

APPENDIX G: WETLANDS ASSESSMENT

1.0 INTRODUCTION

This Wetlands Assessment has been prepared in accordance with 10 Code of Federal Regulations (CFR) 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements" for the purpose of fulfilling the U. S. Department of Energy's (DOE)/National Nuclear Security Administration's (NNSA) responsibilities under Executive Order 11990, "Protection of Wetlands." Executive Order 11990 requires Federal agencies to minimize the destruction or degradation of wetlands, and to avoid undertaking new construction located in wetlands unless they find there is no practicable alternative to such construction.

Definition of "Wetland" Under 10 CFR 1022.4

Wetland means an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

NNSA, in accordance with 10 CFR 1022, seeks to identify, evaluate, and as appropriate, implement alternative actions that may avoid or mitigate adverse wetlands impacts, and provide early and adequate opportunities for public review of plans or proposals for actions that may affect wetlands. This Wetlands Assessment serves to inform the public of proposed activities that have the potential to affect the wetlands, and to present alternative activities that may avoid or mitigate adverse wetland impacts. The proposed activity has been evaluated for impacts to floodplains, also in accordance with 10 CFR 1022, and has been found to have no impacts on the floodplains identified on the Oak Ridge Reservation (ORR).

Pursuant to Section 401(a)(1) of the Clean Water Act, an application for an Aquatic Resource Alteration Permit (ARAP) was filed with the Tennessee Department of Environment and Conservation (TDEC) for this proposed activity. This also includes §401 Water Quality Certifications. A public notice of that permit application was published on March 31, 2010, providing 30 days review for members of the public to provide comments. A copy of the permit application and associated information may be found at http://tn.gov/environment/wpc/ppo/arap/NRS10_083.pdf. An approved ARAP was received from TDEC on June 10, 2010 (TDEC 2010).

Pursuant to Section 404 of the Clean Water Act, an application for a Department of the Army Permit was filed on March 24, 2010. A public notice of that permit application was published as Public Notice No. 10-13, Application No. 2010-00366, on May 7, 2010. The public notice provided for a 30-day review for members of the public to provide comments. A synopsis of the permit application and associated information may be found at <http://www.lrn.usace.army.mil/cof/notices/PN%2010-13.PDF>. An approved Section 404 Permit from the U.S. Army Corps of Engineers was received on September 2, 2010 (USACE 2010).

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

Two alternatives were analyzed in this assessment: 1) the proposed action, which would support any of the UPF Alternatives proposed in the Site-Wide Environmental Impact Statement for the Y-12 National Security Complex (SWEIS) (DOE/EIS-0387), and 2) the No Action Alternative.

This section also discusses a third alternative (use of an existing road) that was considered but eliminated from detailed analysis.

2.1 Proposed Action

The proposed action includes the development and construction of support facilities located on the ORR, specifically, extension of an existing Haul Road, construction of a Site Access and Perimeter Modification Road, development of a Wet Soils Disposal Area, and excess soil placement at the West Borrow Area. Henceforth, references to the Haul Road extension Corridor (Corridor) include both the Haul Road extension and the Site Access and Perimeter Modification Road. The proposed Corridor would be approximately 1.2 miles in length and 40 feet in width along an existing power line easement north of Bear Creek road, providing a transportation route to western project areas (Wet Soils Disposal Area, West Borrow Area, and construction storage area). The proposed Haul Road extension on the western end of the Corridor would be necessary to link any potential UPF site construction/excavation activities with supporting infrastructure (i.e., a concrete batch plant, construction storage area, and two soils spoil areas) located to the west of the proposed UPF site. The extension would be required to accommodate the number and size of construction vehicles needed on site, as well as safely provide transportation away from occupied roadways. Although the primary use for the Haul Road extension would be for construction activities related to UPF, it could also be used to support other Y-12 activities (e.g., future EM cleanup activities at Y-12). The proposed Site Access and Perimeter Modification Road on the eastern end of the Corridor would be necessary to link employee work areas on the eastern end of the Y-12 site with other work areas located on the western end of Y-12. The proposed Site Access and Perimeter Modification Road would provide safe, direct access for passenger vehicles traversing the site. The proposed action would only be implemented if one of the UPF Alternatives in the SWEIS is selected in the Record of Decision. The existing surface roads within Y-12 provide inadequate capacity and operational safety to support the UPF Project needs.

The proposed Corridor would traverse a number of different habitats including a power-line right-of-way; small, previously disturbed wetlands, streams, and forest; and mowed areas. It extends from the existing Haul Road on the west to the Polaris Parking Lot on the east. The Haul Road extension Corridor project area is shown in Figure 1.

The proposed action avoids resource impacts to the maximum extent possible. The Wet Soils Disposal Area and West Borrow Area (for storage of dry soils) have been identified to minimize environmental impacts within the ORR boundary. Use of these soil storage areas located on the western portion of Y-12 is the preferred alternative based on existing facilities and conditions. For example, the West Borrow Area would be used, in lieu of further disposal at other previously used borrow areas such as the East Borrow Area, which is largely completed, contoured, and in an acceptable state of stable environmental succession and recovery; and to avoid the disturbance of previously undisturbed areas.

Construction associated with the proposed action would disturb wetlands and require the installation of eight culverts, two of which would be installed on blue line streams¹ as depicted on a U.S. Geological Survey (USGS) quad map. The route for the Corridor was chosen to avoid as much wetlands disturbance as possible, while still providing a safe route for heavy construction equipment. The design includes adjusting the horizontal alignment and increasing road slopes to minimize the adverse wetland impacts.

The proposed action would involve the discharge of fill material into wetland areas and tributaries of Bear Creek. All excavation activities would be performed in compliance with associated permits and with the project Storm Water Pollution Prevention Plan (SWPPP) and Best Management Practices. All excavated wetland soils would be managed for use as source material in the corresponding wetland mitigation efforts.

Construction outside wetlands would be performed with standard construction equipment using traditional methods. When possible, a buffer zone would be established and maintained in areas adjacent to existing wetlands or existing streams. Work done within existing wetlands would be done with manual labor in order to minimize adverse wetland impacts. Wetland vegetation would be protected and maintained (ORNL 2009).

Impacts to wetlands would be minimized by routing the roadbed around wetland areas within the Corridor where possible. Wetland loss due to Corridor construction would total 1.0 acres within the Bear Creek watershed. In kind, in place mitigation of this loss is proposed through expansion and/or creation of wetland acreage (3.02 acres) at six locations within the Bear Creek watershed (B&W 2010).

As shown on Figure 2, the proposed Wet Soils Disposal Area is located on the north side of Bear Creek Road at the former Control Burn Study Area. This is a previously disturbed, second growth area containing thick vegetation, and extensive dead and down woody material. The dry soils storage area is proposed for what is currently known as the West Borrow Area. This site is located on the west side of Reeves Road south of Bear Creek Road. The site is an early successional field from which a large amount of soil was previously excavated (ORNL 2009).

2.2 No Action Alternative

Under the No Action Alternative, there would be no Corridor construction, the Wet Soils Disposal Area would not be developed, and excess soil placement at the West Borrow Area would not occur. Conditions at Y-12 would remain unchanged and wetlands would remain unaffected.

¹ This is a standard reference to the required use of USGS Quad maps and that the stream segments are “blue line” indicating that they are perennial streams with continuous flow, not seasonal or wet weather conveyances.



Figure 2. Wet Soils Disposal and West Borrow Areas.

2.3 Alternatives Considered but Eliminated

There is no reasonable alternative to the implementation of the proposed action at Y-12 for a project of the magnitude of UPF. The only alternative to the extension of the Haul Road is the use of existing surface roads, primarily Bear Creek Road. The existing surface roads within Y-12 provide inadequate capacity and operational safety to support the UPF Project needs. In order to safely handle heavy earthmoving truck traffic, Bear Creek Road would need to be widened. This would result in additional impacts to aquatic resources and wetlands in the form of bridge and/or culvert widening or improvement at three Bear Creek crossings. However, widening of Bear Creek Road would not remove the inherent risk of allowing over-sized construction equipment to routinely use the same roadway as passenger vehicles.

The biggest drawback with this alternative is the unacceptable compromise to Y-12 worker and public safety. Construction equipment is expected to include high capacity earthmoving equipment, not authorized or intended for use over public roadways. The transport of hundreds of thousands of cubic yards of material would require thousands of truckloads that would operate continuously for many months. The interface between plant and construction traffic increases the likelihood of an accident. This alternative was rejected due to basic operational limitations in addition to critical site safety and security concerns unique to Y-12 (B&W 2010).

3.0 WETLANDS DESCRIPTION

Wetlands associated with the UPF project were determined and delineated according to Army Corps of Engineers' wetland delineation protocols (USACE, 1987). To be considered a jurisdictional wetland, a site must meet the necessary hydrology, soils, and wetland vegetation criteria. For each wetland plant community type, the dominant plant species and their abundance were noted, and bore holes were dug to evaluate and characterize the soils and hydrology of the site. Wetland locations were mapped with a high-accuracy Trimble GPS unit and accompanying software.

The wetland vegetation criterion is met if more than 50 percent of the dominant species within each stratum (trees, shrubs, woody vines, herbs) are hydrophytic. To make this determination, species are assigned an indicator status based on the USFWS National List of Plant Species that Occur in Wetlands: 1988 National Summary.

Soil samples were extracted at multiple locations using a post-hole shovel to characterize the wetland sites and to assist in determining appropriate wetland boundaries. Each soil sample was examined for soil color and texture. The presence of mottles, manganese concretions, high organic content, and other indicators of hydric soil status was also examined. The sites were examined for primary and secondary indicators of wetland hydrology. The presence and depth of surface water, as well as the soil saturation and depth to free water in the soil-boring hole was evaluated. The presence of watermarks, drift lines, oxidized root channels, water-stained leaves, and other indicators of wetland hydrology were also noted.

3.1 Haul Road Extension Corridor

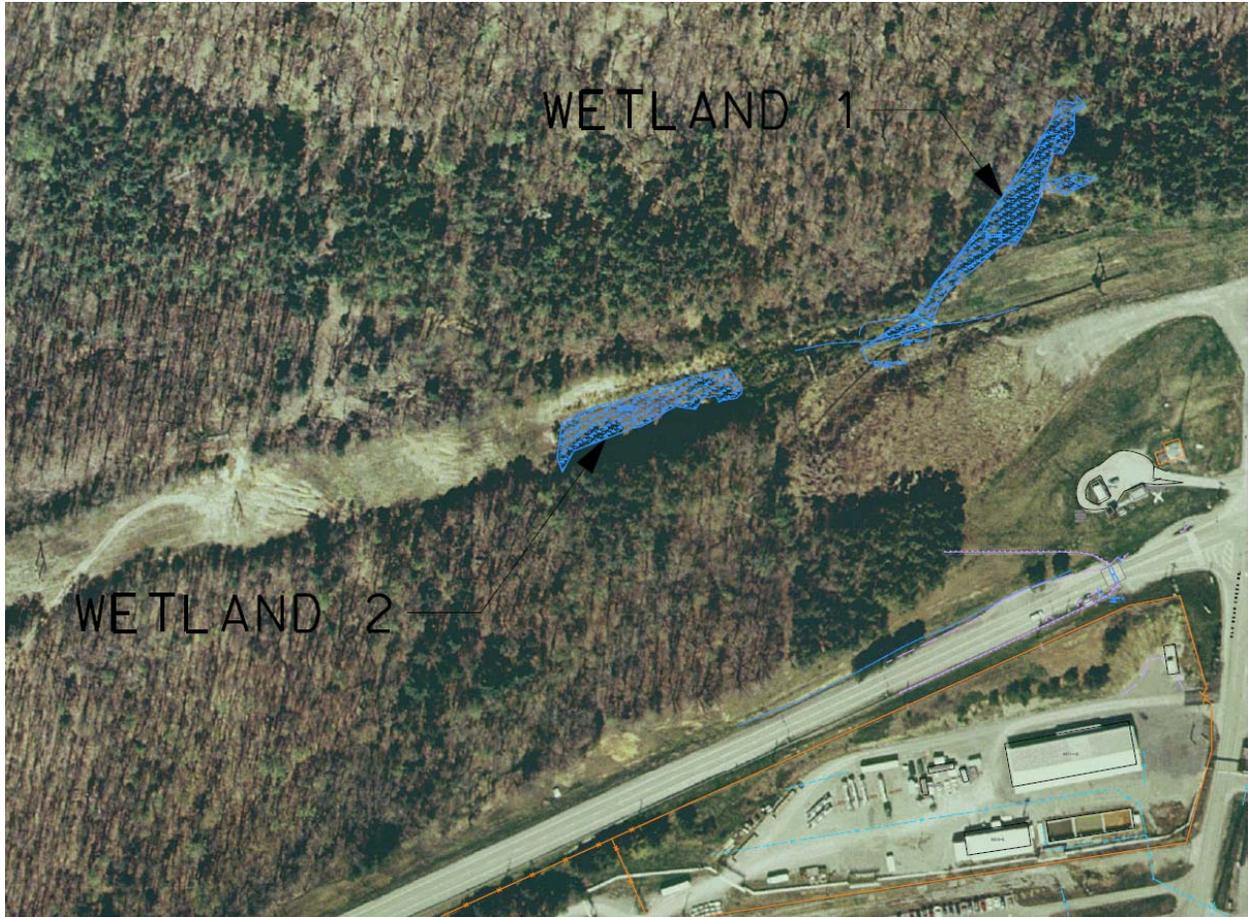
The existing Haul Road traverses a series of rolling hills with some steep slopes. The western portion of the proposed Corridor (labeled Haul Road extension in Figure 1) would travel along a power line corridor bordered on the north and south by forested areas. The corridor itself in this area contains old field habitat with a mixture of shrubs and herbaceous vegetation. This portion of the proposed extension also contains five wetland areas, as well as streams. The eastern portion of the Corridor (labeled Site Access and Perimeter Modification in Figure 1) traverses mainly mowed grassy areas that contain four wetland areas (ORNL 2009).

Wetlands along the Corridor provide important habitat for amphibian species. Of particular note are Wetlands 1 and 2 (Figure 3). Wetland 1 has a large pond that supports a good population of red-spotted newts (*Notophthalmus viridescens viridescens*) and several anuran (frog) species. Wetland 2 has a pond at its west end that also supports a good population of red-spotted newts and larval marble salamanders (*Ambystoma opacum*) (ORNL 2009).

Wetland 1 is northeast of Wetland 2 (Figure 3). This wetland consists of a large ponded area with wetland plant species on its fringes. The wetland is approximately 0.34 acres in size. Most of the wetland plants are concentrated on the south end of the pond and include small carpgrass (*Arthraxon hispidus*), rice cutgrass, cattail and long-beaked arrow-head. The northernmost end of the wetland includes a forested area. An intermittent stream flows out of the south end of the wetland and runs to the west into a large kudzu (*Pueraria lobata*) patch. No rare plant species were found during the survey of this area (ORNL 2009).

Wetland 2 is a rectangular wetland located just south of the proposed Haul Road extension route (Figure 3). This wetland has a ponded area at its west end. The wetland is approximately 0.24 acres in size. Much of this wetland is dominated by tearthumb. Other plants in this wetland include cattail (*Typha sp.*), long-beaked arrow-head (*Sagittaria australis*), rice cutgrass, umbrella sedge (*Cyperus strigosus*), beak-rush (*Rhynchospora sp.*), blunt spikerush (*Eleocharis obtusa*) and narrow-leaved sunflower (*Helianthus angustifolius*). Flow out of the southwestern end of this wetland connects to an existing drainage that crosses the power-line to west of this area and into the forest (ORNL 2009).

The western end of the Corridor extending from the existing Haul Road to Wetland 1 includes old field habitat, forest and five scattered wetlands. Figure 4 shows a portion of this area. The old field habitat is contained within the existing power-line corridor. In this corridor are scattered shrubs and herbaceous vegetation. Common shrubs in this area include smooth sumac (*Rhus glabra*), winged sumac (*Rhus copallina*) and eastern red cedar (*Juniperus virginiana*). Also in this area of the power-line corridor are sweetgum (*Liquidamber styraciflua*), tulip poplar (*Liriodendron tulipifera*) and black willow (*Salix nigra*) saplings. Blackberry (*Rubus sp.*) and Japanese honeysuckle (*Lonicera japonica*) are also prevalent in this area. Herbaceous species include goldenrods, other wildflowers and grasses (ORNL 2009).



Source: ORNL 2009.

Figure 3. Wetlands 1 and 2.



Source: ORNL 2009.

Figure 4. West End Haul Road Extension Corridor.

The forest habitat in this area is characterized by white oak (*Quercus alba*), southern red oak (*Quercus falcata*), chestnut oak (*Quercus montana*), tulip poplar, red maple (*Acer rubrum*) and sweetgum. The understory is relatively open and contains saplings of several different species, including beech (*Fagus grandifolia*), red maple, sweetgum, southern red oak and pignut hickory (*Carya glabra*). Also in the understory are flowering dogwood (*Cornus florida*), sourwood (*Oxydendrum arboretum*), black cherry (*Prunus serotina*), common pawpaw (*Asimina triloba*) and lowbush blueberry (*Vaccinium pallidum*). Groundcover in the area is also scattered, and includes Virginia creeper (*Parthenocissus quinquefolia*), Christmas fern (*Polystichum*

acrostichoides), lady fern (*Athyrium filix-femina*), poison ivy (*Toxicodendron radicans*), muscadine (*Vitis rotundifolia*) and striped pipsissewa (*Chimaphila maculata*) (ORNL 2009).

Herbaceous growth includes horse-balm (*Collinsonia canadensis*), Nepal grass (*Microstegium vimineum*), beefsteak plant (*Perilla frutescens*), downy rattlesnake plantain (*Goodyera pubescens*) and little brown jug (*Hexastylis arifolia*). Of note where the Corridor would cut north out of the power-line right-of-way into the forested area are white oaks with exfoliating bark. These trees provide potential roosting habitat for the federally endangered Indiana bat (*Myotis sodalis*). Indiana bats utilize such trees for maternity roosts from approximately mid-May through mid-September. The ORR is within the known range of the Indiana bat (ORNL 2009).

A small constricted wetland (Wetland 6) is present at the west end of the site on the power-line corridor near the New Salvage Yard Road (Figure 5). This wetland is approximately 0.06 acres in size. The wetland contains black willow and some common alder (*Alnus serrulata*) in the overstory. Herbaceous vegetation in this wetland includes rice cutgrass (*Leersia oryzoides*), leafy bulrush (*Scirpus polyphyllus*), tearthumb (*Polygonum sagittatum*), orange jewelweed (*Impatiens capensis*), soft rush (*Juncus effusus*), small-spike false-nettle (*Boehmeria cylindrica*) and dotted smartweed (*Polygonum punctatum*) (ORNL 2009).

Just northeast of Wetland 6 along the power-line right-of-way is Wetland 8 (Figure 5). This wetland is approximately 0.06 acres in size. This is a constricted wetland with an intermittent stream that flows out of the south end across the right-of-way into the adjacent forested area (ORNL 2009).

A more extensive wetland system (Wetland 7) exists further along the power-line right-of-way (Figure 5). This wetland is approximately 0.33 acres in size. The boundaries of this wetland include a portion of the power-line right-of-way, as well as the forested area to the north. The power-line portion of this wetland includes a fairly diverse assemblage of herbaceous species, including leafy bulrush, tearthumb, rice cutgrass, orange jewelweed, horse-balm, and cardinal flower (*Lobelia cardinalis*). This area of the wetland also includes scattered common alders and black willows (ORNL 2009).

The forested portion of the wetland is dominated by common alder, with some red maple and American sycamore (*Platanus occidentalis*). An intermittent stream flows into the northern end of the wetland off of Pine Ridge. The stream corridor continues out the south end of the wetland and through the forested area. It actually connects to an intermittent stream that flows southward out of Wetland 8 (ORNL 2009).

The eastern end of the proposed Corridor from east of Wetland 1 to the Polaris Parking Lot includes mowed areas, four wetlands, limited early successional old field, and some forest. Figure 6 shows a portion of this area (ORNL 2009).



Source: ORNL 2009.

Figure 5. Wetlands 6, 7, and 8.



Source: ORNL 2009.

Figure 6. East End Haul Road Extension Corridor Area.

The majority of the proposed Corridor in this area would traverse the large mowed areas that contain fescue (*Festuca sp.*) and other turf species. There are also a limited number of rarely mowed areas. Fingers of forest extend down off of Pine Ridge into the area of the proposed Corridor. These are mainly younger forested areas. Tree species include chestnut oak, white oak, red oaks (*Quercus sp.*), red maple, sweetgum, tulip poplar, pignut hickory and black gum (*Nyssa sylvatica*).

Shrub species include eastern red cedar, winged sumac and bush honeysuckle (*Lonicera mackii*). Japanese honeysuckle is also present. There is also Christmas fern present in the groundcover in some areas. Fragrant goldenrod (*Solidago odora*) is present on the fringes of the forest (ORNL 2009).

Wetlands 3 and 4 are in a mowed turf grass area of the proposed Corridor (Figure 7). These wetlands are approximately 0.10 and 0.34 acres in size, respectively. The two wetlands are split by the current road that runs through the area. Both wetlands have significant patches of black willow and cattail. Wetland 3 also has rice cutgrass, small hop sedge, soft rush and umbrella sedge. Wetland 4 is somewhat more diverse with rice cutgrass, blunt spikerush, small carpgrass, bushy seedbox (*Ludwigia alternifolia*), umbrella sedge (*Cyperus flavescens*), wool-grass (*Scirpus cyperinus*) and cardinal flower (ORNL 2009).

One of the wooded areas includes a wetland (Wetland 5) (Figure 7). This wetland is approximately 0.05 acres in size. This is a ravine that extends down from Pine Ridge. This ravine contains a spring that feeds an intermittent stream which flows down to Wetland 5. Upland areas of the ravine contain mainly young second growth forest with a mixture of native and non-native trees and shrubs (ORNL 2009).

Trees include sweetgum, tulip poplar and scrub pine (*Pinus virginiana*). Shrubs include autumn olive (*Elaeagnus umbellata*), thorny olive (*Elaeagnus pungens*), winged sumac and Japanese barberry (*Berberis thunbergii*). Blackberry and Japanese honeysuckle are also present. Lady fern is present in the groundcover. Herbaceous species include Nepal grass, crown vetch (*Coronilla varia*), Sericea lespedeza (*Lespedeza cuneata*) and Canada goldenrod (*Solidago canadensis*). Tree species in the wetland portion of the ravine include eastern cottonwood (*Populus deltoides*), red maple, black willow, American sycamore and common alder. Other plant species in the wetland include cattail, cardinal flower, soft rush, *Scirpus sp.*, chufa (*Cyperus exculentus*), late-flowering thorough-wort (*Eupatorium serotinum*), willow-herb (*Epilobium sp.*), small carpgrass, bushy seedbox and dotted smartweed (ORNL 2009).

Wetland 9 is a previously flagged wetland just northwest of the Polaris Parking Lot (Figure 7). This wetland is approximately 0.06 acres in size. The wetland has a shallow ponded area with limited wetland vegetation on the fringes. Wetland species include common alder, black willow and late flowering thorough-wort. Additional plant species surrounding this wetland also include red maple, American beech, sweetgum, blackberry and lady fern. There is also a large patch of kudzu directly adjacent to the wetland on the east side. A drainage channel flows southward out of this wetland for a short distance along the existing road. No rare plant species were found during the survey of this area (ORNL 2009).



Source: ORNL 2009.

Figure 7. Wetlands 3, 4, 5, and 9.

3.2 Wet Soils Disposal Area and West Borrow Area

The Wet Soils Disposal Area is located at the former Control Burn Study Area on the north side of Bear Creek Road and bordered by the existing Environmental Management Waste Management Facility (EMWMF) Haul Road to the north. The site is mainly second growth woods with significant amounts of dead and down woody material. Figure 8 shows a portion of this area. No wetlands were found within the area. The West Borrow Area, proposed for storage of dry soils, is an early successional field containing mainly herbaceous plant species. No wetlands were found within the area. Figure 9 shows a portion of this area (ORNL 2009).



Source: ORNL 2009.

Figure 8. Wet Soils Disposal Area.



Source: ORNL 2009.

Figure 9. West Borrow Area.

4.0 POTENTIAL IMPACTS TO WETLANDS

This section discusses the potential impacts of the proposed action on the wetlands. The impact assessment focuses on the survival, quality, and function of the wetlands. Mitigation measures are also discussed.

Project impacts from the construction of the Corridor would be minimized through avoidance of wetlands by routing the roadbed around wetland areas within the Corridor and wetland expansion and creation. Avoidance was utilized in project design and roadway alignment allowing the complete avoidance of Wetland 9 and minimal loss at high quality Wetlands 1 and 2 (0.08 and 0.03 acres lost respectively). Unavoidable complete wetland loss would occur at Wetlands 3, 4, and 5. These wetlands are primarily man-made from prior Y-12 development and considered to be relatively low in quality and function (B&W 2010).

The Wet Soils Disposal Area includes approximately 16.6 acres of property previously used for a controlled burn demonstration and pine reforestation project. The site is highly disturbed and would be used to disposition the wet and/or saturated soils that are expected to be encountered during initial site preparation and from the UPF foundation excavation. Wet soils would be placed at the site and graded according to the planned design for the area after necessary drying. The West Borrow Area is an 18.3 acre site that previously served as the source of clay for Y-12 landfill cap projects. This site would be utilized, as necessary, for the placement of excess soil from the UPF project with moisture content satisfactory for compaction (B&W 2010).

All areas identified for excavation as part of the UPF Project are undergoing characterization. This characterization utilizes a MARSSIM (Multi-Agency Radiation Survey and Site Investigation Manual) based sampling plan. Based on a review of historical land use for the Corridor and wetland development areas, no waste disposal areas have been identified. Soil samples from the Corridor and wetland development areas would be collected and evaluated to confirm the results of the land use review. Analysis of the soil samples would include cadmium, mercury, PCBs, cesium 137, thorium 232, uranium (total), uranium 235, and uranium 238. No contaminated soil is anticipated to be encountered at the Corridor or wetland development areas (B&W 2010).

4.1 Haul Road Extension Corridor

The designed alignment for the proposed Corridor generally follows the power line easement, which would mitigate impacts to the sensitive forest habitat found to the north and south of the power line. The Corridor would necessarily cross some headwater areas of small unnamed tributaries to Bear Creek, some of which contain wetlands. It is anticipated that the Corridor construction would result in the loss of 1.0 acre of wetlands (a total comprising all or parts of 8 separate locations), and put 2 small stream segments [approximately 188 feet of North Tributary 2 (NT-2) and approximately 100 feet of an unnamed tributary of NT-2] within culverts. A portion of these proposed segments are currently within culverts. The use of the Wet Soils Disposal Area and the West Borrow Area is not anticipated to impact wetlands or streams (B&W 2010).

The scope and sequencing of the project related to wetlands would be included as part of Corridor construction excavation, with saving of wetland soils and seed bank where possible, and construction of earthen dams or weirs (a fixed or adjustable water level or flow control device) to ensure portions of wetlands not directly within the road footprint are not negatively affected. Some of these dam structures would be used to help retain water for the wetland mitigation sites near the Corridor. Grading activities necessary for wetland creation would also be conducted in concert with the proposed action. All impacted and non-impacted areas would be protected through erosion control and best management practices described in the project SWPPP. Near the Wet Soils Disposal Area, Wetland 11 would be constructed concurrent with the development and installation of the Wet Soils Disposal Area. Wetland 10 would be created following completion of UPF excavation activity, and reclamation, recontouring, and closure of the Wet Soils Disposal Area (B&W 2010).

Two impacted first order streams (NT-1 and NT-2) contain fish and benthic macroinvertebrates typical of small streams on the ORR. The fish, including blacknose dace and creek chubs, are found in small numbers in both stream sections where culverts are planned. Although these stream sections are potential Tennessee dace habitat, this species was not encountered in the planned culvert areas during the February and June 2010 surveys. One individual was collected downstream of the Corridor footprint (B&W 2010).

An important priority in defining appropriate wetland mitigation is to restore wetlands near the site of wetland loss whenever possible. However, wetland restoration opportunities were found to be limited near the impacted area. To mitigate the wetland loss associated with the UPF project, 4 of the 8 wetlands impacted by the project would be expanded further "upstream" of the present wetlands, totaling an additional 1.22 acres of wetland created. Two additional large wetlands of 0.73 and 1.07 acres would be created near the Wet Soils Disposal Area. Total acreage of planned mitigation wetlands is 3.02 acre (B&W 2010).

The western end of the Corridor (Haul Road extension section) from the existing Haul Road to Wetland 1 includes old field, forest and wetland habitat. The proposed route of the Corridor in this area would take it through or adjacent to five wetlands. The combined acreage of these wetlands is almost 1 acre. Direct disturbance and sedimentation into streams are two potential impacts. Disturbance to Wetlands 1 and 2, in particular, have the potential to impact amphibian populations (B&W 2010).

The eastern end of the Corridor (Site Access and Perimeter Modification section) extending from east of Wetland 1 to the Polaris Parking Lot includes mowed areas, wetlands, limited early successional old field, and some forest. The greatest acreage in this area of the Corridor is in mowed turf grasses. There is the potential for the disturbance and/or loss of four wetland resources along this portion of the Corridor. The combined acreage of these four wetlands is approximately 0.5 acre (B&W 2010).

4.2 Wet Soils Disposal Area and West Borrow Area

No wetlands were found within these areas and the proposed action would not result in any wetland impacts.

4.3 Mitigation

4.3.1 Wetland Mitigation

Applicable wetland mitigation requirements specify a desired 2:1 ratio for wetland restoration, a 4:1 ratio for wetland creation or enhancement, and a 10:1 ratio for wetland preservation. Alternatively, an applicant may propose and utilize best professional judgment ratios that consider, among other things, the resource value and functions of the affected wetland(s) and the likelihood of mitigation success (TDEC 2000). For the proposed action, NNSA utilized professional judgment ratios which provided an overall 3:1 mitigation offset ratio. In overall balance, it is believed that the proposed mitigation would result in no net loss of resource value and would provide a qualitative and quantifiable net increase in the watersheds wetland resource value. If the Haul Road extension Corridor were constructed, the loss of 1.0 acre of wetlands would be mitigated by the creation of additional wetland areas. Forty percent of the created wetlands for this project would be added to existing wetlands that would additionally enhance the overall benefit of each of those wetlands. Adding to existing wetlands would also increase the likelihood of mitigation success.

Wetland mitigation ratios proposed for this project include 2:1 for three wetland sites (wetlands 3, 4, and 5) totaling 0.49 acres on the eastern end of the Corridor (within the footprint of the Site Access and Perimeter Modification Road) and are highly disturbed and of poor habitat and functional quality. The remaining 0.51 wetland acres (within the Haul Road extension footprint) are of higher natural and functional quality and would be mitigated at a 4:1 ratio. A 2:1 ratio for the loss of the three highly disturbed wetlands (Wetlands 3, 4, and 5) is reasonable given the much lower natural and functional quality of these sites. The largest wetland near Bear Creek Road (Wetland 4) was undoubtedly created by the backing up of water upstream of the road when it was constructed. Underlying a shallow soil layer is extensive riprap from past construction, and most wetland plants found at the site are highly adaptable species such as cattails and black willow. Nearby, Wetlands 3 and 5 were similarly created or disturbed by past construction activities.

Although the wetlands within the footprint of the Site Access and Perimeter Modification Road are in areas that receive spring flow and historically had more natural wetland characteristics, their current state is highly disturbed with low natural quality and relatively poor wetland functions. Water from these three sites is hydrologically connected via the Y-12 storm drain system to East Fork Poplar Creek, which receives substantial flows in its headwaters from inputs of piped Melton Hill Reservoir water. The benefit of the three wetlands to downstream water quality, therefore, is negligible.

The wetlands within the Haul Road extension footprint (0.51 acres) are in a relatively natural state, either forested or marsh wetlands, with a relatively diverse flora and comprising of valuable wetland and water quality functions for the streams of the Bear Creek watershed. The exception relative to natural quality is Wetland 2, which is rectangular in shape and created as part of previous Y-12 construction operations, but has naturalized over many years and provides unique habitat for amphibians and other fauna. Only a small portion of Wetland 2 (0.03 acres) would be lost (see Table 1) (B&W 2010).

Table 1. UPF Wetland Summary (Numbers in Acres).

Site	Existing acres	Existing wetland type	Wetland loss from project	Location Specific Compensatory Mitigation Description	Acres
Wetland 1	0.34	Forested wetland/pond	0.08	Wetland creation. Expansion and enhancement of current wetland. Small seep area could potentially have been wetland prior to area construction.	0.45
Wetland 2	0.24	Marsh/pond	0.03	No wetland creation or expansion. Maximum impact avoidance through road realignment.	N/A
Wetland 3	0.10	Marsh	0.10	Wetland loss. No location specific mitigation.	N/A
Wetland 4	0.34	Marsh	0.34	Wetland loss. No location specific mitigation.	N/A
Wetland 5	0.05	Forested wetland	0.05	Wetland loss. No location specific mitigation.	N/A
Wetland 6	0.06	Marsh	0.03	Wetland creation. Expansion of current wetland.	0.20
Wetland 7	0.33	Forested wetland	0.31	Wetland creation. Expansion of current wetland.	0.30
Wetland 8	0.06	Marsh	0.06	Wetland creation. Expansion of current wetland.	0.27
Wetland 9	0.06	Forested wetland	0.0	Wetland avoided by road realignment. Outside UPF footprint.	N/A
Wetland 10	0	N/A	N/A	Wetland creation. Water source in area and evidence of ditching from past logging practices. Historical small wetlands possible prior to disturbance.	1.07
Wetland 11	0	N/A	N/A	Wetland creation. Would utilize a low flow, unnamed watercourse in disturbed upland habitat to create this wetland.	0.73
Total	1.58		1.0		3.02

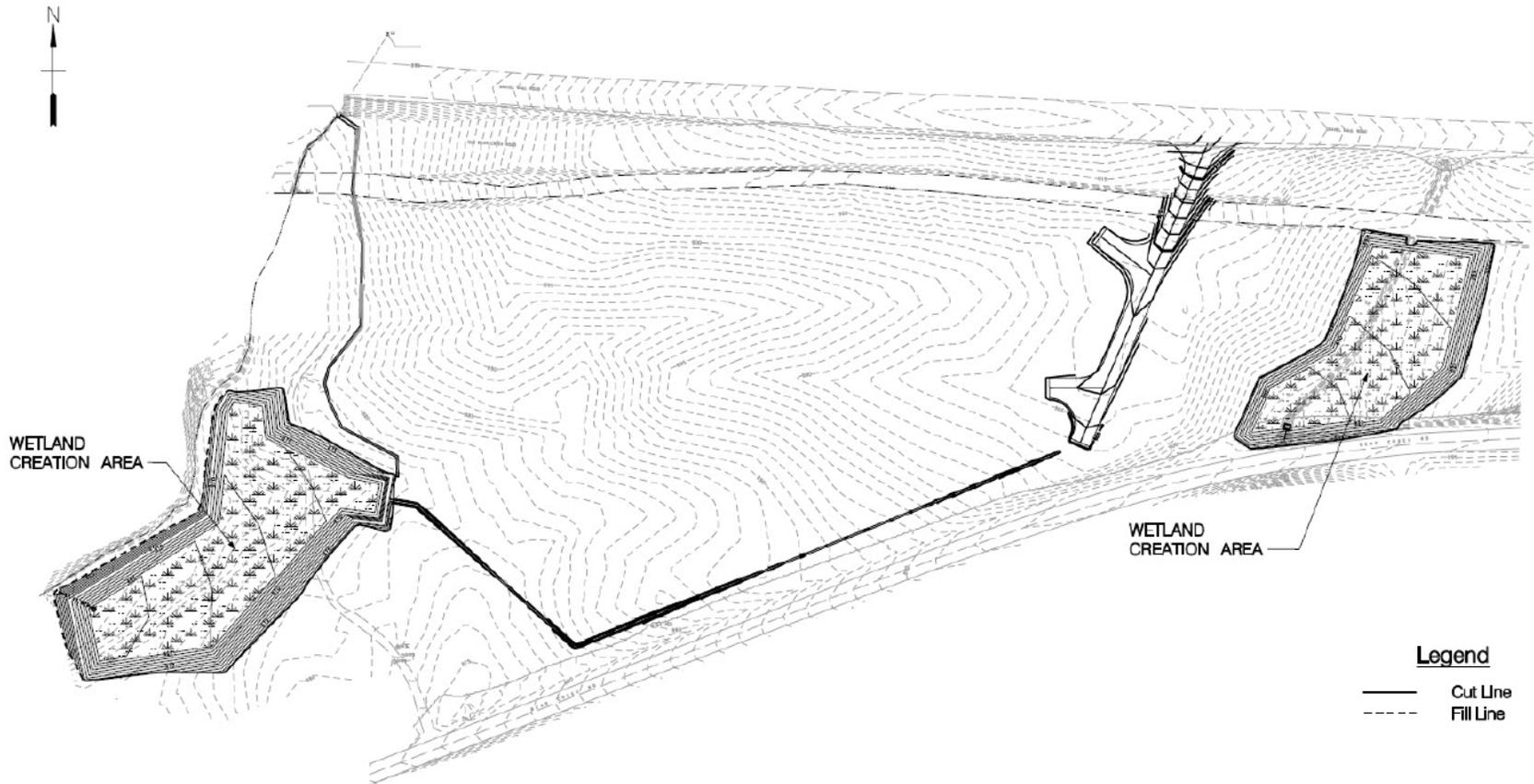
Source: B&W 2010.

Figure 1 shows the locations of Wetlands 1 through 9.

A total of 2.04 acres would be created as compensation for the 0.51 acres of wetland loss in the Haul Road extension footprint (a 4:1 ratio). Mitigation efforts would concentrate on improving existing quality wetlands (Wetlands 1, 6, 7, and 8), and creating two new wetlands in areas with a high potential for success (Wetlands 10 and 11). Figure 12 shows the locations of Wetlands 10 and 11. In all cases, harvested wetland vegetation and soils from associated project sites would be used, where possible, to support the establishment of hydric soils and wetland plants species in the mitigation areas. All mitigation sites are in the Bear Creek watershed where the impacts to wetlands would occur. In all, 3.02 acres of wetlands would be constructed to compensate for the removal of 1 acre (B&W 2010).

In summary, the wetland mitigation plan involves the creation of 3.02 acres of wetlands.

- Wetland 1 is proposed to be expanded from 0.34 acres to 0.71 acres. This expansion would be accomplished by raising the normal pool elevation of the drainage area by placing the outlet culvert above the ground surface.
- Wetland 6 is to be expanded from 0.06 acres to 0.23 acres. This expansion would be accomplished by raising the outlet culvert for the drainage area, with excavation and contouring upland to increase the surface area of the wetland.
- Wetland 7 is to be relocated and expanded by 0.3 acres north of its existing location beyond the grading limits of the Corridor. This would be a net loss of wetland, from 0.33 acres to 0.32 acres. The overall topography would remain roughly the same, and creation of this wetland would be done by raising the outlet culvert for the drainage area. This wetland would be fed by a blue-line stream, NT-2 to Bear Creek, which is proposed to be carried by culvert beyond the extension. Currently, this stream travels through an 18-inch diameter corrugated metal pipe that is in poor condition. The outlet of this pipe has been washed out, greatly impeding any possibility of aquatic species' migration in this area. Alteration of this wetland and stream channel would enhance the quality of the aquatic habitat in the area.
- Wetland 8 is to be expanded from 0.06 acres to 0.27 acres. This expansion would be accomplished by raising the outlet culvert for the drainage area, and excavating up-gradient to increase the surface area of the wetland. The wetland drains to an existing metal culvert in poor condition. This wetland would be moved from its current location to the upstream side of the proposed Haul Road extension.
- Wetland 10 is a new wetland that would be constructed in association with the proposed sediment basin that would serve the Wet Soils Disposal Area (see Figure 12). This wetland is proposed to be 1.07 acres. Saturated soil conditions within a wide ditch between the Wet Soils Disposal Area and the creek suggest that significant base flow may be present to feed the wetland. The wetland would be formed by constructing an earthen embankment no nearer than 60 feet from a nearby tributary. The water level in the wetland would be controlled by an outlet structure that would discharge into the nearby tributary.
- Wetland 11 is a new wetland that would be located just east of the Wet Soils Disposal Area (see Figure 12). This wetland is proposed to be 0.73 of an acre. It would be created in the area of a wet weather conveyance that does not appear on a USGS Quad Map. This wetland would be bound by a 54-inch diameter culvert downstream at Bear Creek Road and an approximate 24-inch diameter culvert upstream at Old Bear Creek Road. The wetland would be created by providing an outlet structure that would tie into the existing 54-inch pipe, and raise the water level to induce wetland development (B&W 2010).

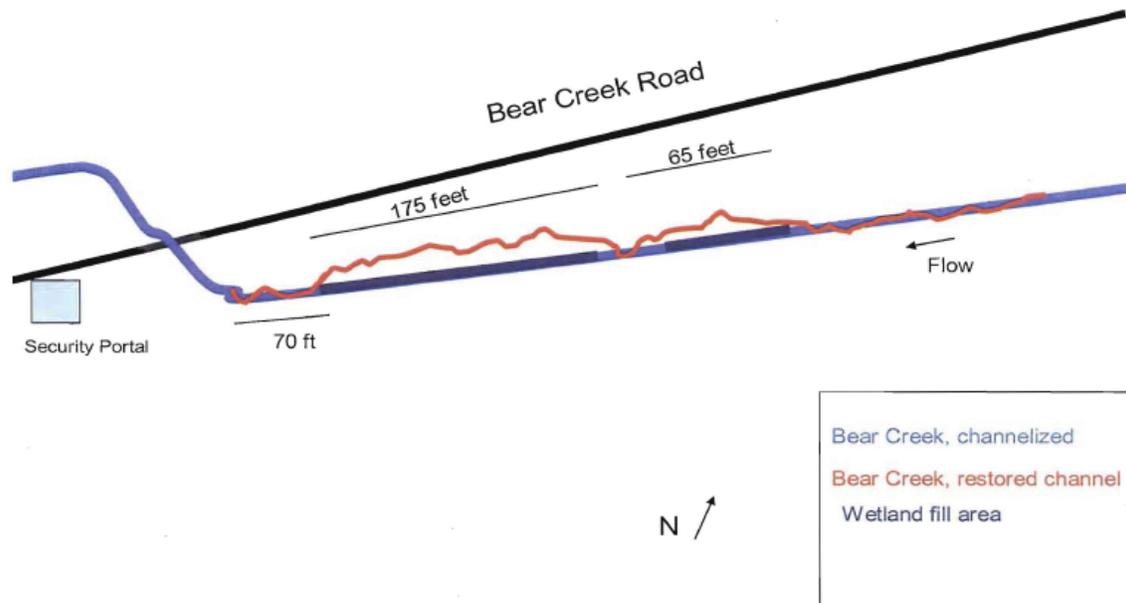


Source: B&W 2010.

Figure 12. Proposed New Wetlands 10 and 11 at the Wet Soils Disposal Area.

4.3.2 Stream Mitigation

The proposed approach for offsetting the loss of streams due to culvert placement on the Haul Road extension would be to restore a section of Bear Creek (see Figure 13) to a more natural channel course. The approach would include: (1) returning Bear Creek to sections of its original channel; and (2) engineering a more natural course in some adjacent sections of stream. Approximately 300 feet of stream mitigation would be performed for this project.



Source: B&W 2010.

Figure 13. Schematic of Bear Creek Showing Stream and Wetland Restoration.

The restoration of Bear Creek would focus on the section just east of the security portal going upstream toward the confluence with NT-1 and NT-2. This stream segment was previously channelized to a very standard width of 10-12 feet, is 2-3 feet below the land surface, and has limited habitat diversity. A normal stream channel varies in wetted width, water depth, has a sinuous track, and in our region contains a range of structural forms including riffles (shallow area with high water velocities), runs (slightly deeper areas with moderate water velocities), glides (deeper areas with slower water velocities), and pools (very deep areas with minimal water velocity). Because the stream was straightened and widened, it has a very shallow, uniform water depth of 1-6 inches at base flow, and lacks cover components such as undercut banks and deeper pools. In essence, the channelized section would replace four structural forms with one, a long uniform run environment.

These changes in habitat have limited use by fish species, particularly the Tennessee Dace (*Phoxinus tennesseensis*). To address these habitat deficiencies, Bear Creek would be returned to sections of its original channel and engineering modifications would be made in other sections. The original channel is still partially discernable running parallel to the channelized section. There are two sections that would be incorporated into the restoration design. The lower section is approximately 175 feet in length. A second section is about 15 feet upstream from the top of

the first reach and covers another 65 feet. These sections are narrower (approximately 4 to 7 feet in width) than the existing channelized section, have more variety in depth, and incorporate some curvature that would provide a variety of flow velocities.

The banks exhibit both undercut features and have larger trees incorporated into them. Where the historic channel intersects with the channelized section, the water flow would need to be restored to the historic channel. This restoration would be accomplished using large boulders, wooden structures, or a combination of materials, backed by soil and an impervious membrane. Limited removal of sediment at entrance points back into the original channel may be required to complete stream flow restoration. The addition of substrate material, such as a mix of gravel and cobbles may be added to the historic channel in order to limit re-suspension of sediment. Once flow is re-established in the historic channel, then Bear Creek would have a more natural pattern with variations in depth, increased sinuosity, and improved cover components.

Upstream and downstream of these historic channel sections, portions of the channelized Bear Creek could be modified using established stream restoration guidelines to improve habitat characteristics. In addition, approximately 70 feet of downstream channel would be modified with the goal to provide the cover, depth, and sinuosity by manipulating the channelized section of stream.

Prior to any in-stream work on Bear Creek and the small sections of impacted NT-1 and NT-2, any fish that are present would be captured using electrofishing² and moved from the impacted section.

5.0 CONCLUSIONS

Avoidance of wetland impacts has been optimized by routing the roadbed design around wetland areas wherever possible within the Corridor; however impacts to wetlands are unavoidable. Wetland loss due to the Haul Road extension would be 0.51 acres. The Site Access and Perimeter Modification Road (east of the proposed Haul Road extension) would also result in the unavoidable loss of an additional 0.49 acres of wetlands. In total, these activities would result in the loss of 1.0 acre of wetlands. Mitigation of this loss is proposed through expansion and/or creation of wetland acreage at six locations within the Bear Creek watershed. In all, 3.02 acres of wetlands would be constructed to compensate for the removal of 1.0 acre. In addition, 300 feet of stream mitigation and invasive species removal would compensate for the 288 feet of stream segments placed in culvert by the Haul Road extension construction.

² Electrofishing is the use of electricity to stun fish prior to capture.

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