analysis, or conclusions contained herein without permission from The Estate of Barbara J. Nelson.

The determination of ecological system classifications, functions, values, and boundaries is an inexact science, and different individuals and agencies may reach different conclusions. With regard to wetlands, the final determination of their boundaries for regulatory purposes is the responsibility of the various agencies that regulate development activities in wetlands. We cannot guarantee the outcome of such agency determinations. Therefore, the conclusions of this document should be reviewed by the appropriate regulatory agencies prior to any detailed site planning or construction activities.

We warrant that the work performed conforms to standards generally accepted in our field, and has been prepared substantially in accordance with then-current technical guidelines and criteria. The conclusions of this report represent the results of our analysis of the information provided by the project proponent and their consultants, together with information gathered in the course of the study. No other warranty, expressed or implied, is made.

Thank you for the opportunity to provide this information. If you have any questions or need additional information, please do not hesitate to contact me or Chris Wright at (206) 525-8122 or via email at rwlundquist@raedeke.com or cwright@raedeke.com.

LITERATURE CITED


Transpo Group. 2018. Memorandum regarding Gunshy Manor Driveway/NE Union Hill Road Sight Distance Evaluation, dated January 17, 2018, to Rick Brater, PE – King County Department of Transportation, and Randy Sandin – King County DPER.
**PLANT SCHEDULE FOR BUFFER ENHANCEMENT**

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>MIN. SIZE</th>
<th>REMARKS</th>
<th>SPACING</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaultheria shallon</td>
<td>Salal</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>8' O.C.</td>
<td>40</td>
</tr>
<tr>
<td>Mahonia aquifolium</td>
<td>Hollyleaved Oregon grape</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>8' O.C.</td>
<td>40</td>
</tr>
<tr>
<td>Polystichum munitum</td>
<td>Pineland Swordfern</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>8' O.C.</td>
<td>45</td>
</tr>
<tr>
<td>Symphoricarpos albus</td>
<td>Common Snowberry</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>8' O.C.</td>
<td>40</td>
</tr>
<tr>
<td>Rosa pisocarpa</td>
<td>Clustered Rose</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>5' O.C.</td>
<td>9</td>
</tr>
<tr>
<td>Rubus parviflorus</td>
<td>Western Thimbleberry</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>5' O.C.</td>
<td>9</td>
</tr>
</tbody>
</table>

**PLANT SCHEDULE FOR RIPARIAN ENHANCEMENT**

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>MIN. SIZE</th>
<th>REMARKS</th>
<th>SPACING</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rose</td>
<td>Clustered Rose</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>5' O.C.</td>
<td>9</td>
</tr>
<tr>
<td>Rubus parviflorus</td>
<td>Western Thimbleberry</td>
<td>1 gal.</td>
<td>Full &amp; Bushy</td>
<td>5' O.C.</td>
<td>9</td>
</tr>
</tbody>
</table>

Plants to be installed in the enhancement areas will need to be flagged with ribbon for identification.

Note: Up to 3 trees will be felled in the tree removal area and left as large woody debris. Downed trees to be trimmed or cut to remain as logs at least 20 ft. long and 12 in. in diameter at large end. Trees and locations to be determined in the field.

**TREE LEGEND**
- **TREE - FIR**
- **TREE - MAPLE**
- **TREE - CEDAR**
- **TREE - ALDER**
- **TREE - VINE MAPLE**
- **TREE TO REMAIN**
- **TREE TO BE PRUNED**

**REVISED TREE SURVEY & LAYOUT**
- 8/9/18

**REVISED SIGHT LINE AREA**
- 8/9/18
TREE REPLACEMENT LEGEND

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>MIN. SIZE</th>
<th>REMARKS</th>
<th>SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSM</td>
<td>Pseudotsuga menziesii</td>
<td>Douglas Fir</td>
<td>4' tall</td>
<td>APPROX. 10' O.C.</td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>Thuja plicata</td>
<td>Western red Arborvitae</td>
<td>4' tall</td>
<td>APPROX. 10' O.C.</td>
<td></td>
</tr>
</tbody>
</table>

TREE PLACEMENT DIAGRAM

1. REMOVE SOD FROM WITHIN THE TREE PLANTING AREA & AMEND EXISTING SOIL WITH 2 TO 3 INCHES OF COMPOST.
2. PLACE THE TREES APPROX. 10 FEET FROM THE GRAVEL ROAD AT APPROX. 10 FEET O.C.
3. CEDAR TREES (THUJA P LICATA) SHOULD BE PLACED CLOSER TO THE DITCH AND UNDER THE SHADE OF THE EXISTING CANOPY.
4. VOLE PROTECTION SHOULD BE PLACED AROUND THE BOTTOM OF EACH TREE.
5. MULCH THE ENTIRETY OF THE TREE PLANTING AREA.

CONTAINER TREE OR SHRUB PLANTING DETAIL

SET TOP OF ROOTBALL FLUSH WITH GRADE.
DIG PLANTING PIT 2 TIMES AS WIDE AS ROOTBALL BUT NOT DEEPER THAN THE ROOTBALL.
FINISH GRADE REMOVE CONTAINER COMPLETELY.
LOOSEN ROOTS OR TEASE APART ROOTS THAT ARE TIGHTLY BOUND BACKFILL PER SPECIFICATIONS PLACE ROOTBALL ON UNEXCAVATED OR TAMPED SOIL (SO PLANT DOES NOT SINK).

EX. TREE REPLACEMENT AREA APPROX. 4,000 SF FOR THE REQUIRED 33 NATIVE TREES
1.1 GENERAL DESCRIPTION

The project will be installed in accordance with the approved layout, planting, grading, and irrigation plans. The project is to consist of the following elements:

- Tree Plantings
- Shrub Plantings
- Ground Cover Plantings
- Mulch Application
- Supplementation of Plant Material
- Maintenance of Plant Material

1.2 MATERIALS

All plant materials shall be locally and regionally obtained. Plant Materials shall be purchased from suppliers without a history of professional discipline or complaint. The project is to consist of:

- Trees
- Shrubs
- Ground Covers
- Bark Mulch

1.3 CONSTRUCTION MONITORING

The project shall be monitored during the initial and final phases of construction. These phases include:

1.3.1 On-Site Meeting Prior to Commencement of Work
1.3.2 On-Site Meeting after Completion of the First Year
1.3.3 Final Inspections

1.4 MAINTENANCE

The project shall be maintained as specified in the Maintenance Plan. Maintenance shall include:

- Irrigation
- Fertilization
- Pruning
- Pest Control

2.0 PERFORMANCE STANDARDS

2.1 SPECIFIC PERFORMANCE STANDARDS TO BE USED IN THE THREE-YEAR LONG-TERM MONITORING AND TWO-YEAR SHADING PERIOD:

- 100% Survivial of all planted vegetation (trees, shrubs, and ground covers) in the buffer mitigation area and tree replacement area
- 100% Survival of all planted vegetation (trees, shrubs, and ground covers) in buffer area
- 95% Survival of all planted vegetation (trees, shrubs, and ground covers) in the tree replacement area
- 95% Survival of all planted vegetation (trees, shrubs, and ground covers) in the mitigation area
- 100% Establishment of all planted vegetation (trees, shrubs, and ground covers)
- 100% Coverage by planted vegetation (trees, shrubs, and ground covers) in the buffer mitigation area and tree replacement area
- 95% Coverage by planted vegetation (trees, shrubs, and ground covers) in the buffer area
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- 95% Coverage by planted vegetation (trees, shrubs, and ground covers) in the buffer area
- 95% Coverage by planted vegetation (trees, shrubs, and ground covers) in the tree replacement area
- 95% Coverage by planted vegetation (trees, shrubs, and ground covers) in the mitigation area

2.2 STANDARD MONITORING METHODS

These methods will be used to verify the performance of the project:

- Visual Assessment
- Measurement
- Soil Sampling
- Water Quality
- Biological Monitoring

3.0 MONITORING STANDARDS & MAINTENANCE PLAN

3.1 PROGRAM MONITORING

The project will be monitored during the following phases:

- Initial Monitoring
- Long-Term Monitoring
- Shading Period

3.2 SITE MAINTENANCE

The project will be maintained as specified in the Maintenance Plan. Maintenance will include:

- Irrigation
- Fertilization
- Pruning
- Pest Control

4.0 ABBREVIATIONS

- Trees
- Shrubs
- Ground Covers
- Bark Mulch

5.0 REFERENCES

- American Association of Nurserymen (ANSI Z60.1-2004V)
- American Standard for Nursery Stock - 2004
- Bituminous Transportation Agency (2004)
- City of Seattle (2004)
- City of Seattle (2012)
- Department of Ecology (2012)
- Department of Transportation (2004)
- Department of Transportation (2012)
- Friends of Rain (2004)
- Friends of Rain (2012)
- Seattle Department of Transportation (2004)
- Seattle Department of Transportation (2012)
- State of Washington (2012)
- University of Washington (2004)
- University of Washington (2012)