

**SR 509/I-5 Freight and Congestion Relief Project
(AMB Property) Mitigation Site**

USACE NWP (14, 23) 200500979

Northwest Region

2010 MONITORING REPORT

Wetland Assessment and Monitoring Program

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SR 509/I-5 Freight and Congestion Relief (AMB Property) Mitigation Site

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	General Site Information			
	USACE NWP 14, 23 Number	200500979		
	Mitigation Location	Southwest of Sea-Tac Airport on west side of Des Moines Drive, south of 188 th Way, King County		
	LLID Number	1223195474339		
	Construction Date	2006-2007		
	Monitoring Period	2007-2016		
	Year of Monitoring	4 of 10		
	Area of Project Impact	0.43 acre Wetland	3.10 acres of Wetland Buffer ¹	
	Type of Mitigation	Wetland Re-establishment	Wetland Enhancement	Buffer Enhancement
	Area of Mitigation	0.63 acres	0.33 acres	2.01 acres

¹ 3.10 acres are the total buffer impacts (1:1 ratio). The Buffer and Wetland Enhancement (2.01 and 0.33 for a total of 2.34 acres) combined are mitigating for the buffer impacts. The remaining 0.76 acres of mitigation needed that is not shown on this table will be mitigated through WSDOT's participation in the Des Moines Creek Basin Plan and construction projects.

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Summary of Monitoring Results and Management Activities (2010)

Performance Standards (Year-10)	2010 Results ²		Management Activities
The wetland areas will be delineated using current methods to assure that the mitigation site contains 0.63 acre of new wetland	2.56 acres of wetland re-establishment and enhancement		
Native facultative or wetter species will achieve 75% coverage in the wetland	94% cover (CI _{90%} = 88 - 100%)		
Native upland buffer woody species will achieve 40% coverage	74% cover (CI _{80%} = 66 - 82%)		
Non-native species will not exceed 20 percent coverage in each forested, scrub-shrub wetland, and upland buffer communities	Forested and Scrub-shrub wetland	3% cover	Herbicide application in May, June, and July of 2010. Mechanical weed control in Sept. 2010.
	Upland Buffer	10% cover	

Report Introduction

This report summarizes Year-4 of 10 monitoring activities evaluating final year (Year-10) standards at the State Route (SR) 509/I-5 Freight and Congestion Relief (AMB Property) Mitigation Site. Included are a site description, the performance standards, an explanation of monitoring methods, and an evaluation of site success. Monitoring activities in 2010 include vegetation surveys and photo-documentation on July 13th, assessments of wetland hydrology in February 24th and March 10th and 23rd, and a wetland delineation on March 10th.

² Estimated values are presented with their corresponding statistical confidence interval. For example, 94% cover (CI_{90%} = 88 – 100%) means that we are 90% confident that the true aerial cover value is between 88 and 100%.

What is the SR 509 AMB Property Mitigation Site?

This 4.0-acre mitigation site (Figure 1) compensates for loss of 0.43 (0.32 acre for Corps) acre of wetland and 2.34 acre of wetland buffer due to an extension of SR 509 to improve connectivity to regional highways. The remaining 0.76 acres of buffer needed for compensation (for a total of 3.10 acres) have been mitigated for by the Des Moines Creek Basin Plan. Mitigation includes 0.63 acre of wetland re-establishment, 0.33 acre of wetland enhancement, and 2.01 acre of enhanced upland buffer. The mitigation site is just south of the Seattle-Tacoma International Airport. To alleviate concerns that the wetland will attract waterfowl, flocking birds, and raptors that might disrupt flight paths causing air traffic safety risks, open water was not planned and has not developed on this site.

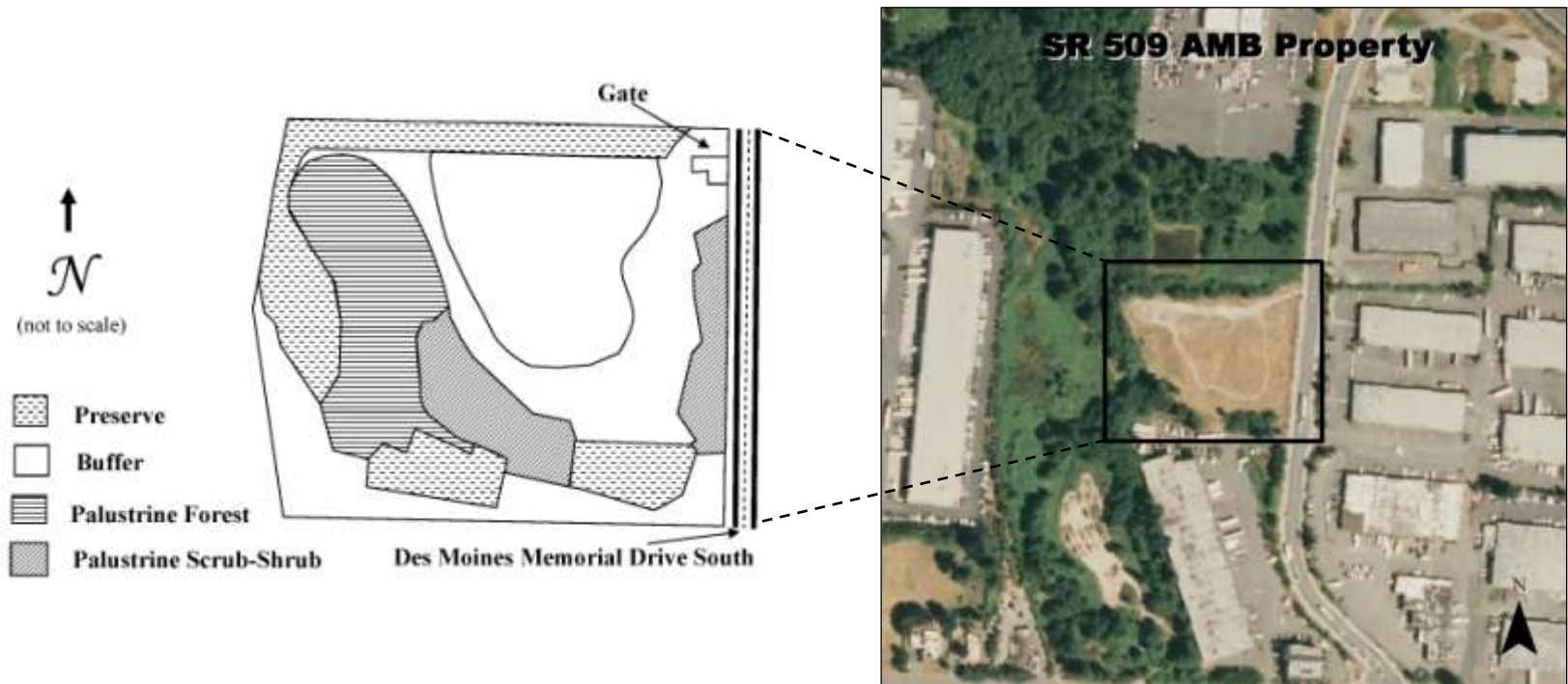


Figure 1 Site Sketch

The SR 509 Freight and Congestion Relief Project Mitigation Site includes forested and scrub-shrub wetlands, areas of wetland preservation, and a wetland buffer. Appendix 1 includes site directions.

What are the performance standards for this site?

Performance Standard 1

The wetland areas will be delineated using current methods to assure that the mitigation site contains 0.63 acre of new wetland.

Performance Standard 2

Native facultative or wetter woody species will achieve 75% coverage in wetland.

Performance Standard 3

Native upland buffer woody species will achieve 40% coverage.

Performance Standard 4

Non-native invasive species, to include reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus spp.*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Polygonum spp.*), and thistle sp. (*Cirsium sp.*) will not exceed 20 percent coverage in each forested and scrub-shrub wetland and upland buffer community.

Appendix 1 provides the complete text of the performance standards for this project, and Appendix 4 shows the planting plan (Peters 2005).

How were the performance standards evaluated?

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). Eleven permanent hydrology pit locations were established in Year-1 of monitoring and recorded on a map (Appendix 3, Figure 3). During each monitoring visit, visual observations are made to determine the extent of inundation and surface saturation. Depth and location of standing water is recorded. At each pit location, in the absence of inundation or surface saturation, subsurface observations are made.

To evaluate standards for vegetative cover, a baseline was established from east to west through the site (Figure 2). Thirteen sampling transects were randomly placed perpendicular to the baseline. The line intercept method was used to estimate woody cover in the wetland and the buffer (Performance Standards 2 and 3).

Aerial cover of invasive vegetation across the site was estimated qualitatively due to the low amount observed at the time of the site visit (Performance Standard 4).

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

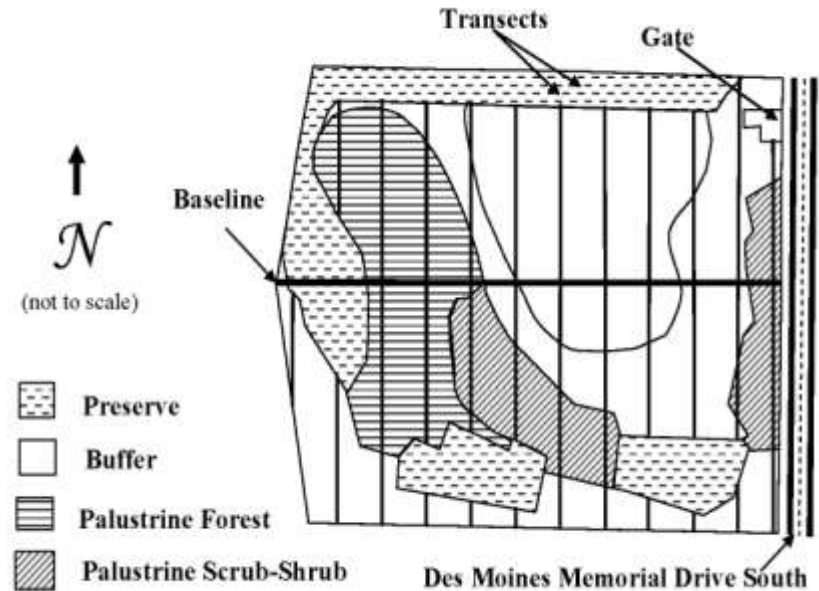


Figure 2 Site Sampling Design (2010)

Is this site a success?

This is a very successful mitigation site. The site is currently in Year-4 of 10 in the monitoring schedule and has met the Year 10 performance standards two years in a row. The scrub-shrub and forested wetland areas and the buffer have developed into dense and diverse communities.

Wetland functions are supported by the successful achievement of the performance standards. The vegetation onsite slows the water velocity. The several low areas on the site temporarily store flood/stormwater during the rainy season allowing toxicants and nutrients to settle out with the sediment.

Due to this site's proximity to Sea-Tac International Airport, there was some concern regarding wildlife on the site. There have been many bird species observed on site, but none that had a high relative hazard score as outlined in Appendix A of the SR 509/I-5 Freight and Congestion Relief Project Final Wetland Mitigation Report.

There have been many invasive species observed on the mitigation site and WSDOT has continued to manage for these species with herbicide and by mechanical means.

Results for Performance Standard 1

(0.63 acre of new wetland):

A delineation conducted on March 10th, 2010 indicates the total wetland acreage on site is 2.56 acres (1.6 acres more than planned). The intended 0.63 acre of re-establishment (formerly called created) wetland area falls within the delineated area. Hydrology data was also collected in 2010. Three visits to the site occurred in February and March and eleven pit locations were observed (Appendix 3, Table 1). The only pit location that did not have saturation or inundation in the upper 12” was pit #7 on the March 23rd site visit. This could be due to a couple of factors including the location of the pit (on a slope in between the buffer and the wetland) or to the lack of rainfall in the several days preceding the site visit (Appendix 3, Table 2).

Results for Performance Standard 2

(75% cover of FAC and wetter species in the wetland):

Aerial cover of FAC and wetter woody species in the scrub-shrub and forested wetland zones is 94% cover (CI_{90%} = 88 - 100%) (Photo 1). This exceeds the final year standard. The dominant species in the wetland include willows (*Salix* spp.) and Oregon ash (*Fraxinus latifolia*). Tree height is estimated at approximately three to five meters.

Results for Performance Standard 3

(40% cover of upland woody species in the buffer):

Aerial cover of native woody species in the upland buffer zone is 74% cover (CI_{80%} = 66 - 82%). This exceeds the final year standard. Dominant species in this zone include willows (*Salix* spp.), hardhack (*Spiraea douglasii*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). The tree and shrub heights range from approximately 0.5 to 3 meters tall (Photo 2 – next page).



Photo 1
Woody cover in the wetland (July 2010)



Photo 2
Woody cover in the buffer (July 2010)

Results for Performance Standard 4

(Non-native invasive species will not exceed 20% cover in each forested and scrub-shrub wetland and upland buffer community):

The scrub-shrub and forested wetlands are qualitatively estimated to have three percent cover. The buffer is estimated at having ten percent cover. This amount is slightly higher in the buffer due to many of the invasive species encroaching from the edge of the site. Species observed on site include Himalayan blackberry (*Rubus armeniacus*), cutleaf blackberry (*Rubus*

What is planned for this site?

The region has plans to remove garbage on the neighboring property. Weed control will continue through the 2011 growing season. Monitoring will see if the site has achieved the final year standards for the third consecutive year in 2011 (Year-5) monitoring.

laciniatus), Japanese knotweed (*Polygonum cuspidatum*), Scotch broom (*Cytisus scoparius*), reed canarygrass (*Phalaris arundinacea*), poison hemlock (*Conium maculatum*), and thistles (*Cirsium* spp.). Evidence of repeated weed control was observed during the site visit (Photo 3).



Photo 3
Treated knotweed on the edge of the site (July 2010)

Appendix 1 – Goals and Performance Standards

The following excerpt is from the *SR 509/I-5 Freight and Congestion Relief Project Detailed Wetland Mitigation Plan* (WSDOT Northwest Region Environmental Services 2006). The performance standards addressed this year and the standards for Year-10 are identified in **bold** font.

GOALS AND OBJECTIVES

The performance measures and success standards in this report are to assure wetland creation and enhancement for the Corps, the Washington Department of Ecology and local jurisdictions. They will also assure compliance with Section 404 Permits, Section 401 Water Quality Certification and local critical area regulations.

WSDOT will meet the following objectives by achieving the stated success standards. Performance measures will be used to verify that the mitigation is on track to achieve the success standards. Both of the objectives apply to the wetland re-establishment and enhancement areas on the AMB site. Objective 2 – vegetation also applies to the buffer on the AMB site.

Objective 1 – Hydrology

The AMB wetland re-establishment site will provide ground or surface water inundation or saturation sufficient to support the wetlands.

Performance Measures

Years 1-7

The soils will be saturated to the surface, or standing water will be present in a monitoring well at 12 inches below the surface or less, for a consecutive number of days greater than or equal to 12.5% of the growing season during a normal year. Wetland hydrology will be determined using indicators of wetland hydrology, as listed in the Washington State Wetlands Identification and Delineation Manual (Ecology 1997).

Year 5

The wetland areas will be delineated using current methods to assure that the mitigation site contains 0.63 acre of new wetland.

Success Standards

Year 10

The wetland areas will be delineated using current methods to assure that the mitigation site contains 0.63 acre of new wetland.

Objective 2 – Vegetation

The AMB mitigation site will include 0.63-acre wetland re-establishment, 0.33 acre of wetland enhancement, and 2.01 acres of buffer enhancement. Each area will be monitored and evaluated separately. Note: colonizing vegetation will be included in this coverage calculation.

Performance Measures

Year 1

The vegetation will achieve 100% survival of planted woody species at the end of the first year plant establishment period. If all dead woody species are replaced, the success standard will be met.

Non-native invasive species, to include reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus spp.*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Polygonum spp.*), and thistle sp. (*Cirsium sp.*) will not exceed 20 percent coverage in each forested and scrub-shrub wetland and upland buffer community. If coverage by native plant species falls below 80 percent of the performance measure, then contingency actions shall be implemented and the invasive species list shall be evaluated to determine if additional invasive species should be controlled. If Japanese knotweed is found at the mitigation site during monitoring, WSDOT will promptly remove the stems above ground and chemically treat it to facilitate elimination of below ground roots and rhizomes.

Year 3

The native woody species will maintain a density of four plants per 100 square feet.

Non-native invasive species, to include reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus spp.*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Polygonum spp.*), and thistle sp. (*Cirsium sp.*) will not exceed 20 percent coverage in each forested and scrub-shrub wetland and upland buffer community. If coverage by native plant species falls below 80 percent of the performance measure, then contingency actions shall be implemented and the invasive species list shall be evaluated to determine if additional invasive species should be controlled. If Japanese knotweed is found at the mitigation site during

monitoring, WSDOT will promptly remove the stems above ground and chemically treat it to facilitate elimination of below ground roots and rhizomes.

Year 5

Native facultative or wetter woody species will achieve 35% coverage.

Native upland buffer woody species will achieve 30% coverage.

Non-native invasive species, to include reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus spp.*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Polygonum spp.*), and thistle sp. (*Cirsium sp.*) will not exceed 20 percent coverage in each forested and scrub-shrub wetland and upland buffer community. If coverage by native plant species falls below 80 percent of the performance measure, then contingency actions shall be implemented and the invasive species list shall be evaluated to determine if additional invasive species should be controlled. If Japanese knotweed is found at the mitigation site during monitoring, WSDOT will promptly remove the stems above ground and chemically treat it to facilitate elimination of below ground roots and rhizomes.

Year 7

Native facultative or wetter woody species will achieve 50% coverage.

Native upland buffer woody species will achieve 40% coverage.

Non-native invasive species, to include reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus spp.*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Polygonum spp.*), and thistle sp. (*Cirsium sp.*) will not exceed 20 percent coverage in each forested and scrub-shrub wetland and upland buffer community. If coverage by native plant species falls below 80 percent of the performance measure, then contingency actions shall be implemented and the invasive species list shall be evaluated to determine if additional invasive species should be controlled. If Japanese knotweed is found at the mitigation site during monitoring, WSDOT will promptly remove the stems above ground and chemically treat it to facilitate elimination of below ground roots and rhizomes.

Success Standards

Year 10

Native facultative or wetter woody species will achieve 75% coverage in wetland.

Native upland buffer woody species will achieve 40% coverage.

Non-native invasive species, to include reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus spp.*), Scotch broom (*Cytisus scoparius*), Japanese knotweed (*Polygonum spp.*), and thistle sp. (*Cirsium sp.*) will not exceed 20 percent coverage in each forested and scrub-shrub wetland and upland buffer community. If coverage by native plant species falls below 80 percent of the success standard, then contingency actions shall be implemented and the invasive species list shall be evaluated to determine if additional invasive species should be controlled. If Japanese knotweed is found at the mitigation site during monitoring, WSDOT will promptly remove the stems above ground and chemically treat it to facilitate elimination of below ground roots and rhizomes.

Monitoring Plan

All wetland re-establishment, wetland enhancement and buffer enhancement areas will be monitored for a minimum of ten years or until all success standards have been achieved. Formal monitoring procedures will be performed in years one, three, five, seven, and ten after initial acceptance of the mitigation construction. Report submittals will occur for each formal monitoring year. Monitoring reports will be submitted to the Corps, Ecology and the City of SeaTac for review and comment.

WSDOT staff will monitor the re-establishment, rehabilitated and enhanced wetland and buffer areas to determine if the performance measures and success standards have been met. Successful mitigation will be measured by attainment of the success standards described in this mitigation plan document. If the performance measure or success standards have not been met, the management plan will be altered to achieve the final success standards. Monitoring will cease as soon as all success standards have been attained.

WSDOT's Environmental Affairs Office Monitoring Group completes a report summarizing monitoring for each wetland mitigation site within the Northwest Region requiring monitoring for that year. Examples of past monitoring of wetlands can be found in the annual monitoring reports for WSDOT's Northwest Region (WSDOT 2001b and 2002). These reports include a detailed description of monitoring methods employed. Each year these methods are adjusted slightly to improve the objectivity and effectiveness of the analysis.

Maintenance Plan

WSDOT will maintain the site for 10 years, unless all success standards are met and the site is closed with the approval of the regulatory agencies. Included in the maintenance program will be weeding, mulching, and plant replacement. If Japanese knotweed is found at the mitigation site during monitoring, WSDOT will promptly remove the stems above ground and chemically treat it to facilitate elimination of below ground roots and rhizomes.

All aspects of the long-term maintenance related to wildlife hazards to aircraft will be included within the Wildlife Hazard Management agreement between WSDOT and the Port of Seattle.

Contingency Plan

Depending on the analysis of the data collected during mitigation monitoring, it may be necessary to implement contingency measures to ensure that the original goals and objectives of the project are met. Several factors, both man-made and natural, could have a detrimental effect on the success of the mitigation. Table 8 lists the components of wetland mitigation, related factors with potential adverse effects on the wetlands, and contingencies to ensure success of the project. No contingency plan can foresee all problems and their solutions. In all cases, if a more effective remedy is identified, it would be considered.

Any application of contingency plans within 10,000 feet of the airport must meet FAA (2004) Advisory Circular 150/5200-33A “Hazardous Wildlife Attractants on or near Airports” and the Port of Seattle’s Wildlife Hazard Management Plan for Sea-Tac International Airport (2000) guidelines. WSDOT and the Port of Seattle have developed a draft Wildlife Hazard Management Agreement addressing wildlife management on the mitigation site and will approve a final version shortly. Implementation of the final Wildlife Hazard Management Agreement will discourage select species of wildlife from using the site. These species tend to include large birds, flocking birds and large mammals. Wildlife hazard management falls into two categories: immediate threats and chronic problems. Immediate threats typically involve individuals or individual flocks; WSDOT and the Port of Seattle will typically use harassment to remove these threats. In some instances, site alteration (grading or vegetation removal) may be necessary to remove immediate threats. WSDOT and the Port of Seattle will address all immediate threats that involve air traffic safety, and should alteration of the site occur will subsequently notify regulatory agencies, such as the Corps of Engineers and the Department of Ecology. Chronic problem resolution typically involves alteration of the site to remove wildlife

Appendix 2 – Methods

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). Eleven permanent hydrology pit locations were established in Year-1 of monitoring and recorded on a map. During each monitoring visit, visual observations are made to determine the extent of inundation and surface saturation. Depth and location of standing water is recorded. At each pit location, in the absence of inundation or surface saturation, subsurface observations are made.

To assess vegetation standards, a 124-meter baseline was established from east to west through the site. Thirteen temporary sampling transects were placed perpendicular to the baseline using a restricted random sampling method (Figure 2). Aerial cover of woody species in the wetland zone (Performance Standard 2) was assessed using the line intercept method. Sixteen 15-meter line-segment sample units were randomly positioned along the sampling transects in this zone. Aerial cover of woody species in the upland buffer zone (Performance Standard 3) was assessed using the line intercept method as well. Seventeen 15-meter line-segment sample units were randomly positioned along the sampling transects in this zone.

Aerial cover of invasive species was qualitatively estimated per zone due to the low amount of cover observed at the time of the site visit (Performance Standard 4).

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 2 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

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

Appendix 3 – Data Table

Table 1 2010 Hydrology Data

Date of visit	Surface observation	Sub-surface Observations	
February 24, 2010	Hydrology was observed in all intended areas. The PSS near the fence was a bit drier than the rest of the site. The mulch layer is very thick, but when scraped away, the soil was saturated in most places.	Pit 1	Standing water at 3"
		Pit 2	Saturated to the surface
		Pit 3	Inundated to 1.5"
		Pit 4	Standing water at 9"
		Pit 5	Standing water at 10"
		Pit 6	Standing water at 9.5"
		Pit 7	Standing water at 12"
		Pit 8	Saturated to the surface
		Pit 9	Inundated to 3"
		Pit 10	Inundated to 1.5"
		Pit 11	Standing water at 5.5"
March 10, 2010	Wetland hydrology observed in all intended areas including much of the buffer. Extent of surface saturation difficult to determine due to depth of mulch. Very little of the site was inundated.	Pit 1	Standing water at 4"
		Pit 2	Standing water at 7"
		Pit 3	Saturated to the surface
		Pit 4	Standing water at 11"
		Pit 5	Standing water at 10"
		Pit 6	Standing water at 10"
		Pit 7	Standing water at 12"
		Pit 8	Saturated to the surface
		Pit 9	Inundated 1.5"
		Pit 10	Saturated to the surface
		Pit 11	Standing water at 7"

March 23, 2010	Hydrology was observed in nearly all intended locations. The amount of surface water on site this visit was less than the last two visits.	Pit 1	Standing water at 14" and saturation at 5"
		Pit 2	Standing water at 14" and saturation at 4" after 34 minutes
		Pit 3	Saturated to the surface
		Pit 4	No standing water after 30 minutes but saturation from 4" to 8"
		Pit 5	Standing water at 12" and saturation at 4" after 30 minutes
		Pit 6	Standing water at 11" immediately
		Pit 7	No standing water or saturation after 30 minutes
		Pit 8	Standing water at 7" immediately
		Pit 9	Saturated to the surface
		Pit 10	Saturated to the surface
		Pit 11	Standing water at 17" and saturation at 3" after 30 minutes

Table 2 Daily rainfall for the month of March 2010 from weather station MKSEA in Seatac, WA.

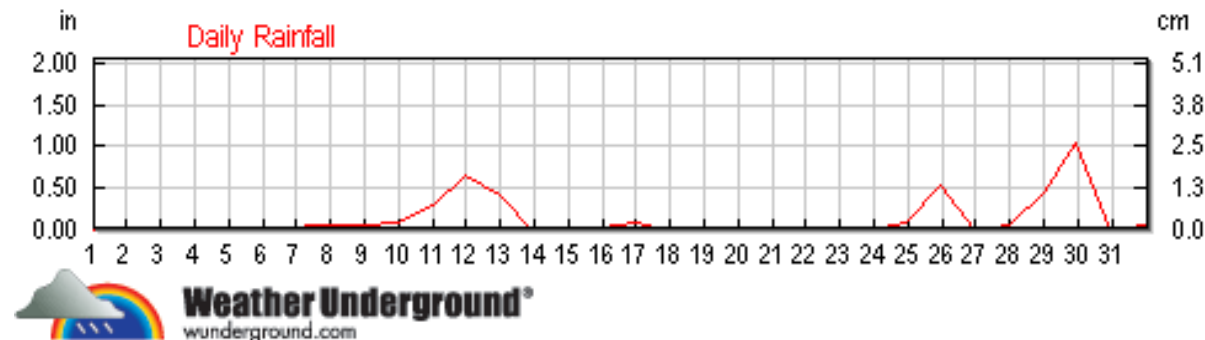
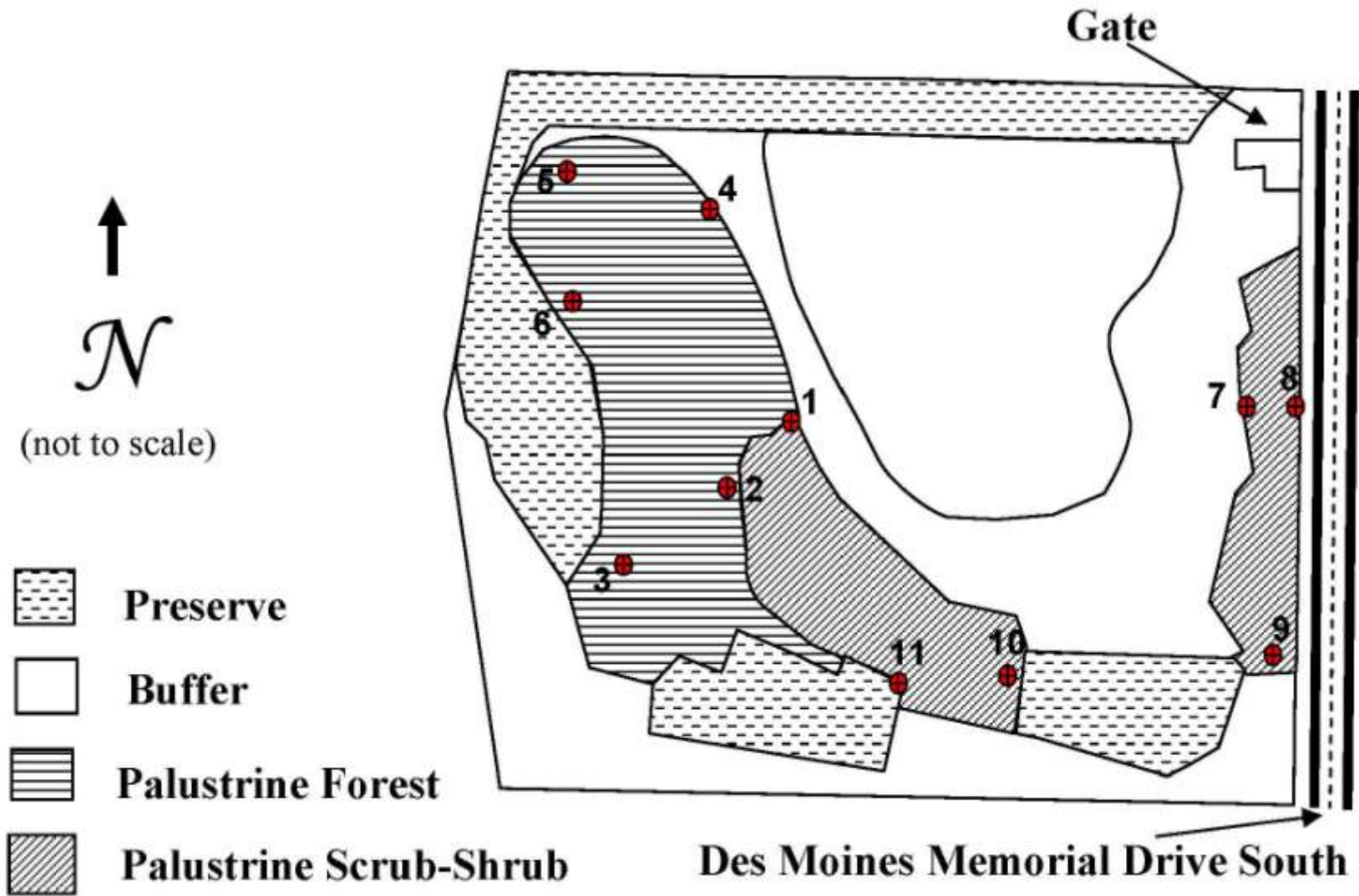
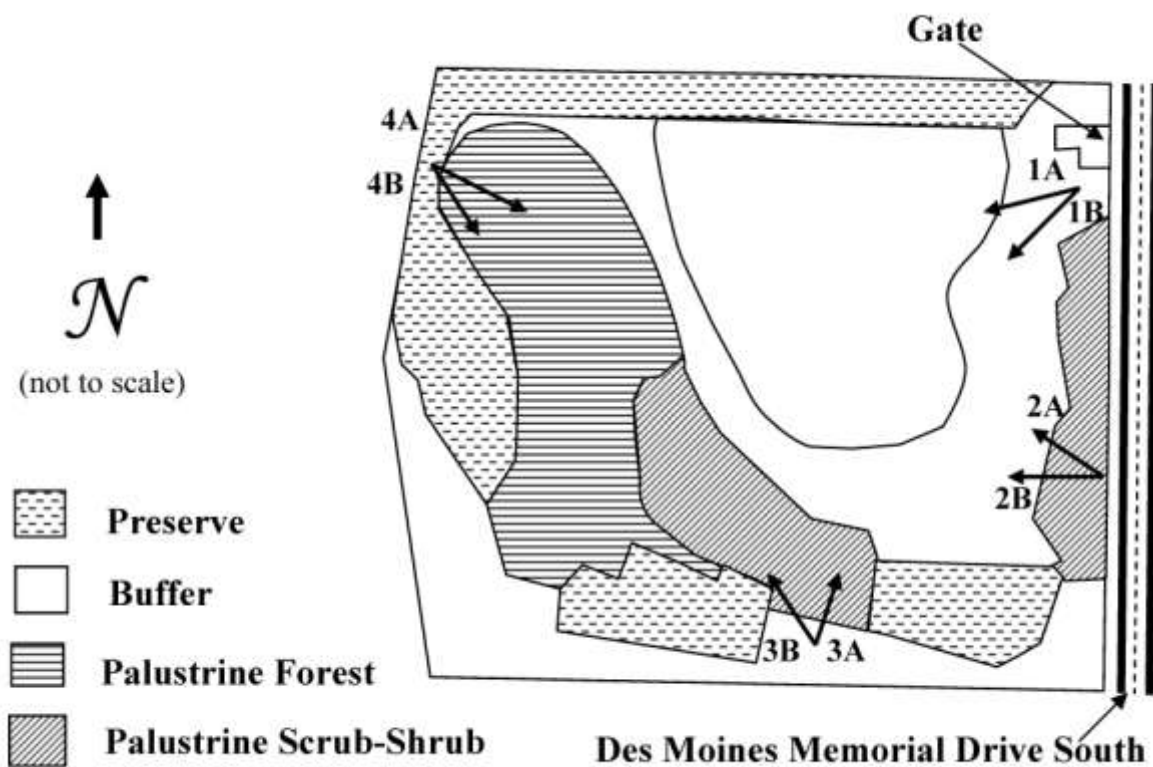


Figure 3. Hydrology Pit Map



Appendix 5 – Photo Points



The photographs below were taken from permanent photo-points on July 13, 2010 and document current site development.



Photo Point 1a



Photo Point 1b



Photo Point 2a



Photo Point 2b



Photo Point 3a



Photo Point 3b



Photo Point 4a



Photo Point 4b

Literature Cited

1. Ecology. See Washington State Department of Ecology.
2. Peters, D. 2005. SR 509/I-5 Freight and Congestion Relief Project Planting Plan. Washington State Department of Transportation, Northwest Region, Seattle, WA.
3. United States Army Corps of Engineers. 2005. Department of the Army Permit Number 200500979.
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), Northwest Region Environmental Services. 2006. SR 509/I-% Freight and Congestion Relief Project Mitigation Report. Washington State Department of Transportation, Northwest Region, Seattle, WA.
6. 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>
7. Weather Underground [Internet]. 2010. Weather History Data – Washington State weather stations. Available from: <http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=MKSEA&graphspan=custom&month=10&day=24&year=2010&monthend=10&dayend=25&yearend=2010>