

**Section 2-04
Wetlands and Other Surface Waters**

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WETLANDS

INTRODUCTION

General: Any government agency must follow Federal law on any action that utilizes Federal funds, is located on Federal land, or requires a Federal permit.

Section 404 of the Clean Water Act (CWA) established a program to regulate the discharge of fill material into waters of the United States (WUS), including wetlands.

The Code of Federal Regulations (CFR) is the codification of the general and permanent rules and regulations (sometimes called administrative law) published in the Federal Register by the executive departments and agencies of the federal government of the United States. Title 33 is the portion of the CFR that governs Navigation and Navigable Waters within the United States.

The U.S. Army Corps of Engineers (COE) is the Federal agency responsible for enforcing the Section 404 provisions. Section 404 requires a permit before fill material may be discharged into waters of the United States.

Through its regulatory program, the COE ensures that impact to aquatic resources from construction projects is avoided, minimized, or mitigated. This is supported by the FHWA, goal of “no overall net loss” of wetlands. For permitted activities that result in unavoidable losses, the COE requires replacement wetlands to offset those losses.

During plan development, Environmental Services and Project Development address wetland issues. Project Development is responsible for the design, details, exhibits, and estimated quantities for the contract plans. Environmental Services is responsible for the wetland delineations, annotations, formal permit application and coordination with the COE, and provides draft wetland mitigation designs to Project Development. Environmental Services and the Districts work together to identify suitable mitigation sites.

During road design, the progressive order to address the wetland impacts within a project is: 1. Avoidance, 2. Minimization, and if needed, 3. Mitigation. The design process cannot skip avoidance or minimization and go directly to mitigation; each step must be analyzed and documented in the design reports for COE permit purposes.

Section 404 permits are obtained depending on the scope of work and amount of wetland/WUS impact. The types of permits are Nationwide or Individual (Standard) Permit. The Department is able to utilize various Nationwide Permits (NWP) depending on the amount of wetland/WUS impacts and the type of environmental document used for a specific project. Nationwide Permits average about 2-4 months for review and processing from the COE (after receipt of all applicable information) and are valid until Nationwide Permits are re-issued (approx. every five years). If a project has been “PS&E’d” before the expiration date, the COE provides an additional year beyond that date for completion of the

authorized wetland/WUS impacts. Amendments to COE permits may require as much review time as the original permit submittal.

Projects that impact large amounts of wetlands or require a more in-depth environmental document may not qualify for Nationwide Permits. The Department then must obtain an Individual Permit (IP) from the COE. IP's are subject to a 30-day Public Notice requirement (submitted by the COE) and receive substantially greater review than NWP's. Accordingly, IP's often result in an overall review period of 8 months, or longer, by the COE. IP's have variable expiration dates, specific to each permit and more restrictions (special conditions).

PRELIMINARY WETLAND SURVEYS

General: The term "wetland" refers specifically to areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands must meet three basic criteria: 1) a predominance of hydrophytic ("water-loving") vegetation, 2) hydric (anaerobic) soils, and 3) hydrology (periodically flooded and/or saturated soils).

Many varieties of wetlands occur in Wyoming, including seasonally flooded basins, freshwater marshes, saline marshes, wet meadows, riverine-fringe wetlands, playas, forested wetlands, shrub swamps and, very rarely, bogs and fens. Less than 3 percent of the surface area of Wyoming currently qualifies as "wetland".

The Environmental Services representative will determine the need for a wetland delineation. If this is not done at the reconnaissance/kickoff meeting phase, it must be done as soon as possible after Preliminary Plans are distributed to not delay the design schedule.

All existing wetland boundaries (or "delineations") within close proximity to the roadway will be identified in a mapping reference file that will be available for the designer's use.

After Preliminary Plans are issued, Environmental Services or their consultant will delineate the existing wetlands and other non-wetland Waters of the US (WUS). Delineation work is limited by seasonal conditions; the work cannot be done when there is snow cover, and most of the wetland types can only be accurately identified during the growing season, typically late April through September. Preliminary Plans should be issued to accommodate this schedule.

Environmental Services or their consultant will annotate the wetland boundaries, waters of the U.S. boundaries, and designate wetland types on paper copies of the Preliminary Plan sheets. The consultant will provide annotated paper copy, as well as a sub-meter GPS file that is transferable to Microstation, to Environmental

Services staff who will then annotate these field delineations on a Microstation file that can be referenced into the roadway plan design file. The naming convention for this file will be *ProjectERP#_wus.dgn*; the wus designates waters of the U.S. Environmental Services will notify Project Development via email when the map file is completed.

Be aware that there could be changes to the wetland delineations after they have been mapped initially. The COE will review the wetland delineations and provide their comments during the permit application review process and changes may be requested. Environmental Services will arrange to have projects re-delineated as necessary as well as update the wetland mapping file as current delineations are renewed every four years as needed. Wetland mapping must be shown on all plan sets, even when wetland impact detail sheets are provided. This is necessary to ensure the contractors are aware of, and avoid, wetlands along the project corridor. If necessary, wetland mapping can be shown in “half-tone” to reduce visual clutter on the plans.

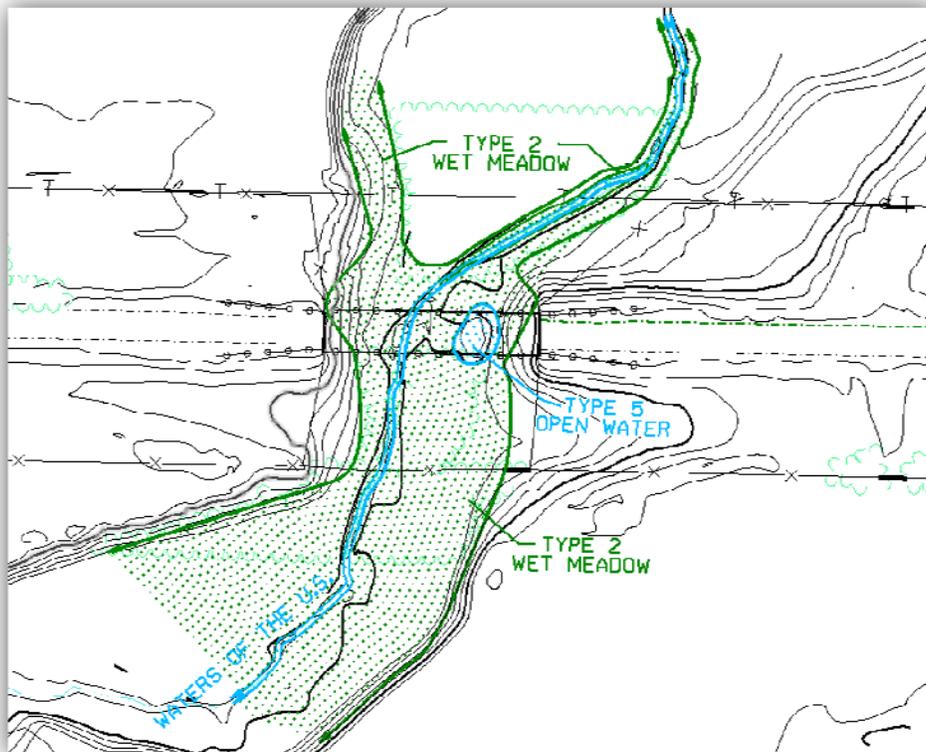


EXHIBIT 1
MAPPED WETLAND AREAS

IMPACTS MUST BE AVOIDED AND/OR MINIMIZED FIRST

General: Wetland delineations need to be defined in a mapping reference file before the development of the design for the Grading Plans because of the high potential to affect the majority of road design elements. Preliminary Plans need to be issued in a timely fashion to take advantage of the earliest field season. Otherwise, a project could be delayed a year if Preliminary Plans are issued late in the fall. Consider the time needed for wetland information when setting up the initial project schedule.

Limits of construction/disturbance need to be examined at all wetland locations to determine the amount of impact. All options should be considered first in an effort to avoid wetlands impacts. If wetlands impacts cannot be avoided without compromising minimum design standards then minimize impacts as much as practicable. A combination of techniques may be required to achieve the most effect. If wetlands are impacted, the design should be evaluated in the areas listed below:

- **Shift centerline away from wetland:** Determine if the road centerline could be shifted away from the wetland areas. In open areas, or in cases where a wide highway right of way exists, it may be possible to move away from the wetland without causing other impacts to another resource.

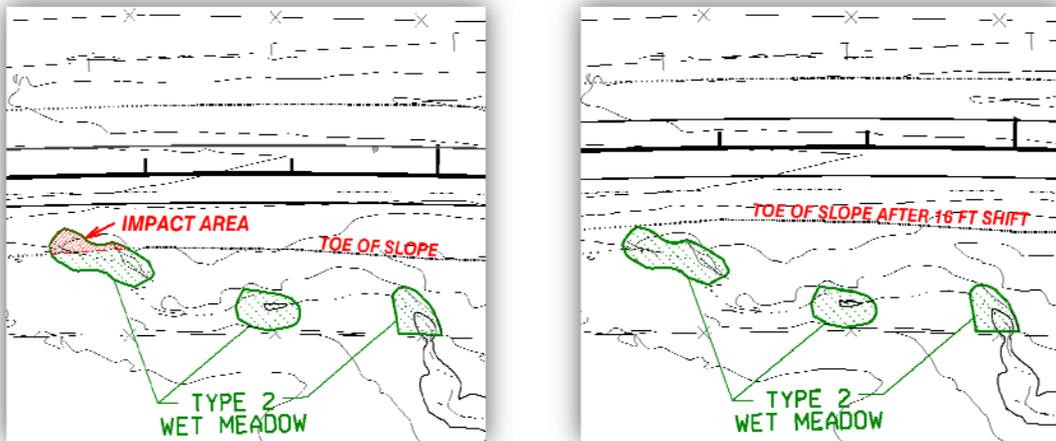
**BEFORE****AFTER**

EXHIBIT 2
SHIFT CENTERLINE

- Lower grade to decrease fill area:** Lowering the profile gradeline of the road near the wetland should reduce the distance out from the road where the toe of slope meets the terrain. For example, by lowering the grade one foot in an area with a 1V:4H fill slope, the distance away from the road could be reduced by 4 feet.

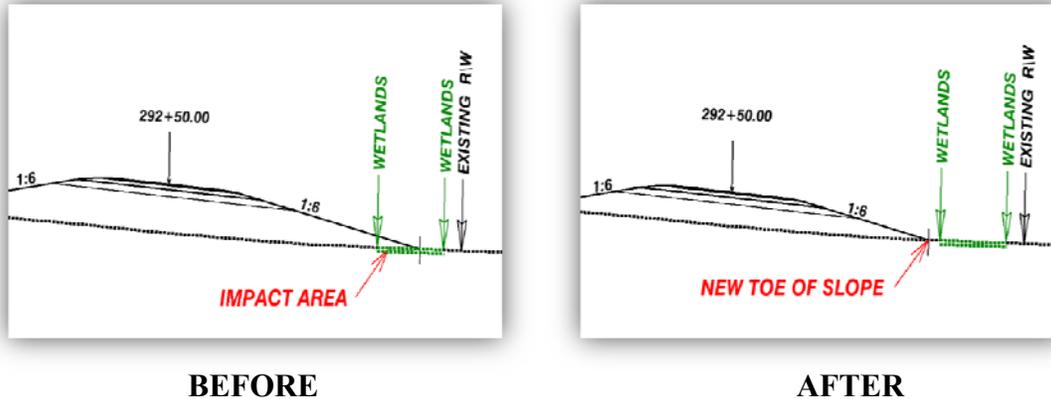


EXHIBIT 3
LOWER GRADE

- Raise grade to eliminate ditch:** If the road section is in excavation a ditch is established and the corresponding backslope usually increases the impact distance out from the roadway. By raising the grade to eliminate the ditch and minimize backslope the limit of disturbance can be reduced. Most wetlands occur in low areas where fills are more common, but can occur near high terrain or mountainous areas, where irrigation ditches or large amounts of snowmelt are present. Pay special attention to the roadway drainage patterns when lowering grade near wetlands or irrigation canals to ensure drainage flow away from the roadway is maintained.

Based on the definitions in the regulations, cuts and fills within wetland/WUS areas are considered “temporary” only where the approximate original cross-section is restored; otherwise cut and fill impacts are considered permanent. Environmental Services will offer assistance in determining what impacts should be considered temporary vs permanent. See EXHIBIT 4, RAISE GRADE.

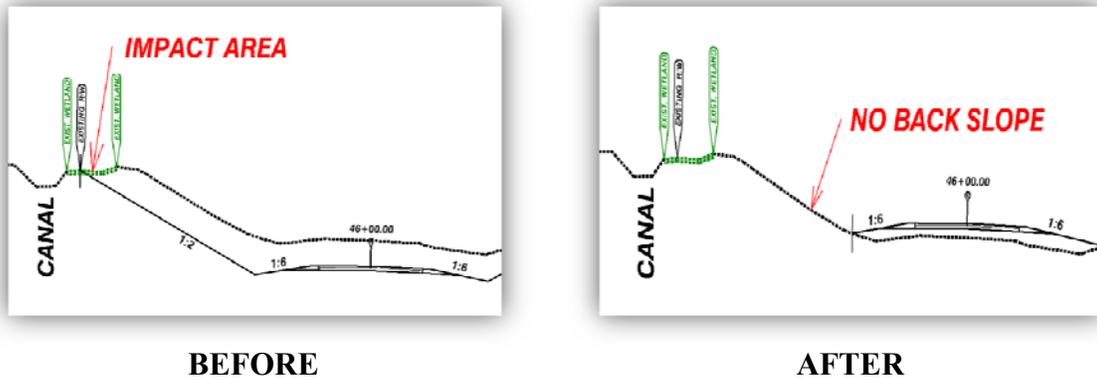


EXHIBIT 4
RAISE GRADE

- Steepen fill slopes (up to 1V:4H):** Determine if a steeper fill slope would reduce the impacts compared to the standard fill slope selection based on fill height. Flat slopes 1V:4H or flatter (inside the clear zone) usually do not need road side barriers, but the designer needs to evaluate the situation considering all roadway geometry, curves, steep grades, etc.

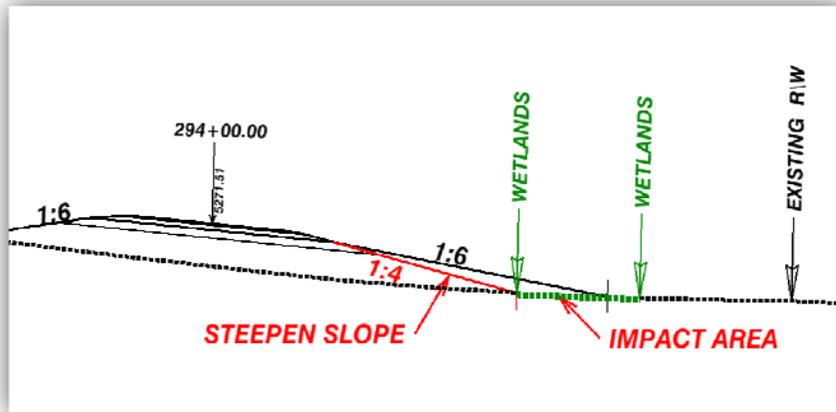


EXHIBIT 5
STEEPEN FILL SLOPES

- Add barn roof section with steep slopes (1V:2H):** In high fill situations, the construction limit distance may be reduced by using a barn roof safety section with steeper fill slopes outside the clear zone. Trial and error with the slope selection by the designer will be required to determine which method best fits each situation. See EXHIBIT 6, ADD BARN ROOF SECTION.

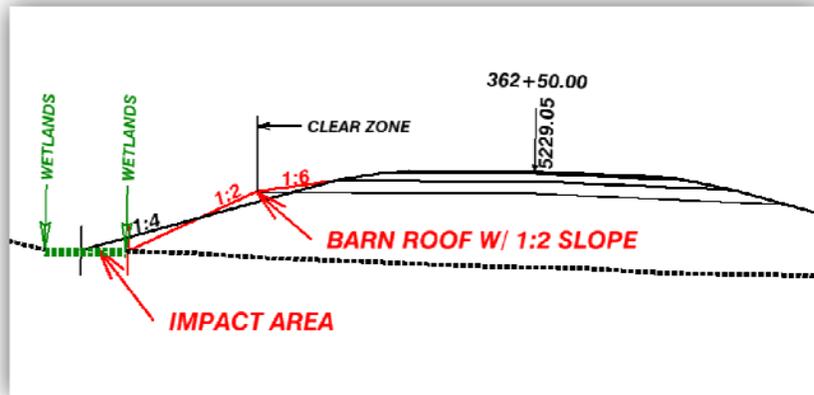


EXHIBIT 6
ADD BARN ROOF SECTION

- **Use guardrail with no barn roof and steep slopes (1V:2H):** Certain situations may call for the use of guardrail and 1V:2H slopes behind the rail. Evaluate the flared end treatment areas so as not to cause impacts due to additional grading in the widened end treatment area, additional rail lengths may be necessary. Remember that guardrail is a hazard in itself so should be evaluated carefully.

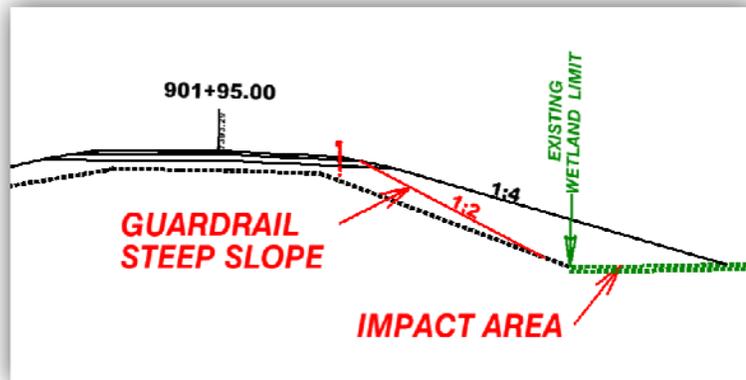


EXHIBIT 7
USE GUARDRAIL

- **Mechanically Stabilized Earth slopes (1V:1H maximum):** Slopes as steep as 1V:1H in certain areas are possible with engineered geogrid reinforcement design. This type of slope will require geotechnical investigations and design input from the Geology Program for each specific location. Guardrail will also be required to protect the steep fill areas. This option could add significant cost to the project. Slopes should transition smoothly in and out of these steep areas to avoid abrupt changes to the slope selection at the ends of the reinforced fill. See EXHIBIT 8, GEOGRID SLOPE.

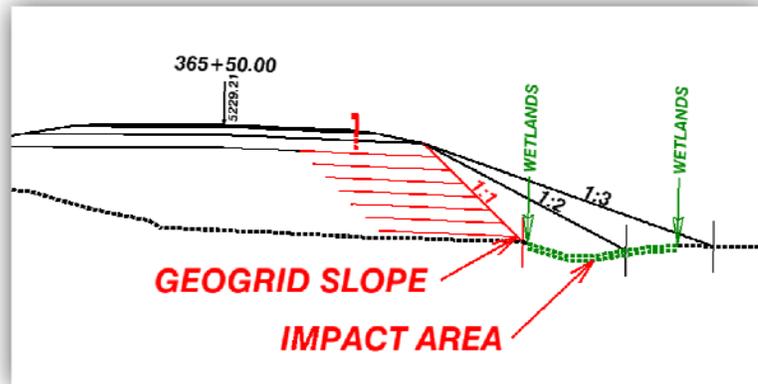


EXHIBIT 8
GEOGRID SLOPE

- Retaining wall:** Retaining walls can sometimes be used to avoid adjacent wetlands but are an expensive option. The retaining wall option will require geotechnical investigations from the Geology Program and structural design from the Bridge Program. Adequate foundation design is usually problematic in weak and saturated soil conditions found at wetland sites, which will add cost to the design. The area above the wall footing in the wetland should be shown as an impact. Guardrail or bridge rail, depending on the type and design of the retaining wall, will also be required to protect the drop offs in the retaining wall areas. Avoid abrupt changes to the slope selection at the ends of the retaining walls so there is a smooth transition area.

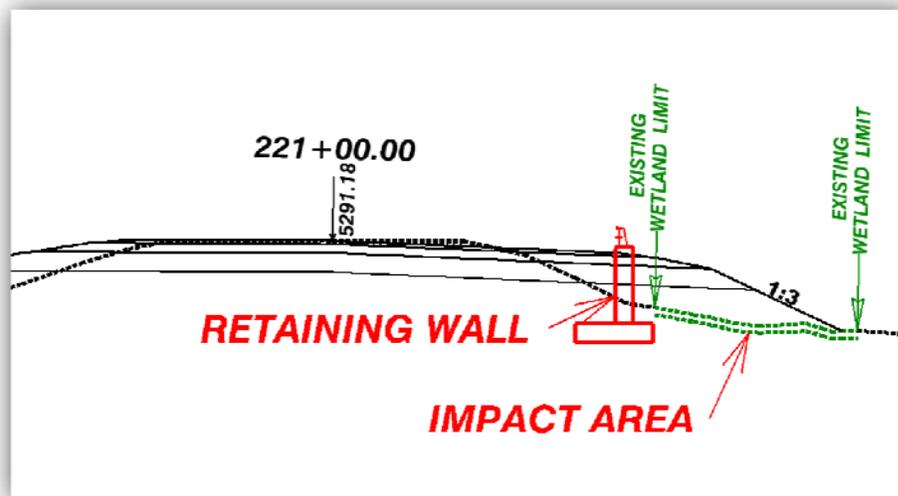


EXHIBIT 9
RETAINING WALL

- **Bridge structure to span wetland, very expensive (last resort):** In very extreme situations the department has had to span critically important or high value wetland areas with a bridge structure before the COE would approve the permit. Needless to say, this is very expensive and should be avoided if at all possible.

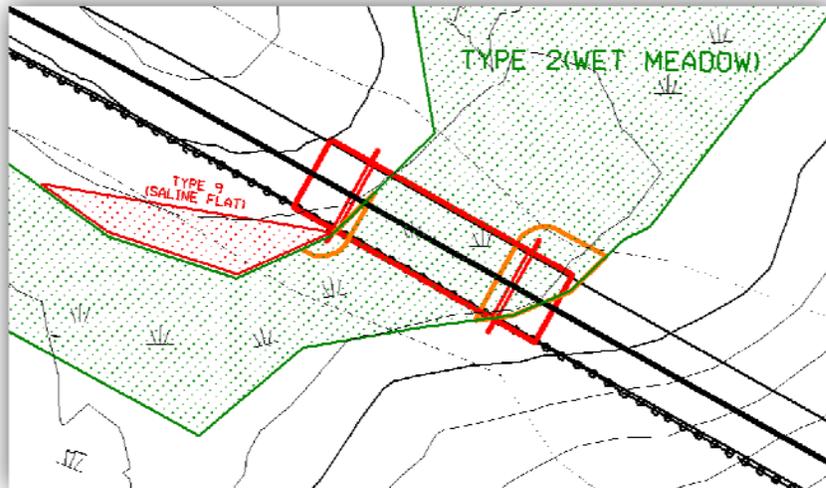


EXHIBIT 10
BRIDGE STRUCTURE

IMPACTS ON PLAN SHEETS

General: The delineated wetland/WUS areas and calculated impacts from the proposed design should be shown at each location on all sets of plans. If the wetland designations conflict with other design information, separate detail sheets highlighting the wetland information may be required. Bridge impacts must be combined with impacts from Project Development for clarity and to avoid duplication of impacts. Remember, on Individual Permits (since they require public notice) the COE reduces our 11" x 17" plan sheets to 8 ½" x 11" sheets for their Public Notice distribution, so ensure they are easy to read when reduced. See EXHIBIT 11, WETLAND IMPACT DETAILS.

Different shades of gray and patterning should be used to distinguish between permanent and temporary wetland impacts. Temporary impacts include placing fill material for detours or structure work. Temporary impacts related to bridge or retaining wall construction includes construction shoring, footing excavation, construction platforms, and cofferdams, which should also include the dewatered area and volume inside the cofferdam. The Bridge Program will provide details and tables for impacts related to structure work. See EXHIBIT 12, TEMPORARY IMPACTS.

IMPACTS TO WATERS OF U.S.

Impacts due to channel changes in waters of the U.S. (WUS) should reflect new channel length vs. old channel length (i.e. to show the net change in length). Substantial changes in length of pipe crossings and/or existing channels may need to be shown on a detail sheet, if requested by Environmental Services.

When calculating impacts involving channel changes, only areas where the channel is actually covered with fill or excavated (permanent or temporary) should be noted as an impact. Segments of the existing channel that are simply cut-off (but not covered with fill) are not shown as an impact; instead such segments are counted as a loss of channel length only.

Impacts to WUS features must include both area and volume. For calculation of volume for WUS impacts, utilize the mapped WUS boundaries as the width (i.e. bank-to-bank) and make a reasonable guess for the “average” channel depth in the area of impact. Although the WUS area inside the pipe is covered, it is not considered “filled”. Avoid showing toe of slope catch lines across the drainage channel past the pipe outlets or at bridges, to ensure that it’s clear that flow will be maintained after construction.

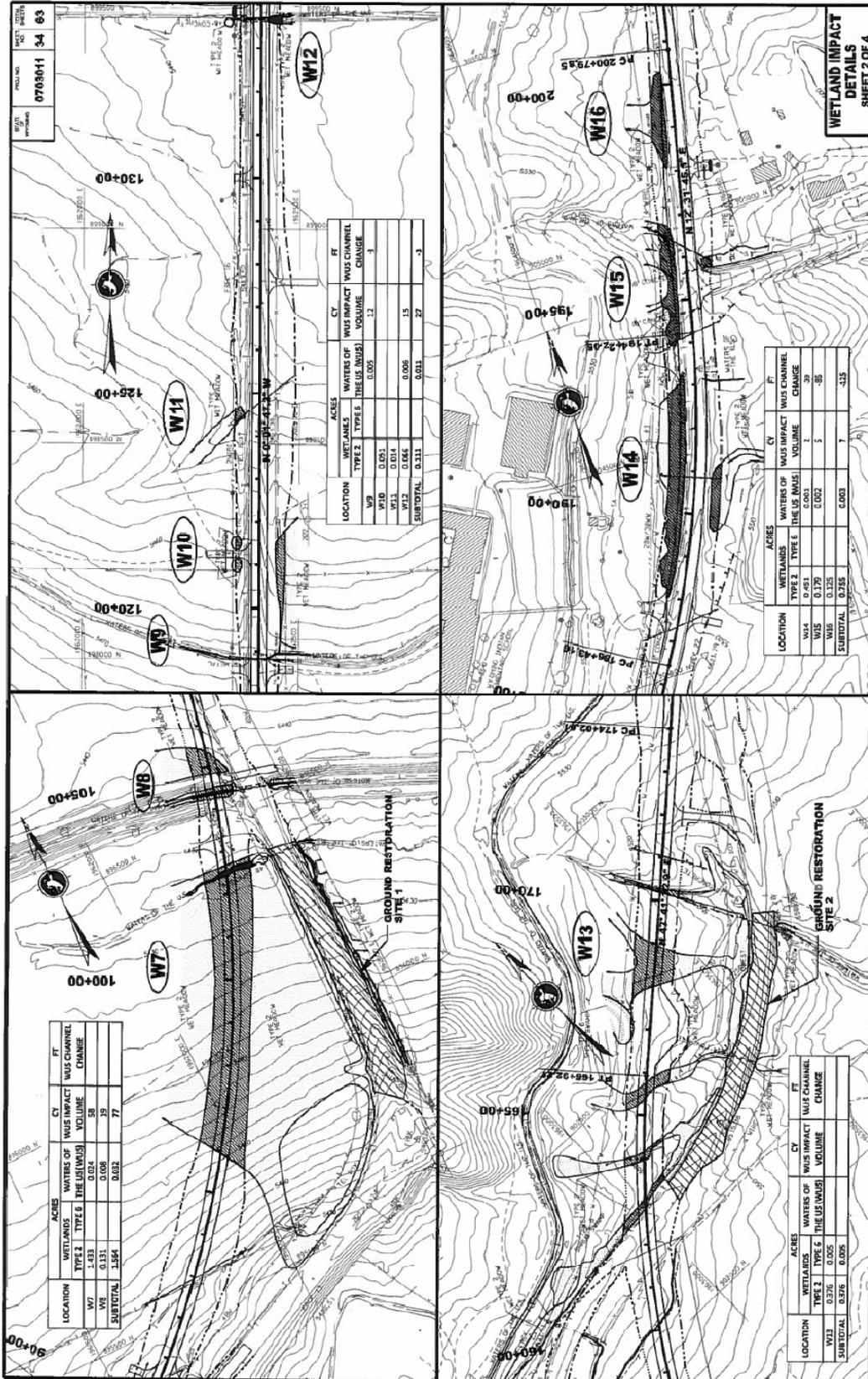


EXHIBIT 11
WETLAND IMPACT DETAILS

Include a table in the plans showing the total of each type of wetlands impacted and a grand total of impacts, including impacts to waters of the U.S.

WETLAND AND WATERS OF THE U.S. IMPACT SUMMARY

LOCATION	WETLAND TYPE	ACRES		CY	FT
		PERMANENT IMPACT	TEMPORARY IMPACT	WUS IMPACT VOLUME	WUS CHANNEL LENGTH CHANGE
WETLAND IMPACTS					
27+15 - 34+30	LT	TYPE 2 WET MEADOW	0.221	0.056	
93+05 - 93+25	LT	TYPE 6 SHRUB SWAMP	0.001		
137+50 - 138+45	RT	TYPE 6 SHRUB SWAMP	0.036	0.021	
138+65 - 140+30	RT	TYPE 2 WET MEADOW	0.031	0.006	
TOTAL WETLAND IMPACTS			0.289	0.083	-----
WATERS OF THE U.S. IMPACTS					
62+10 - 63+55	LT	WATERS OF US (WUS)	0.046	0.001	1.2
TOTAL WATERS OF THE U.S. IMPACTS			0.046	0.001	1.2

EXHIBIT 13 IMPACT SUMMARY

Wetland impacts should be shown to the nearest 1/1000th of an acre (0.001). Waters of the U.S. should be shown in area to the nearest 0.001 acre, and in volume to the nearest 0.1 CY.

If the total of the proposed impacts exceed the allowable limits of disturbance after all avoidance and minimization options are exhausted, then a mitigation plan will be required. In general, the current threshold of impacted wetlands requiring mitigation for a project = 0.095 acres or more. Mitigation may still be required for “high value” wetlands, on a case-by-case basis.

MITIGATION SITE SELECTION

General: If wetland mitigation is anticipated, the site should be selected before the Grading Plans are issued so it can be identified on the Grading Plans. The Resident Engineer, Environmental Services, and Project Development must work together to select a suitable mitigation site that should meet the following criteria:

1. Hydrologically, Hydraulically acceptable (ES must approve site) Environmental Services will coordinate investigations necessary to acquire any needed hydrology data. Adequate and reliable hydrology at the mitigation site is essential for success. Baseline data supporting proposed water supply of a mitigation site is required. Only passive sources of water supply are used for mitigation sites. Basic hydrology information required for passive systems includes:

The water supply is dependent on natural groundwater fluctuations, seasonal precipitation and/or overbank flooding with no human management techniques. Groundwater supported mitigation designs need to be correlated to site specific data gathered from the use of piezometers, soils, spring flow data, and/or other site investigation data. Much of this information can be gathered during the delineation of the site. Although several years of groundwater data is preferred, measurement of an average year's peak groundwater level is acceptable. Occasionally, site specific soils data can be used as a surrogate for this data element. The best information is obtained from the relative elevations of nearby or adjacent functional wetlands.

Data is also required to document and justify overbank flooding. This typically involves detailed surveying as well as hydrologic modeling. The anticipated frequency and duration of flooding needs to be specified.

If the mitigation area is to be supported by precipitation, a water budget may be required, including identification of anticipated runoff volumes and evaporation rates.

Select sites with minimal alkalinity.

2. Adequate size for proposed mitigation

Mitigation ratios often compound the size needed and increased ratios are usually based on wetland type and/or location of the mitigation site (Environmental Services will provide project specific mitigation ratios).

If impacts are mitigated on the project and in the same drainage area, then the mitigation ratio is a minimum of 1.5:1. If the impacted wetlands are Type 6 (shrub swamp), or Type 12 (woody riparian), then the mitigation ratio is 2:1.

If impacts are mitigated off the project or away from the drainage area, then the mitigation ratios could be 1:3 or higher, as directed by the COE.

If out-of-kind or off project mitigation is proposed, justification and COE approval is required. Mitigation sites adjacent to the project and in the same drainage area are always preferred.

Where possible, mitigation sites should include a vegetated buffer around the mitigation wetland.

3. Acceptable conditions of mitigation site

The mitigation site must be acceptable in terms of location, size, immediate surrounding land use, historic land use, context in relation to watershed, vegetation, soils, and hydrology. A copy of the applicable portion of the USGS Quadrangle and/or National Wetland Inventory map with the site identified on it will be needed by Environmental Services and COE. Aerial photography or Google Earth Image© of the site is also very helpful.

4. Landowner permission or government land concurrence

Agreements are required with the landowner for access, boundary fencing, and grazing restrictions until wetland is considered established, etc. Usually a 7-10 year term agreement is used to ensure its establishment.

5. Proposed mitigation does not disturb existing wetlands within the site beyond that which is shown in the mitigation design plan.

If wetlands and other waters of the U.S. are present at the mitigation site, a delineation of these areas is required. Impacts to any existing wetlands at the mitigation site are considered additional project impacts and are not included in the net wetland acreage created at the site. Also avoid impacting any woody and riparian vegetation near the site.

6. Site selection should avoid utilities, irrigation facilities, and other improvements

The need to relocate or re-build existing facilities will add unnecessary cost to the project.

7. Archaeological/Cultural and Sensitive Species clearance needed

All sites will require archeological/cultural survey and sensitive species clearance to be acceptable for mitigation. The proposed site will need to be mapped and the boundaries clearly indicated on a plan sheet for use during the archeological and sensitive species field survey.

8. Consider combining with borrow area if material removed is suitable

Excavated material could be used for roadway embankment if needed for the project and the material is suitable for road fill. If not usable, excess material will need to be wasted at an approved location. A borrow area can often be contoured to be an acceptable wetland mitigation site.

9. Expand existing wetland away from area being disturbed

If a wetland is being impacted near the roadway, look at enlarging the same wetland in a direction away from the road.

MITIGATION AREA DESIGN

General: Once an adequate site for the mitigation design is selected, Project Development can begin the design in accordance with the following guidelines:

Coordination during design between Environmental Services and the Resident Engineer is essential. Environmental Services and the Resident Engineer are responsible for the initial site location and grading specific activities. In addition, Environmental Services is responsible for revegetation recommendations, overall design review, and coordination with the COE.

The selected site area will need to be mapped to the same requirements and detail as the project mapping. Request mapping and terrain extension from Photogrammetry & Surveys if needed. Field supplements for utilities, property fences, existing wetland delineations, and other features of the site may also be needed. Land survey information will be required for boundary descriptions for the landowner agreement.

A plan view that includes topographic information (1 or 2 foot contour intervals), roads, trails, structures, property lines, directional arrows, scale, and the exact size and boundaries of existing wetlands and streams, will be required for the permit application.

The overall shape of the mitigation area should appear as a natural wetland area if possible. Avoid long straight sides or square shapes, instead, use a natural curving shape that will blend into the surrounding terrain. Try to daylight back slope cuts as quickly as possible to minimize impacting the existing terrain near the wetland area.

Be aware of drainage flow through the area. Adequate and reliable hydrology at the mitigation site is essential for success. Sometimes it is possible to combine an engineered drainage system detention pond within or adjacent to the mitigation site but consider possible storm events and ensure erosion protection along high flow areas is included in the final design.

Mitigation sites along streams or rivers should be adjacent to, but not encroach on the channel. It is best to be close enough to share high water events of the stream but far enough away for long term stability. Possible bank armoring (i.e. riprap, bio-engineered "soft armoring" or river barbs) may be required to keep a meandering river from damaging the newly developed wetland.

The proposed design must meet the mitigation area size requirements in acres. Slight slopes and changes in elevation, or even "terraces" provide a variety of conditions for plant establishment.

The bottom excavation of the mitigation area should be at an elevation where it will be mostly wet but not always flooded. Too deep an area that is constantly

under water will not vegetate properly. The bottom slope should be relatively flat, shallow standing water is desirable.

Proposed muck, if required, and topsoil placement depths in the finished design will need to be known and estimated quantities calculated. Additional borrow areas may be needed to acquire the total material quantity.

Excavation quantities developed from the mitigation area will need to be coordinated with the overall project earthwork. Borrow material may be obtained from the mitigation area if the material is suitable for road embankment. Unclassified excavation, muck excavation, topsoil borrow, and other grading bid items may be used to describe the work.

Coordination with multiple material handling requirements can get complicated, depending on the timing and sequence of adjacent work. For example, the wetland topsoil at the impact areas may need to be excavated, hauled and stored at the mitigation site for later use in the reclamation before any roadway embankment is placed in the impact areas. If the topsoil material cannot be stored at the mitigation site, another temporary site may be needed.

MITIGATION AREA DRAWINGS

Scaled plan view drawings criteria:

- existing and proposed topography at a scale from which accurate determinations relative to hydrology and vegetative community can be readily discerned, one or two foot contours are recommended
- location of stationed baseline, profile and/or cross sections
- proposed wetland mitigation location and shape, including “types”
- existing wetland, woody riparian vegetation, and other waters delineation boundaries clearly identified. Impacts (area) to existing wetlands should be depicted and deducted from the total at the site (the amount of “net” creation of wetland should be clear).
- boundary description for temporary construction permit area and permanent easement for wetland only, either station & offset or coordinates
- material storage and spoil disposal areas
- variable planting areas, soil erosion and sediment control features, if needed

- location of monitoring wells, piezometers or other hydrology data collection points, etc., if needed
- See EXHIBIT 14 and 15, MITIGATION AREA PLAN VIEW

Scaled profile and/or cross sections criteria:

- show existing and proposed ground surfaces with elevations indicated.
Proposed topsoil depths must be specified
- ordinary high water elevation and anticipated groundwater levels, if available
- width, depth, and bottom elevations of water supply ditches and top elevations and widths of berms, dams, etc., if needed
- proposed wetland cover type, if variable
- See EXHIBIT 16, PROFILE AND CROSS SECTION VIEW

Mitigation design layout and details should be included with R/W & Engineering Plans or even earlier if grading requirements for the mitigation site are substantial. Discuss design specifics at the plan inspection meetings.

Occasionally, special colored exhibits, computer generated renderings or visualizations of the completed mitigation design may be needed to assist with land owner negotiations and/or agency approval.

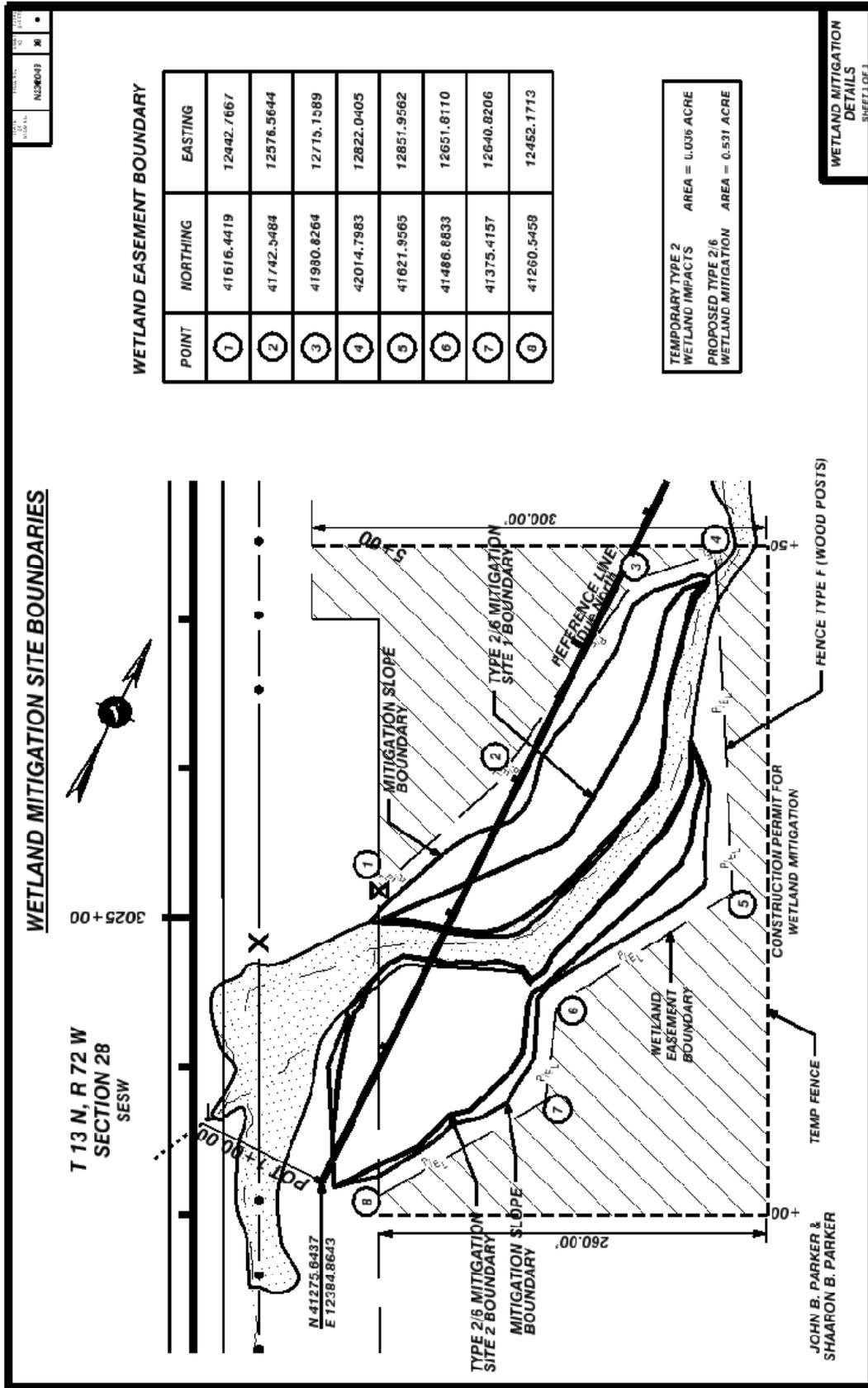


EXHIBIT 15
MITIGATION AREA PLAN VIEW

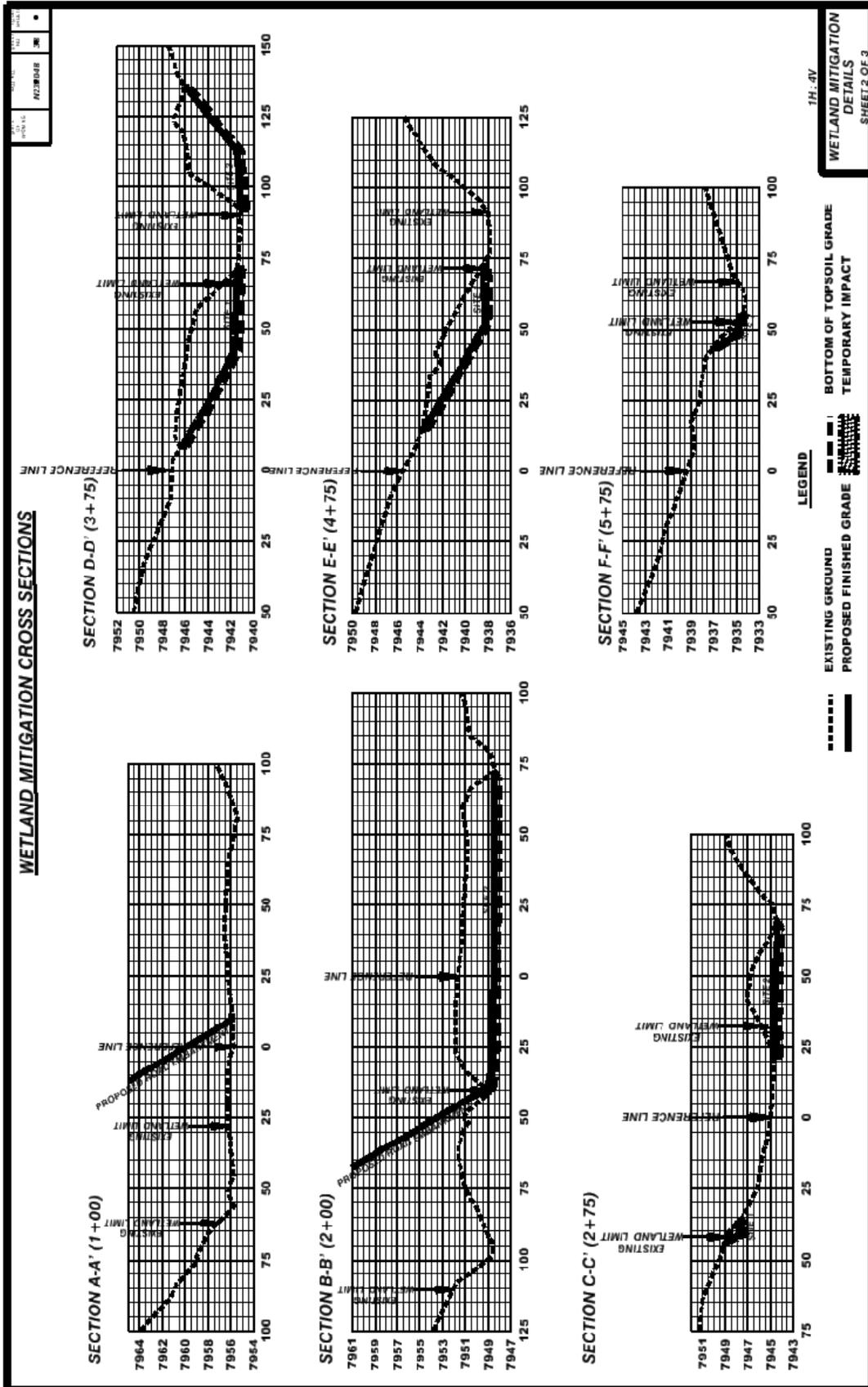


EXHIBIT 16
 PROFILE AND CROSS SECTION VIEW

CONTRACT PLANS SUMMARY AND SPECIAL PROVISION

Wetland construction is typically summarized in the plans as a lump sum bid item with a bill of materials for quantity information. Excavation and topsoil quantities will need special attention when combined with work elsewhere on the project to avoid doubling up of quantities or missing pay items. See EXHIBIT 17, WETLAND CONSTRUCTION SUMMARY.

Wetland seeding recommendations will be provided by Environmental Services to be included in the Material & Rates Summary. Wetland seeding will be different than the typical dry land seed mix specified for the rest of the project. Proposed vegetation planting recommendations may also include willow rootstock or other woody wetland species not placed by seeding.

The lump sum bid item for wetland construction will require a special provision to detail the specific construction requirements such as material handling, planting instructions, timing restrictions and work coordination. Environmental Services will develop the special provision.

WETLAND CONSTRUCTION SUMMARY

STA. - STA.	LS
	WETLAND CONSTRUCTION
112+80 - 126+00 RT	LUMP SUM
126+00 - 131+00 RT	LUMP SUM
TOTAL	LUMP SUM
FOR ESTIMATE	LUMP SUM

BILL OF MATERIALS FOR WETLAND CONSTRUCTION

STA. - STA.	ACRES	CY			EA	LB		TON	MG
	AREA	UNCLASSIFIED EXCAVATION	TOPSOIL STORING	TOPSOIL PLACING	WILLOW ROOTSTOCK	WET MEADOW SEEDING (PLS)	FERTILIZER TYPE I	DRY MULCH	WATER
112+80 - 127+50 RT	6.75	8453	3564	3564	90	144	258	9.7	18
126+00 - 131+00 RT	2.92	4446	2155	2155	50	62	117	4.4	10
TOTAL		12899	5719	5719	140	206	375	14.1	28

EXHIBIT 17
WETLAND CONSTRUCTION SUMMARY