

**SR 161 234th Street East to 176th Street East (Graham Hill)
Mitigation Site**

Ecology Order DE 03SEAHQ-5832

Olympic Region

2010 MONITORING REPORT

Wetland Assessment and Monitoring Program

Issued March 2011



Environmental Services Office

Author:

Cori Flowers

Editor:

Tony Bush

Contributors:

Teri Fisher

Diana Martinez

For additional information about this report or the WSDOT Wetland Assessment and Monitoring Program, please contact:

Tony Bush, Wetland Assessment and Monitoring Program
WSDOT, Environmental Services Office
P. O. Box 47332, Olympia, WA 98504
Phone: 360-570-6640 E-mail: busht@wsdot.wa.gov

Monitoring reports are published on the web at: <http://www.wsdot.wa.gov/Environment/Biology/Wetlands/reports.htm>

SR 161 234th Street East to 176th Street East (Graham Hill) Mitigation Site

Ecology Order DE 03SEAHQ-5832



General Site Information		
Ecology Order Number	DE 03SEAHQ-5832	
Mitigation Location	West side of SR 161 south of Graham, near 234 th Street East, Pierce County	
LLID Number	1222960470438	
Construction Date	2005	
Monitoring Period	2006-2015	
Year of Monitoring	5 of 10	
Area of Project Impact	0.55 acre	
Type of Mitigation	Wetland Establishment	Wetland Enhancement
Area of Mitigation	0.8 acre	0.5 acre

This Page Intentionally Left Blank

Summary of Monitoring Results and Management Activities (2010)

Performance Standards and Monitoring Tasks	2010 Results ¹	Management Activities
Performance Standards		
50% aerial cover of woody vegetation in the establishment and enhancement area	11% cover (CI _{80%} = 9-14%)	Replanting conducted, plant protectors installed, and bark mulch rings applied
Hydrology within the wetland creation area must be present for 12.5% of the growing season	Present	
Less than 20% invasive species in the establishment and enhancement area	3% cover (CI _{80%} = 3-4%)	Weed control conducted (herbicide and manual removal)
Monitoring Tasks		
Survival of vegetation will be assessed	Vegetation qualitatively assessed at 95% across the site	
Three formal bird surveys will be conducted and any wildlife signs will be recorded	3 bird surveys were conducted and wildlife signs observed	

Report Introduction

This report summarizes (Year-5) monitoring activities at the State Route (SR) 161 Graham Hill Mitigation Site. Included are a site description, the performance standards, an explanation of monitoring methods, and an evaluation of site development. Monitoring activities included vegetation surveys, photo-documentation, bird surveys, and assessments of wetland hydrology. Wetland hydrology was assessed March 9, 16 and April 8, 2010. Bird surveys were conducted May 17, 26 and June 7, 2010. Vegetation monitoring occurred August 16-17, 2010.

¹ Estimated values are presented with their corresponding statistical confidence interval. For example, 11% (CI_{80%} = 9-14% cover) means we are 80% confident that the true aerial cover value is between 9% and 14%.

What is the SR 161 Graham Hill Mitigation Site?

This 8.93 acre WSDOT property (Figure 1) contains 1.3 acres of mitigation to compensate for impacts to 0.55 acre of wetlands due to road widening along SR 161. The mitigation site is located south of the city of Graham, and at the southern end of the road project. Connected to a larger wetland complex and situated on a slight slope, the site combines forested wetland establishment (formerly called creation) and wetland enhancement. The site provides mitigation for lost wetland functions including wildlife habitat, groundwater recharge, and water quality.

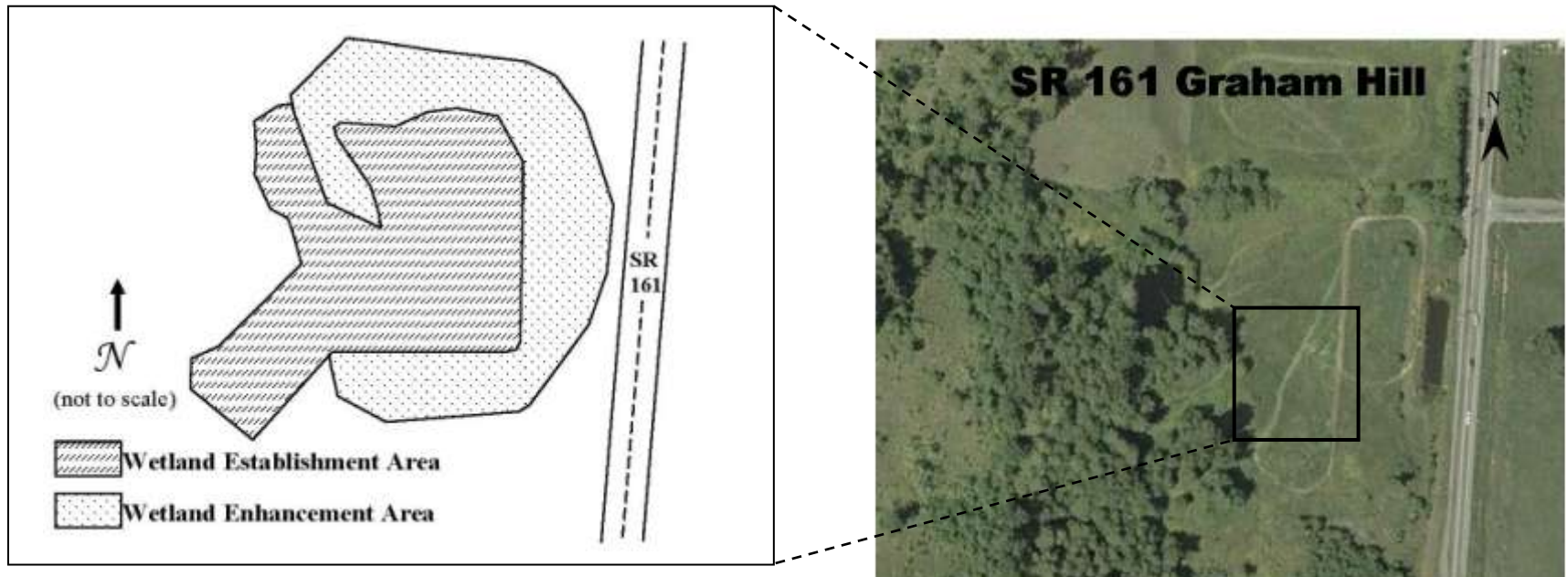


Figure 1 Site Sketch

The SR 161 Graham Hill Mitigation Site includes a sloped and forested wetland establishment area surrounded by wetland enhancement. Existing wetlands border the site to the north and west.

What are the performance standards and monitoring tasks for this site?

Performance Standard 1

Vegetative success within the creation and enhancement areas must equal or exceed 50 percent aerial cover of planted trees and shrubs (can include non-invasive volunteers) by the end of year five, or additional planting (and monitoring) to achieve such.

Performance Standard 2

Hydrology (within 12 inches of the soil surface) within the wetland creation area must be present for at least 12.5 percent of the growing season (consecutive). This can be determined by making reasonable assumptions based on site observation (vegetation, soil, hydrology indicators if staff is there during the dry months). At least one monitoring trip must be made during the early growing season each year to directly observe whether wetland hydrology is present.

Performance Standard 3

Cover of reed canarygrass, or other invasive species may not exceed 20 percent of the total created and enhanced wetland areas at any time during years one through five.

Monitoring Task 1

Survival of vegetation will be assessed after the first growing season, at least once (July 1 to mid-Aug) in years two, three, and five. Monitoring will not be necessary in year four unless year three success standards are not being met.

Monitoring Task 2

Three formal bird surveys will be conducted each monitoring season permanent census stations throughout the mitigation site. Surveys will take place between sunrise and noon, from May through June. In addition to the surveys, any wildlife sign and/or other sighting will be recorded during all site visits.

Appendix 1 provides the complete text of the performance standards for this project, and Appendix 5 shows the As-built planting plan (WSDOT 2006).

How were the performance standards evaluated?

To evaluate standards for vegetative cover, a baseline was established parallel to SR 161 (Figure 2). Twenty-five sampling transects were randomly placed perpendicular to the baseline. The line intercept method was used to estimate woody cover (Performance Standard 1), and the point intercept method was used to estimate invasive species cover (Performance Standard 3).

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standards 2). To determine extent of inundation and surface saturation visual observations were made. In areas where surface saturation or inundation was not apparent temporary pits were dug. Depth of standing water was recorded. Locations of saturation, inundation, and pits were recorded on a map (Appendix 4 - Table 2).

Bird surveys were conducted using the point count method to document species richness and relative abundance (Ralph et al. 1993). Incidental wildlife observations were recorded during each monitoring visit.

For additional details on the methods, see Appendix 2 of this report or view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

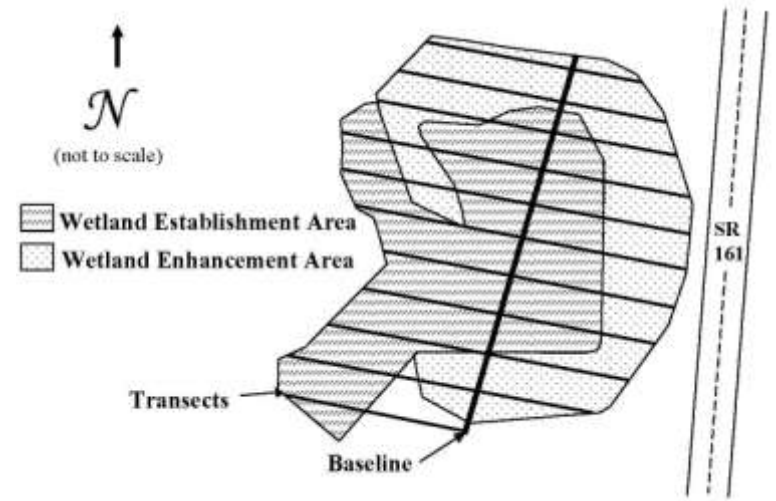


Figure 2 Site Sampling Design (2010)

How is the site developing?

This site is developing well in many respects. The performance standards for invasive cover and hydrology have been met. The performance standard for aerial cover of woody vegetation has not been met. Woody vegetation mortality is low but the plantings are developing slowly due to deer browse and competition from grasses. Application of mulch rings and trees guards appear to have helped woody vegetation vigor. The woody wetland areas were replanted in November, 2010 with 150 salmonberry (*Rubus spectabilis*), 100 Oregon ash (*Fraxinus latifolia*), 82 red alder (*Alnus rubra*), 50 Sitka spruce (*Picea sitchensis*), and 50 black cottonwood (*Populus balsamifera* ssp. *trichocarpa*).

This site provides habitat for a variety of wetland dependant and wetland associated birds. Additional signs of animal use were observed including herbivory and scat.

Results for Performance Standard 1

(50% cover of woody vegetation in the establishment and enhancement area):

Aerial cover of woody species in the establishment and enhancement area is determined to be 11% cover ($CI_{80\%} = 9-14\%$). This amount is less than the 50 percent requirement. Woody species establishment and growth has been slow which is likely due to deer browse and competition from grasses (Photo 1).

Results for Performance Standard 2

(Hydrology within the wetland creation area must be present 12.5% of the growing season):

Based on three hydrology visits in the months of March and April, 2010, wetland hydrology was observed in all intended areas (Photo 2). Standing water or soil saturation was present within 12 inches of the soil surface in temporary pits located in the intended wetland throughout this period (see Appendix 4 for hydrology observations and pit locations).

Results for Performance Standard 3

(Less than 20% invasive species in the establishment and enhancement area):

Cover of invasive species is 3% ($CI_{80\%} = 3-4\%$). This is well below the threshold for Year-5. Invasive species observed include *Cirsium vulgare* (bull thistle), *Cirsium arvense* (Canada thistle), and *Phalaris arundinacea* (reed canarygrass).



Photo 1
Woody cover in wetland (August 2010)



Photo 2
Hydrology in Wetland 1 (March 2010)

Results for Monitoring Task 1
(Survival planted woody species):

Survival of planted woody species is qualitatively estimated at 95 percent. Plantings are healthy but growth is slow the plants have been heavily browsed.

Results for Monitoring Task 2
(Conduct three formal bird surveys from May to June):

Three formal bird surveys were conducted in May and June 2010. During these surveys, three wetland-dependent and three wetland-associated avian species² were observed on site. One additional wetland associated avian species and one wetland dependant species have been observed on site throughout the monitoring period. A bird's nest on site was observed in March of 2010 (Photo 3). Appendix 3 provides a complete list of birds observed.



Photo 3
Bird nest observed on site (March 2010)

² Birds are assigned wetland-dependent or wetland-associated species status based on the classification scheme presented in Brown and Smith (1998). Regional variation occurs. Additional references used to further classify bird species include Thomas (1979), Ehrlich et al. (1988), and Smith et al. (1997).

What is planned for this site?

Continued weed control will be conducted as needed in 2011.

Appendix 1 – Goals and Performance Standards

The following excerpt is from the *SR 161 234th Street East to 176th Street East Wetland Mitigation Plan* (WSDOT 2003). The performance criteria addressed this year are identified in **bold** font.

GOALS AND OBJECTIVES

The general goal of the wetland mitigation plan is to create 34,875 square feet of forested wetland, as well as enhance emergent 21,724 square feet of existing emergent wetland area, which will provide wildlife habitat, groundwater recharge, and water quality functions. The following summarizes the objectives that must be met by the third growing season after monitoring:

- Create a recognizable plant community that will develop into a forested wetland.
- Create a seasonally saturated wetland hydrologic regime that meets the criteria of the 1997 Washington State manual (DOE, 1997), i.e., at least 12.5% of the growing season.
- Establish a Hydrologic connection between Wetland A and the created wetland area.

The following summarizes the performance standards that the wetland creation and enhancement areas must meet:

- 100 percent survival (or replacement) of trees and shrubs at the end of year one. Non-invasive volunteer species are acceptable to include in this total.
- **Vegetative success within the creation and enhancement areas must equal or exceed 50 percent aerial canopy cover of planted trees and shrubs (can include non-invasive volunteers) by the end of year five, or additional planting (and monitoring) to achieve such.**
- **Hydrology (within 12 inches of the soil surface) within the wetland creation area must be present for at least 12.5% of the growing season (consecutive). This can be determined by making reasonable assumptions based on site observations (vegetation, soil, hydrology indicators if staff is there during the dry months). At least one monitoring**

trip must be made during the early growing season each year to directly observe whether wetland hydrology is present.

- **Cover of reed canarygrass, or other invasive species may not exceed 20 percent of the total created and enhanced wetland areas at any time during years one through five.**

Using the Canopy Coverage method during years 1-2, and the Line Intercept Method during years 3 and 5, the following standards of success for vegetative growth in all areas (as applicable) shall be met as shown in Table 4:

Table 4. Vegetative standards of success by year and layer for wetland creation and enhancement areas (percentages based *sic*) on aerial coverage of the wetland areas).

Year	Native Woody Species
Year #1	10%
Year #2	20%
Year #3	30%
Year #5	50%

This table has changed as per Jodie Beall on 04/18/2006. Above are the revised standards for this site.

MAINTENANCE & MONITORING

The following list features of the wetland creation and enhancement project, which will or may require on-going maintenance. Although it strives to include all potential maintenance needs, unforeseen problems are likely to arise. Therefore, it is essential that WSDOT personnel visit the site at least 2 times a year during the first two growing seasons following construction to assure that maintenance or corrections are promptly made. In addition to the 4 visits during years 1 and 2, monitoring will also occur in years 3 and 5.

- Loss of tree or shrub species (wetland and buffer species) for various reasons-replace or replant as needed.
- Presence of reed canarygrass, or other invasive species – mow monthly May-August, treat as needed with approved herbicide in late June/early July.
- Poor growth of upland buffer plants – apply slow release balanced fertilizer.

Monitoring will occur regularly to measure the success of the wetland creation project and determine if the goals have been met. The following monitoring documentation will occur:

Vegetative Survival – Plant survival, species composition and vigor status will be measured in sample plots. The location of the vegetation sampling plots will be shown on the as-built planting plan. **Survival of vegetation will be assessed after the first growing season, and at least once (July 1 to mid-August) in years 2, 3, and 5. Monitoring will not be necessary in year four, unless the year three success standards are not being met.**

Hydrology – Hydrology will be measured by direct observation (shallow pits) and by soil and vegetative indicators.

Wildlife – Three formal bird surveys will be conducted each monitoring season from permanent census stations throughout the mitigation site. Surveys will take place between sunrise and noon, from May through June. Biologists will conduct the survey by standing silently at a station for five minutes, followed by five minutes of recording all bird species detected by sight or sound within 30 meters of the mitigation site. In addition to the surveys, any wildlife sign (e.g. tracks, scat), and/or other sightings will be recorded during all site visits. The bird surveys will be conducted during optimal weather conditions, i.e., little or no precipitation, and light to no wind, to ensure good visibility.

Photo stations – a total of five photo stations will be located throughout the area. Each photo station will consist of a permanent marker where photographs will be taken at each compass point (N, S, E, and W) once a year in years 1, 2, 3, and 5 at the height of the growing season (July 15 to August 1).

At completion of construction an as-built plan will be prepared showing any deviations from the wetland creation plan. This can also serve as the baseline monitoring report. Monitoring reports will be prepared on a yearly basis for each monitoring year, and submitted to the appropriate regulatory agencies.

Additional informal monitoring to assess and address maintenance issues will be performed year round throughout the monitoring period. These visits will include checking for the presence of invasive plants, damage due to vandalism, drought and any other unforeseen problems. These visits are necessary so that prompt control measures can be taken.

CONTINGENCY PLAN

In the event that the goals and objectives are not met by the third year, contingency measures must be taken. These include but are not limited to replanting dead plants, hydrologic manipulation, irrigation, mulching of plants, weed control, trash removal, erosion repair, and any other practices necessary to meet the goals of the mitigation plan. Recommendations to correct deficiencies will be made after each site visit by the wetland biologist. WSDOT will correct deficiencies in a timely and responsible manner.

Appendix 2 – Methods

To assess vegetation standards, a 100-meter baseline was established diagonally across the site. Twenty-five temporary sampling transects were placed perpendicular to the baseline using a systematic random sampling method (Figure 2). Aerial cover of woody species across the site (Performance Standard 1) was assessed using the line intercept method. One hundred and eighteen 10-meter line-segment sample units were randomly positioned along the sampling transects in this zone. The point intercept method was used to estimate aerial cover of invasive species cover across the entire site (Performance Standard 3). One hundred and eighteen randomly positioned 10-meter point-line sample units (40 points each) were placed along the sampling transects.

Sample size analysis confirmed sufficient sampling had been completed based on site sampling objectives and the desired level of statistical confidence. The sample size equation shown here (below) was used to perform the analysis on data collected (Performance Standards 1 and 3). In this equation, the precision level (*B*) equals half the maximum acceptable confidence interval width multiplied by the sample mean.

$$n = \frac{(z)^2 (s)^2}{(B)^2}$$

n = unadjusted sample size
z = standard normal deviate
s = sample standard deviation
B = precision level

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 2). To determine extent of inundation and surface saturation visual observations were made. In areas where surface saturation or inundation was not apparent temporary pits were dug. Depth of standing water was recorded. Locations of saturation, inundation, and pits were recorded on a map (Appendix 4 – Table 2).

To evaluate the wildlife monitoring task, bird surveys were conducted using the point count method to document species richness and relative abundance (Ralph et al. 1993). Incidental wildlife observations were recorded during each monitoring visit.

For additional details on the methods view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

Appendix 3 – Bird Observations

Table 1. List of Birds Observed Using the Mitigation Site during the monitoring period (years-1 to 5)

SR 161 Graham Hill Cumulative Bird List			
Family Name ³	Common Name	Scientific Name	Status
<i>Accipitridae</i>	Red-tail Hawk	<i>Buteo jamaicensis</i>	
<i>Picidae</i>	Northern Flicker	<i>Colaptes auratus</i>	
	Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	
	Hairy Woodpecker	<i>Picoides billosus</i>	
<i>Tyrannidae</i>	Willow Flycatcher	<i>Empidonax traillii</i>	wetland-associated
	Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	
<i>Corvidae</i>	Steller’s Jay	<i>Cyanocitta stelleri</i>	
	American Crow	<i>Corvus brachyrhynchos</i>	
<i>Hirundinidae</i>	Violet-green Swallow	<i>Tachycineta thalassina</i>	wetland-associated
	Barn Swallow	<i>Hirundo rustica</i>	wetland-associated
<i>Paridae</i>	Black-capped Chickadee	<i>Poecile atricapillus</i>	wetland-associated
<i>Troglodytidae</i>	Bewick’s Wren	<i>Thryomanes bewickii</i>	
<i>Turdidae</i>	Swainson’s Thrush	<i>Catharus ustulatus</i>	
	American Robin	<i>Turdus migratorius</i>	
<i>Parulidae</i>	Wilson’s Warbler	<i>Wilsonia pusilla</i>	wetland-associated
<i>Thraupidae</i>	Western Tanager	<i>Piranga ludoviciana</i>	
<i>Sturnidae</i>	European Starling	<i>Sturnus vulgaris</i>	
<i>Bombycillidae</i>	Cedar Waxwing	<i>Bombycilla cedrorum</i>	
<i>Parulidae</i>	Common Yellowthroat	<i>Geothlypis trichas</i>	wetland-dependent
<i>Emberizidae</i>	Song Sparrow	<i>Melospiza melodia</i>	
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	
	Dark-Eyed Junco	<i>Junco hyemalis</i>	
	Spotted Towhee	<i>Pipilo maculatus</i>	
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	
<i>Cardinalidae</i>	Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	

³ The SR 161 Graham Hill bird species list follows the American Ornithologists’ Union Checklist of North American Birds (AOU 1998). The list incorporates changes made in the 42nd, 43rd, and 44th Supplement to the Checklist as published in the Auk 117:847-858 (2000), 119:897-906 (2002), and 120:923-932 (2003).

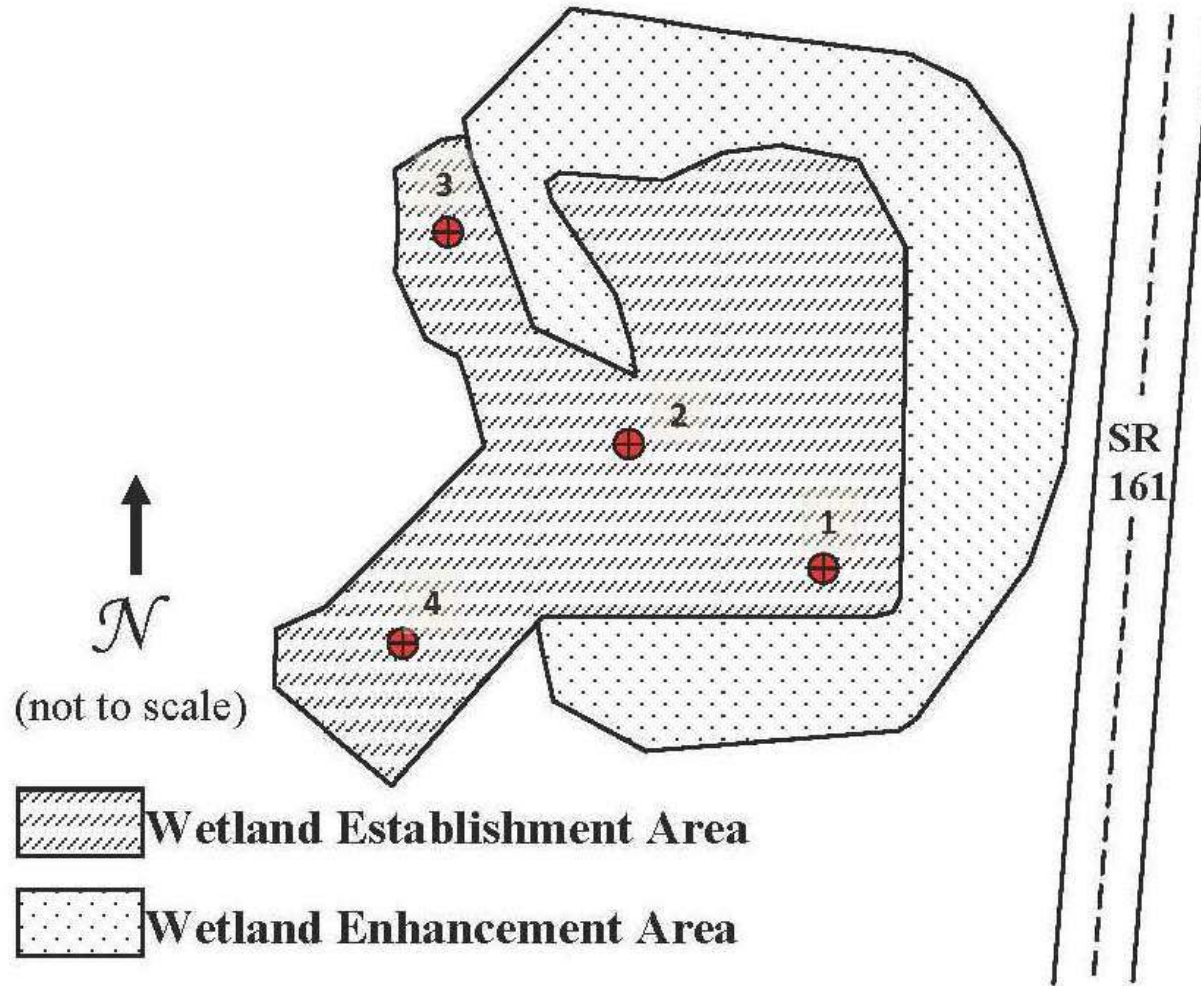
SR 161 Graham Hill Cumulative Bird List			
Family Name ³	Common Name	Scientific Name	Status
<i>Icteridae</i>	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	wetland-dependent
	Brown-headed Cowbird	<i>Molothrus ater</i>	
<i>Fringillidae</i>	American Goldfinch	<i>Carduelis tristis</i>	
	House Finch	<i>Carpodacus domesticus</i>	
<i>Anatidae</i>	Mallard	<i>Anas platyrhynchos</i>	wetland-dependent
<i>Alcedinidae</i>	Belted Kingfisher	<i>Megaceryle alcyon</i>	wetland-dependent

Appendix 4 – Hydrology Observations

Table 2. Hydrology Observations

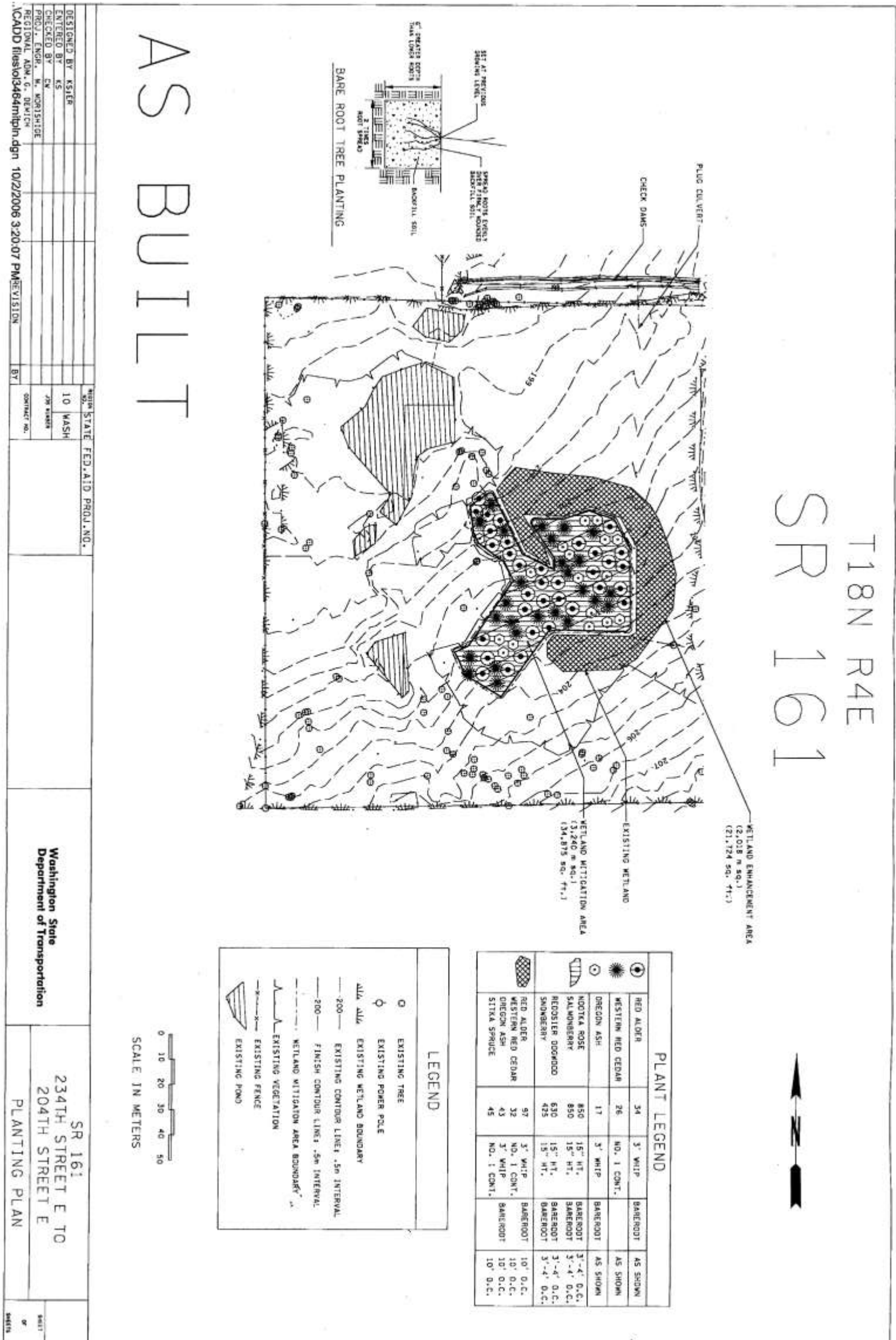
Hydrology Observations For SR 161 Graham Hill			
Date	3/9/2010	3/16/2010	4/8/2010
Was wetland hydrology observed in all intended areas	Yes	Yes	Yes
Surface observation	Surface hydrology on site was primarily soil saturation. Water was seeping through the site from the south (on the uphill gradient) and is slowly moving to the northwest of the site where a pond is located off site. The enhancement area did not demonstrate surface water.	Hydrology present in nearly all areas, 3/4 of the site exhibited saturated soils with pockets of inundation in most depressions. An additional pit was dug in the elevated enhancement area and had a layer of saturated soil at 13" no standing water	Most of the intended wetland area was saturated to the surface.
Subsurface Observations			
Pit 1	Standing water at 6.5", water seeping into pit at 3.5"	Standing water at 6.5"	Saturated to the surface
Pit 2	Standing water at 12" after 52 min, saturation 0-8"	Surface saturation	Saturated to the surface
Pit 3	Standing water at 17.5" after 31 min, saturation 0-6", water seeping into pit at 17"	Standing water at 11" initially	Standing water at 11" after 15 minutes
Pit 4	Standing water at 12" saturation at 4" on downhill side of pit and to the surface on the uphill side of pit.	Standing water at 15" saturated soils at 9-12", appears to be a restrictive layer at 9" where a change in soil type occurs soils were saturated directly above the soil change	Standing water at 14", saturation between 1 and 3" and 9 and 14"
water marks			
drift lines			
sediment deposits			
water-stained leaves	Yes		yes

Figure 3. Hydrology Pit Locations

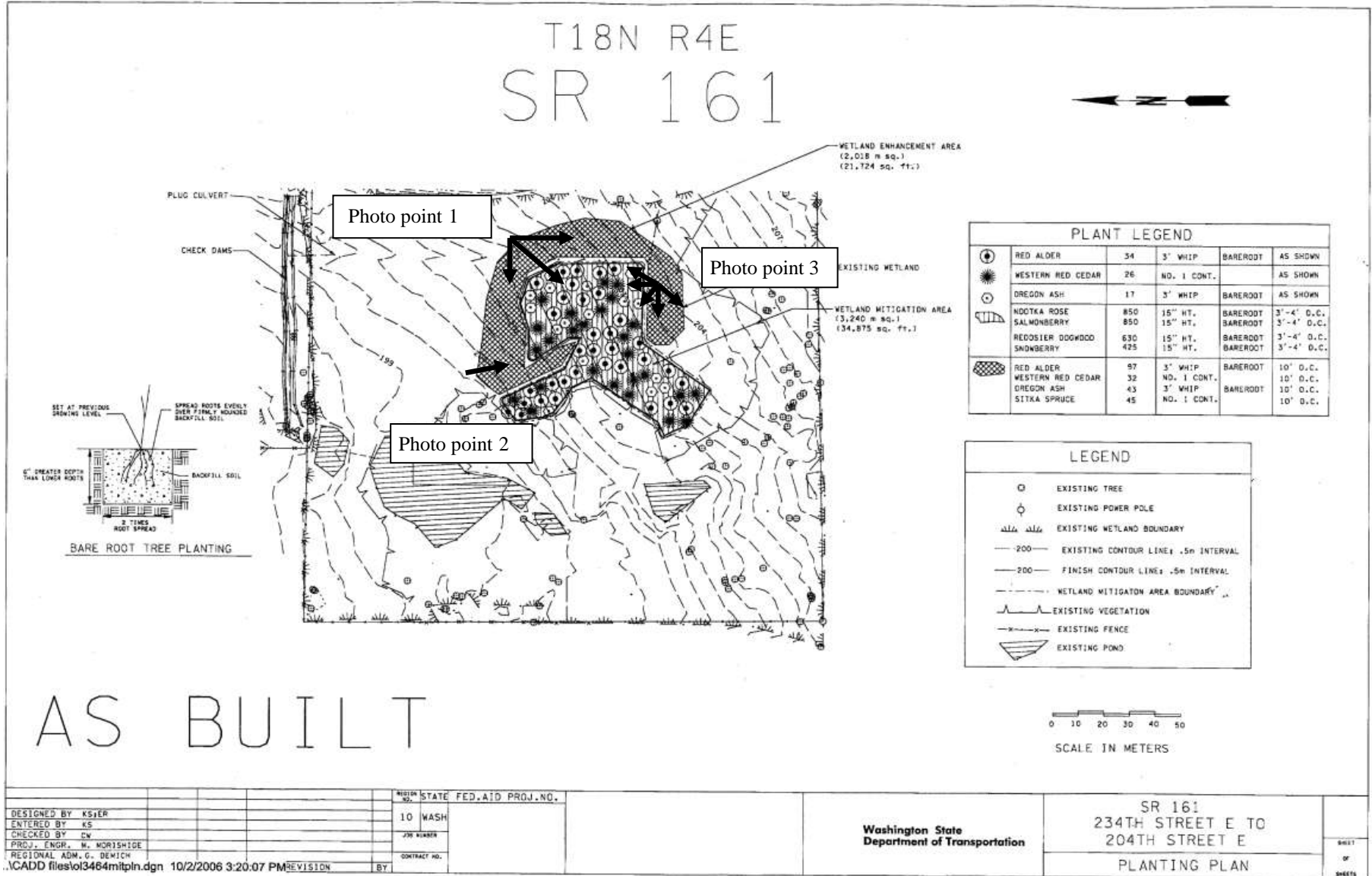


Appendix 5 – As Built Planting Plan

(from WSDOT 2006)



Appendix 6 – Photo Points



The photographs below were taken from permanent photo-points on August 17, 2010 and document current site development.



Photo Point 1a



Photo Point 1b



Photo Point 1c



Photo Point 2



Photo Point 3a



Photo Point 3b



Photo Point 3c



Photo Point 3d



Photo Point 3e



Photo Point 3f

Literature Cited

1. Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook*. Simon and Schuster, Inc., NY.
2. Ecology. See Washington State Department of Ecology.
3. Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. *Handbook of Field Methods for Monitoring Landbirds*. Gen. Tech. Rep. PSW-GTR-144. Pacific Southwest Research Station, Forest Service, Department of Agriculture, Albany, CA.
4. Washington State Department of Ecology (Ecology). 1997. *Washington State Wetlands Identification and Delineation Manual*. Publication No.96-94, Olympia, WA.
5. Washington State Department of Transportation (WSDOT) WSDOT Wetland Mitigation Site Monitoring Methods (12 June 2008). <http://www.wsdot.wa.gov/NR/rdonlyres/C211AB59-D5A2-4AA2-8A76-3D9A77E01203/0/MethodsWhitePaper052004.pdf>
6. Washington State Department of Ecology (Ecology). 1998. Department of Ecology Order No DE 03SEAHQ-5832.
7. Washington State Department of Transportation. 2003. *Final Wetland Mitigation Plan SR 161 234th Street East*. Washington State Department of Transportation, Olympic Region, Olympia, WA.
8. Washington State Department of Transportation. 2006. *SR 161 234th Street East to 204th Street East As-built*. Washington State Department of Transportation, Olympic Region, Olympia, WA.