

EROSION AND SEDIMENTATION CONTROL PLAN

Company: ALGONQUIN GAS TRANSMISSION, LLC

Project: ALGONQUIN INCREMENTAL MARKET PROJECT
("AIM Project")

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Effective January 17, 2003
Revised October 8, 2013 for the AIM Project

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1. INTRODUCTION

1.1 Purpose of this Plan

This Erosion and Sedimentation Control Plan (Plan) has been prepared for use by the Company and its contractors as a guidance manual for minimizing erosion of disturbed soils and transportation of sediments off the right-of-way (ROW) and into sensitive resources (wetlands, streams, and residential areas) during natural gas pipeline construction. The procedures developed in this Plan, which represent the Company's best management practices, are designed to accommodate varying field conditions while maintaining rigid minimum standards for the protection of environmentally sensitive areas.

This Plan is designed to provide specifications for the installation and implementation of soil erosion and sediment control measures while permitting adequate flexibility to use the most appropriate measures based on site-specific conditions. The intent of this Plan is to provide general information on the pipeline construction process and to describe specific measures that will be employed during and following construction to minimize impacts to the environment along the pipeline ROW.

The goal of this Plan is to preserve the integrity of environmentally sensitive areas and to maintain existing water quality by implementing the following objectives:

- Minimize the extent and duration of disturbance;
- Protect exposed soil by diverting runoff to stabilized areas;
- Install temporary and permanent erosion control measures; and
- Establish an effective inspection and maintenance program.

1.2 Guidelines and Requirements

The measures described in this Plan have been developed based on guidelines from the Federal Energy Regulatory Commission (FERC), United States Army Corps of Engineers (COE), the United States Fish and Wildlife Service (USF&W), the United States Department of Agriculture, and the Natural Resource Conservation Service, as well as from the Company's significant experience and practical knowledge of pipeline construction and effective environmental protection measures. Lessons and insights gained during pipeline construction projects along the Company's pipeline system and comments from agency representatives are also incorporated into this Plan.

Any deviation from the placement of the structures specified in the construction drawings, or changes in the design of control measures as set forth in this Plan, must be approved by the Company's Environmental Construction Permitting Department and must have the concurrence from the appropriate permitting agency.

Pursuant to changes in the FERC regulations, interstate pipeline companies are now required to comply with the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan and the FERC's Wetland and Waterbody Construction and Mitigation Procedures (Plan and Procedures, 5/31/13 Version), unless approval to deviate from the Plan and Procedures is received from the appropriate state agency.

The following identifies the differences between this Plan and the FERC's Plan and Procedures as well as the reasons behind the differences:

1. FERC Plan (Section V.C.1 and V.C.3): Perform compaction testing in residential areas disturbed by construction activities and perform appropriate soil compaction mitigation in severely compacted residential areas.

This Plan: Compaction testing and mitigation are not required in residential areas.

Reason to Deviate: This Plan requires that topsoil either be segregated or replaced in residential areas. Topsoil that is segregated or replaced results in little compaction and provides a suitable medium for grass. Most yard areas that are sown in grass do not require deep root penetration. In the event that the grass needs deeper root penetration, the subsequent freeze-thaw cycles of the upper portions of the subsoil will provide natural mitigation of any compacted areas of the ROW within 2-3 years. Post-construction monitoring will be conducted during this timeframe as discussed in Section 8.1.

1.3 Surveys, Permits, and Notifications

The Company shall perform the required environmental field surveys and acquire the necessary environmental permits prior to start of construction of the project. The Company shall notify the appropriate federal and state agencies prior to, during, and/or subsequent to the construction of the project, as identified in the Clearance Package/ Permit Book.

1.4 Inquiries

Inquiries regarding this Plan should be addressed to the Manager, Environmental Construction Permitting Department; shown on the front cover; P.O. Box 1642; Houston, Texas 77056. For field conditions requiring an immediate response, contact the Area Manager at the address shown on the front cover.

2. SUPERVISION AND INSPECTION

To effectively mitigate project-related impacts, the Plan must be properly implemented in the field. Quick and appropriate decisions in the field regarding critical issues such as stream and wetland crossings, placement of erosion controls, trench dewatering, spoil containment, and other construction related items are essential.

To ensure that the Plan is properly implemented, at least one Environmental Inspector (EI) will be designated by the Company for each construction spread during active construction or restoration. The EI will have peer status with all other activity inspectors and will report directly to the Resident Engineer/ Chief Inspector who has overall authority on the construction spread. On smaller projects, the EI role may be carried out by the Resident Engineer/ Chief Inspector or a Craft Inspector, as designated by the Company. The EI will have the authority to stop activities that violate the environmental conditions of the FERC's Orders (if applicable), other federal and state permits, or landowner requirements, and to order corrective action.

2.1 Responsibilities of the Environmental Inspector

At a minimum, the EI shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this Plan, the construction drawings, the environmental conditions of the FERC's Orders (if applicable), proposed mitigation measures, other federal or state environmental permits and approvals, and environmental requirements in landowner easement agreements;
2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;
3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;
4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
5. Identifying erosion/sediment control and stabilization needs in all areas;
6. Ensuring that the location design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resources sites, wetlands, waterbodies, and sensitive species habitat;
7. Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into a sensitive environmental resource areas, including wetland or waterbody, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;

- 8 Ensuring that subsoil and topsoil are tested in agricultural areas to measure compaction and determine the need for corrective action;
- 9 Advising the Chief Inspector when environmental conditions (such as wet weather or frozen soil) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;
- 10 Ensuring restoration of contours and topsoil;
- 11 Verifying that the soils imported for agricultural or residential use have been certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;
- 12 Ensuring that erosion controls are properly installed to prevent sediment flow into environmental resource (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads and determining the need for additional erosion control devices;
- 13 Inspecting temporary erosion control measures at least:
 - a. On a daily basis in areas of active construction or equipment operation;
 - b. On a weekly basis in areas with no construction or equipment operation; and
 - c. Within 24 hours of each 0.5 inch of rainfall.
- 14 Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;
- 15 Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase;
- 16 Ensuring that the Contractor implements and complies with the Company's Spill Prevention Control and Countermeasure (SPCC) Plan; and
- 17 Keeping records of compliance with the environmental conditions of the FERC's Orders, proposed mitigation measures, and other Federal or state environmental permits during active construction and restoration; and
- 18 Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with Section 3.5.3.2 and 3.5.3.3 of this Plan.

2.2 Environmental Training for Construction

If required by the FERC's Orders, environmental training will be given to both the Company personnel and contractor personnel whose activities will impact the environment during pipeline construction. The level of training will be commensurate with the type of duties of the personnel. All construction personnel from the chief inspector, EI, craft inspectors, contractor job superintendent to loggers, welders, equipment operators, and laborers will be given some form of environmental training. In addition to the EI, all other construction personnel are expected to play an important role in maintaining strict compliance with all permit conditions to protect the environment during

construction. Training will be given prior to the start of construction and throughout the construction process, as needed, and will cover the following issues:

- The specifics of this Plan and the SPCC Plan;
- Job or activity specific permit requirements;
- Company policies and commitments;
- Cultural resource procedures and restrictions;
- Threatened and endangered species restrictions; and
- Any other pertinent information related to the job.

3. CONSTRUCTION TECHNIQUES FOR NATURAL GAS PIPELINES

3.1 Typical ROW Requirements

Pipeline construction workspace requirements are a function of pipe diameter, equipment size, topography, geological rock formations, location of construction such as at road crossings or river crossings, pipeline crossovers, methods of construction such as boring or open-cut construction, or existing soil conditions encountered during construction. As the diameter of the pipeline being installed increases, so does the depth of trench, excavated spoil material, equipment size, and ultimately the amount of construction work space that will be required to construct the project. All construction activities are restricted to the ROW limits identified on the construction drawings. However, in limited, non-wetland areas, the construction ROW width may be expanded by up to 25 feet without approval from the FERC for the following situations:

1. To accommodate full construction ROW topsoil segregation;
2. To ensure safe construction where topographic conditions (i.e., side-slopes) or soil limitations exist; and
3. For truck turn-arounds where no reasonable alternative access exists in limited, non-wetland or non-forested areas.

Use of these limited areas is subject to landowner approval and compliance with all applicable survey, mitigation, and reporting requirements.

The U.S. Department of Transportation (DOT) and Occupational Safety and Health Administration (OSHA) have established minimum size and area requirements for worker safety involving construction activities. See Figures 1, 2, and 3 for typical construction ROW widths. Additional construction ROW may be required at specific locations to construct a pipeline including, but not limited to, steep side or vertical slopes, road crossings, crossovers, areas requiring topsoil segregation, and staging areas associated with wetland and waterbody crossings. These locations are shown on the construction drawings.

3.2 Access Roads

All access to the construction ROW will be limited to existing roads and minimized in wetlands to the extent practical. Additional access roads to the ROW are required at various points along the project ROW where other road crossings (paved or gravel/state/local roads) do not exist. Examples of types of access used include abandoned town roads, railroad ROWs, powerline service roads, logging roads and farm roads. Improvements to access roads (i.e., grading, placing gravel, replacing/installing culverts, and trimming overhanging vegetation) may be required due to the size and nature of the equipment that would utilize the road (Figure 4).

1. Access to the ROW during construction and restoration activities is permitted only by the new or existing access roads identified on the construction drawings.

2. Contractor shall maintain safe conditions at all road crossings and access points during construction and restoration. All access roads will be maintained during construction by grading and the addition of gravel or stone when necessary.
3. Contractor will implement all appropriate erosion and sedimentation control measures for construction/improvement of access roads.
4. Contractor shall ensure that all paved road surfaces utilized during construction are kept free of mud and debris to the extent practical.
5. If crushed stone pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate rock removal after construction (Figure 5).
6. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.
7. All access roads across a waterbody must use an equipment bridge in accordance with Section 5.2.2.
8. The only access roads, unless otherwise permitted, that can be used in wetlands other than the construction ROW are those existing roads requiring no modification or improvements, other than routine, and no impact on the wetland.
9. Limit construction equipment operating in wetland areas to that needed to clear the ROW, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the ROW. All other construction equipment shall use access roads located in upland areas to the maximum extent practical. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the ROW, whenever practical.
10. For access through a saturated wetland, unless otherwise authorized by agency permits, use timber mats or an equivalent (Figure 6).

3.3 Pipe and Contractor Wareyards

Pipe and contractor wareyards are required for storing and staging equipment, pipe, fuel, oil, pipe fabrication, and other construction related materials. The Contractor shall perform the following measures at pipe and contractor wareyards:

1. Strip and segregate topsoil in agricultural lands;
2. Install erosion control structures as directed by the EI, outlined in this Plan, or identified on the construction drawings, and maintain them throughout construction and restoration activities;
3. Implement and comply with the SPCC Plan; and

4. Restore and revegetate all disturbed areas in accordance with the measures outlined in this Plan and as directed by the EI.

3.4 Off-ROW Disturbance

With certain exceptions, which are required in order to comply with FERC Plan and Procedures, all construction activities are restricted to within the limits identified on the construction drawings (exceptions include the installation of slope breakers, installation of energy-dissipating devices, installation of dewatering structures, and drain tile repair which are subject to applicable survey requirements). However, in the event that off-ROW disturbance occurs, the following measures will be implemented:

1. The EI will immediately report the occurrence to the Chief Inspector and ROW Agent;
2. The conditions that caused the disturbance will be evaluated by the Chief Inspector and the EI, and they will determine whether work at the location can proceed under those conditions; and
3. If deemed necessary by the Chief Inspector and EI, one or more of the following corrective actions will be taken: immediate restoration of the original contours, seeding and mulching of the disturbed area, and/or installation of erosion control devices. The Company's Environmental Construction Permitting Department will be notified as soon as practical.

3.5 Construction Sequence

Natural gas pipelines are installed using conventional overland buried pipeline construction techniques. These activities are necessary for the installation of a stable, safe, and reliable transmission facility consistent with DOT requirements and regulations. This section provides an overview of the equipment and operations necessary for the installation of a natural gas pipeline, describes potential impacts that may occur from each operation, and identifies the measures that will be implemented to control these potential impacts. This section also discusses in detail the erosion and sediment control techniques that apply to each construction activity including clearing, grading, trenching, lowering-in of pipe, backfilling, and hydrostatic testing. ROW restoration will be addressed in Section 3.6.

Installation of the pipeline will typically proceed from one end of the construction spread to the other in an assembly line or "mainline" fashion. The spacing between the individual crews responsible for each interdependent activity is based on anticipated rate of progress. The activities listed below are normally performed in the following sequence:

- Survey and Flag the ROW;
- Clearing the ROW;
- Installing temporary sediment barriers;
- Grading the ROW;
- Installing temporary interceptor dikes;
- Trenching/excavating the trench;

- Pipe stringing and bending;
- Welding and weld inspection;
- Trench dewatering;
- Lowering the pipe into the trench;
- Backfilling the trench;
- Hydrostatic testing of pipe; and
- ROW restoration and clean-up.

Obstacles to the mainline technique are often encountered and are not considered to be out of the ordinary. These obstacles, which include side hill crossings, rock, wetlands, streams, roads, and residential areas, do not normally interrupt the assembly line flow.

3.5.1 Clearing

Clearing operations will include the removal of vegetation within the construction ROW. Various clearing methods will be employed depending on tree size, contour of the land, and the ability of the ground to support clearing equipment. Vegetative clearing will either be accomplished by hand or by cutting equipment. The following procedures will be standard practice during clearing:

1. Prior to beginning the removal of vegetation, the limits of clearing will be established and identified in accordance with the construction drawings;
2. All construction activities and ground disturbance will be confined to within the ROW shown on the construction drawings;
3. Clearly mark and protect trees to be saved as per landowner requests or as otherwise required;
4. All brush and trees will be felled into the construction ROW to minimize damage to trees and structures adjacent to the ROW. Trees that inadvertently fall beyond the edge of the ROW will be immediately moved onto the ROW and disturbed areas will be immediately stabilized;
5. Trees will be chipped or cut into lengths identified by the landowner and then stacked at the edge of the ROW or removed;
6. Brush and limbs may be disposed of in one or more of the following ways depending on local restrictions, applicable permits, construction Line List stipulations, and landowner agreements:
 - a. Stockpiled along the edge of the ROW;
 - b. Burned;
 - c. Chipped, spread across the ROW in upland areas, and plowed in; or
 - d. Hauled off site.
7. Existing surface drainage patterns will not be altered by the placement of timber or brush piles at the edge of the construction ROW.

3.5.2 Installing Temporary Sediment Barriers

Sediment barriers, which are temporary erosion controls intended to minimize the flow of sediment and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources, shall be installed following vegetative clearing operations. They may be constructed of materials such as silt fence, staked straw bales, compacted earth (e.g., drivable berms across travel lanes), sandbags, or an equivalent material as identified by the EI (Figures 7, 8, 9 and 10). Where permitted by regulatory agencies, hay bales may be used in lieu of straw bales with the following restrictions: hay bales shall not be used for mulching and the Contractor is responsible for their removal and disposal.

Install temporary sediment barriers at the base of slopes adjacent to road crossings and at waterbody and wetland crossings in accordance with Sections 5.2.4 and 6.2.2 respectively.

1. Do not stake or trench in place straw bales used on equipment bridges or on mats across the travel lane.
2. Inspect temporary sediment barriers daily in areas of active construction to ensure proper functioning and maintenance. In other areas, sediment barriers will be inspected and maintained on a weekly basis throughout construction, and within 24 hours following storm events.
3. Maintain all temporary sediment barriers in place until permanent revegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.
4. Remove temporary sediment barriers from an area when replaced by permanent erosion control measures or when the area has been successfully restored as specified in Section 8.1.

3.5.3 Grading

The construction ROW will be graded as needed to provide a level workspace for safe operation of heavy equipment used in pipeline construction. The following procedures will be standard practice during grading:

3.5.3.1 Topsoil Segregation

Topsoil segregation methods will be used in all residential areas and when the construction ROW is wider than 30 feet in cultivated or rotated croplands, managed pastures, hayfields, and other areas at the landowner's or land managing agency's request.

- a. Prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench line and subsoil storage area (ditch plus spoil side method) as stipulated in the Construction Contract or Line List (Figure 11).
- b. Segregate at least 12 inches of topsoil in deep soils with more than 12 inches of topsoil. In soils with less than 12 inches of topsoil, make every effort to segregate the entire topsoil layer.

- c. Where topsoil segregation is required, maintain separation of salvaged topsoil and subsoil throughout all construction activities.
- d. For wetlands, segregate the top 12 inches of topsoil within the ditchline, except in areas where standing water is present or soils are saturated.
- e. Leave gaps in the topsoil piles for the installation of temporary interceptor dikes to allow water to be diverted off ROW.
- f. Topsoil replacement (i.e., importation of topsoil) may be used as an alternative to topsoil segregation if approved by the landowner and Chief Inspector.
- g. Never use topsoil for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.
- h. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

3.5.3.2 Tree Stump Removal and Disposal

- a. Remove tree stumps in upland areas along the entire width of the permanent ROW to allow adequate clearance for the safe operation of vehicles and equipment. Stumps within the temporary ROW will be removed or ground to a suitable height that will allow the safe passage of equipment, as stipulated by the Chief Inspector or EI.
- b. Dispose of stumps by one of the following methods, pending approval by the Chief Inspector and the landowner, and in accordance with regulatory requirements:
 - Buried at a Company-approved off-site location (except in wetlands and agricultural areas);
 - Burned;
 - Chipped, spread across the ROW in upland areas, and plowed in; or
 - Ground to grade in wetlands, excess chips will be removed for proper disposal.
- c. Grading operations and tree stump removal in wetland areas will be conducted in accordance with Section 6.2.1.

3.5.3.3 Rock Disposal

Rock (including blast rock) will be disposed of in one or more of the following ways:

- a. Buried on the ROW or in approved construction work areas either in the ditchline or as fill during grade cut restoration in accordance with the Construction specifications. In cultivated/ agricultural lands, wetlands, and residential areas, rock may only be backfilled to the top of the existing bedrock profile;
- b. Windrowed per written landowner agreement with the Company;

- c. Removed and disposed of at a Company-approved site; or
- d. Used as riprap for stream bank stabilization where allowed by an applicable regulatory agency(s) (Figure 34).

3.5.4 Installing Temporary Interceptor Dikes

1. Temporary interceptor dikes, which are temporary erosion control measures intended to reduce runoff velocity and divert water off the construction ROW, shall be installed following grading operations (Figure 12). The interceptor dikes are to be installed on all disturbed areas as necessary to avoid excessive erosion. Temporary interceptor dikes may be constructed of materials such as compacted soil, silt fence, staked straw bales or sand bags. If permitted by regulatory agencies, hay bales may be used in lieu of straw bales with the following restrictions: hay bales shall not be used for mulching and the Contractor is responsible for their removal and disposal.

Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland or road crossing at the spacing indicated below (closer spacing should be used if necessary). Where the base of the slope is equal or greater than 50 feet from a waterbody, wetland, or road crossing, install interceptor dikes at a spacing necessary to avoid excessive erosion.

<u>Slope (%)</u>	<u>Spacing (feet)</u>
<5	No Structure
5 - 15	300
> 15 - 30	200
> 30	100

2. Direct the outfall of each temporary interceptor dike to a stable, well vegetated area or construct an energy-dissipating device (silt fence, staked straw bales, erosion control fabric) at the end of the interceptor dike.
3. Position the outfall of each temporary interceptor dike to prevent sediment discharge into wetlands, waterbodies, or other sensitive resources.
4. Install temporary interceptor dikes across the entire ROW at all waterbody and wetland crossings, as well as the base of slopes adjacent to roads, when directed by the EI.
5. Drivable berms, which are smaller versions of interceptor dikes constructed of compacted soil or sand bags, may be used in place of staked straw bales at the entrances and exits of travel lanes at road crossings, waterbodies, and wetlands. They are installed the width of the travel lane at the start of the equipment crossing and made low enough to allow equipment and other vehicles to pass. Yet, they reduce and divert water runoff from sensitive environmental resources.
6. Inspect temporary interceptor dikes daily in areas of active construction to insure proper functioning and maintenance. In other areas, the interceptor dikes will be inspected and

maintained on a weekly basis throughout construction, and within 24 hours following storm events.

3.5.5 Trenching

The trench centerline will be staked after the construction ROW has been prepared. In general, a trench will be excavated to a depth that will permit burial of the pipe with a minimum of 3 feet of cover (Figure 13). Overland trenching may be accomplished using a conventional backhoe or a rotary wheel-ditching machine. In shale or rocky areas where the use of the wheel-ditching machine is limited, a tractor-drawn ripper will be employed to break and loosen hard substratum material. In areas where rock cannot be ripped, drilling and blasting may be required. A backhoe may then be used to remove rock and soil from the ditch.

The following procedures will be standard practice during ditching:

1. Flag drainage tiles damaged during ditching activities for repair; and
2. Place spoil at least 10 feet upgradient from the edge of waterbodies. Spoil will be contained with erosion and sedimentation control devices to prevent spoil materials or heavily silt-laden water from transferring into waterbodies and wetlands or off of the ROW.

3.5.5.1 Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill. Along steep slopes, they serve to reduce erosion and sedimentation in the trench and minimize dewatering problems at the base of slopes where sensitive environments such as waterbodies and wetlands are frequently located. In addition, they provide access across the trench for wildlife and livestock.

- a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.
- b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.
- c. Do not use topsoil for installing temporary soft trench plugs.
- d. Coordinate with the landowner to identify optimal locations for the placement of temporary hard trench plugs designed to provide access for livestock.
- e. Temporary trench plugs may be used in conjunction with interceptor dikes to prevent water in the trench from overflowing into sensitive resource areas (Figure 14). Attempt to divert trench overflow to a well-vegetated off-ROW location or construct an energy-dissipating device.

3.5.6 Trench Dewatering

Trench dewatering may be periodically required along portions of the proposed pipeline prior to and/or subsequent to installation of the pipeline to remove collected water from the trench.

1. Trench dewatering will be conducted (on or off the construction ROW) in such a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody or wetland.
2. The intakes of the hoses used to withdraw the water from the trench will be elevated and screened to minimize pumping of deposited sediments.
3. Water may be discharged into areas where adequate vegetation is present adjacent to the construction ROW to function as a filter medium.
4. Where vegetation is absent or in the vicinity of waterbody/ wetland areas, water will be pumped into a filter bag (Figure 15) or through a structure composed of sediment barriers. When using filter bags, secure the discharge hose to the bag with a clamp.
5. Remove dewatering structures as soon as practicable after the completion of dewatering activities.

3.5.7 Pipe Installation

3.5.7.1 Stringing and Bending

Following trench excavation, pipe sections will be delivered to the construction site by truck or tracked vehicle, and strung out along the trench. Individual pipe sections will be placed on temporary supports or wooden skids and staggered to allow room for work on the exposed ends. Certain pipe sections will be bent, as necessary, to conform to changes in slope and direction of the trench.

3.5.7.2 Welding and Weld Inspection

Once the bending operation is complete, the pipe sections will be welded together on supports using approved welding procedures that comply with Company welding specifications. After welding, the welds will be inspected radiographically or ultrasonically to ensure their structural integrity.

3.5.7.3 Lowering-in

Lowering-in consists of placing the completed pipeline sections into the trench where a tie-in weld will be made. Lowering-in is usually accomplished with two or more sideboom tractors acting in unison and spaced so as not to buckle or otherwise damage the pipe. The pipeline will be lifted from the supports, swung out over the trench, and lowered directly into the trench. The equipment uses a “leap frogging” technique requiring sufficient area to safely move around other tractors within the construction ROW to gain an advanced position on the pipe.

3.5.8 Backfilling

Backfilling consists of covering the pipe with the earth removed from the trench or with other fill material hauled to the site when the existing trench spoil is not adequate for backfill. Backfilling will follow lowering-in of the pipeline as close as is practical.

In areas where the trench bottom is irregularly shaped due to consolidated rock or where the excavated spoil materials are unacceptable for backfilling around the pipe, padding material may be required to prevent damage to the pipe. This padding material will generally consist of sand or screened spoil materials from trench excavation.

1. Under no circumstances shall topsoil be used as padding material.
2. Excess rock, including blast rock, may be used to backfill the trench to the top of the existing bedrock profile in accordance with Company specifications. Rock that is not used to backfill the trench will be treated as described in Section 3.5.3.3.
3. Any excess material will be spread within the ROW in upland areas and land contours will be roughed-in to match adjacent topography.
4. The trench may be backfilled with a crown over the pipe to compensate for compaction and settling. Openings will be left in the completed trench crown to restore pre-construction drainage patterns. Crowning shall not be used in wetland areas.

3.5.8.1 Permanent Trench Plugs

Permanent trench plugs are intended to slow subsurface water flow and erosion along the trench and around the pipe in sloping terrain (Figures 16, 17). Permanent trench plugs will be constructed with sand bags or an equivalent as identified in the permit requirements. On severe slopes greater than 30 percent, "Sakrete" may be used at the discretion of the Chief Inspector.

- a. Topsoil shall not be used to construct trench plugs.
- b. Permanent trench plugs, which are used in conjunction with interceptor dikes, shall be installed at the locations shown on the construction drawings or as determined by the EI. If not shown, use the following spacing:

<u>Slope (%)</u>	<u>Spacing (feet)</u>
<5	No Structure
5 - 15	300
> 15 - 30	200
> 30	100

- c. Trench plugs shall be installed at the base of slopes adjacent to waterbodies and wetlands, and where needed to avoid draining of a resource.

3.5.9 Hydrostatic Testing

Once the pipeline is completed and before it is placed into service, it will be hydrostatically tested for structural integrity. Hydrostatic testing involves filling the pipeline with clean water and maintaining a test pressure in excess of normal operating pressures for a specified period of time (typically 8 hours). The testing procedure involves filling the pipeline with test water, performing the pressure test, and discharging the test water.

1. The EI shall notify appropriate state agencies (as identified in the Hydrostatic Test Package) of the intent to use specific test water sources at least 48 hours before testing activities (unless waived in writing).
2. Pumps used for hydrostatic testing within 100 feet of any waterbody or wetland shall be operated and refueled in accordance with the SPCC Plan. Address secondary containment and refueling of these pumps in the SPCC Plan.
3. Do not use state-designated exceptional value waters, waterbodies that provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission. Use only the water sources identified in the Clearance Package/Permit Book.
4. Screen the intake hose to minimize the potential for entrainment of fish and other aquatic life.
5. Maintain ambient, downstream flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.
6. Locate hydrostatic test manifolds outside wetlands and riparian areas to the greatest extent practical.
7. For an overland discharge of test water from a new pipeline, dewater into an energy dissipation device constructed of straw bales (Figures 18, 19).
8. For an overland discharge of test water from an existing pipeline, dewater into an energy dissipation device constructed of straw bales and absorbent booms (Figure 18). If required by the appropriate permitting agency, the test water may be discharged through an appropriate filtration system including frac tanks and/ or carbon filters.
9. Dewater only at the locations shown on the construction drawings or locations identified in the Hydrostatic Test Package.
10. Locate all dewatering structures in a well-vegetated and stabilized area, if practical, and attempt to maintain at least a 50-foot vegetated buffer from adjacent waterbody/wetland areas. If an adequate buffer is not available, sediment barriers or similar erosion control measure must be installed.

11. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour to aquatic resources, suspension of sediments, flooding or excessive stream flow.
12. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.
13. The EI shall sample and test the source water and discharge water in accordance with the permit requirements.

3.6 ROW Restoration and Final Cleanup

Restoration of the ROW will begin after pipeline construction activities have been completed. Restoration measures include the re-establishment of final grades and drainage patterns as well as the installation of permanent erosion and sedimentation control devices to minimize post-construction erosion. Residential areas will be restored in accordance with Section 4.3.3. Property shall be restored as close to its original condition as practical unless otherwise specified by the landowner.

1. The Contractor shall make every reasonable effort to complete final cleanup of an area (including final grading and installation of permanent erosion control structures) within 20 days after backfilling the trench in that area (within 10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.
2. The disturbed ROW will be seeded within 6 working days of final grading, weather and soil conditions permitting.
3. If final cleanup and seeding cannot be completed and is delayed until the next recommended growing season, the winter stabilization measures in Section 3.6.4 shall be followed.
4. Grade the ROW to pre-construction contours.
5. Spread segregated topsoil back across the graded ROW to its original profile.
6. Remove excess rock from at least the top 12 inches of soil to the extent practical in all rotated and cultivated cropland, hayfields, managed pastures, residential areas, and other areas at the landowner's request. The size, density, and distribution of rock on the construction ROW should be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing.

7. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed, regularly inspected and maintained. When access is no longer required, the travel lane must be removed and the ROW restored.
8. Remove all construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.
9. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

3.6.1 Permanent Erosion Control

3.6.1.1 Permanent Interceptor Dikes

Permanent interceptor dikes are intended to reduce runoff velocity, divert water off the construction ROW, and prevent sediment deposition into sensitive resources (Figure 12). Permanent interceptor dikes will be constructed of compacted soil. Stone or some functional equivalent may be used when directed by the EI.

- a. Install permanent interceptor dikes in all areas, except cultivated areas and lawns, at the locations shown on the construction drawings or as directed by the EI. If not shown, use the spacing outlined for temporary interceptor dike installation in Section 3.5.4.
- b. Install permanent interceptor dikes across the entire ROW at all waterbody and wetland crossings, and at the base of slopes adjacent to roads. When the ROW parallels an existing utility ROW, permanent interceptor dikes may be installed to match existing interceptor dikes on the adjacent undisturbed pipeline ROW.
- c. Construct interceptor dikes with a 2 to 8 percent outslope to divert surface flow to a stable vegetative area without causing water to pool or erode behind the interceptor dike. In the absence of a stable vegetative area, install an energy-dissipating device at the end of the interceptor dike (Figure 12).
- d. Interceptor dikes may extend slightly (about 4 feet) beyond the edge of the construction ROW to effectively drain water off the disturbed area. Where interceptor dikes extend beyond the edge of the construction ROW, they are subject to compliance with all applicable survey requirements.
- e. Install chevron-style interceptor dikes on slopes when directed by the EI (Figure 20).
- f. Install a rock-lined drainage swale along the ROW with restricted drainage features when directed by the EI. The drainage swale is generally 8 feet wide and a maximum of 18-24 inches deep (Figure 21).

- g. On slopes greater than 30 percent, install interceptor dikes with erosion control fabric on the swale side.

3.6.1.2 Erosion Control Fabric

- a. Install erosion control fabric at interceptor dike outlets and drainage swales as necessary or as directed by the EI (Figure 12, 21).
- b. Install erosion control fabric or matting on slopes greater than 30 percent adjacent to roads or waterbodies (Figure 22). Anchor the erosion control fabric or matting with staples or other appropriate devices in accordance with the manufacturers' recommendations.
- c. The EI will direct the installation of high-velocity erosion control fabric on the swale side of permanent interceptor dikes (Figure 23).

3.6.2 Revegetation and Seeding

Successful revegetation of soils disturbed by project-related activities is essential. Seeding will be conducted using the following requirements:

1. Fertilize and add soil pH modifiers in accordance with the recommendations in Appendix B. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practical after application;
2. Seed all disturbed areas within 6 working days of final grading, weather and soil conditions permitting;
3. Prepare seedbed in disturbed areas to a depth of 3 to 4 inches to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed;
4. Seed disturbed areas in accordance with the seed mixes, rates, and dates in Appendix B, except in upland areas where landowners or a land management agency may request alternative seed mixes. Seeding is not required in cultivated croplands unless requested by the landowner.
5. Perform seeding of permanent vegetation within the recommended seeding dates as outlined in Appendix B. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in Section 3.5.2 and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Mulch in accordance with Section 3.6.3. Lawns may be seeded on a schedule established with the landowner;
6. Base seeding rates on Pure Live Seed (PLS). Use seed within 12 months of seed testing;

7. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydroseeding); and
8. Uniformly apply and cover seed in accordance with Appendix B. In the absence of any recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary. A seed drill equipped with a cultipacker is preferred for application, but broadcast or hydroseeding can be used at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. In rocky soils, or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the EI.

3.6.3 Mulch

Mulch is intended to stabilize the soil surface and shall consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent as approved by the EI and Chief Inspector. Hay shall not be used for mulch.

1. Mulch all disturbed upland areas (except cultivated cropland) **before** seeding if:
 - a. Final cleanup, including final grading and installation of permanent erosion control measures, is not completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas); or
 - b. Construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

NOTE: When mulching before seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

2. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary, to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the ROW at a rate of 2 tons/acre of straw or equivalent.
3. Mulch with woodchips only under the following conditions with prior approval from the Chief Inspector or the EI:
 - a. Do not use more than 1 ton/acre; and
 - b. Add the equivalent of 11 lbs/acre available nitrogen (at least 50 % of which is slow release).
4. Ensure that mulch is anchored to minimize loss by wind and water. Anchoring may be achieved by wet soil conditions (when approved by the EI), mechanical means, or with liquid mulch binders.
5. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. **Do not use liquid mulch binders within 100 feet of wetlands and waterbodies**, except where the

product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

6. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor the erosion control fabric with staples or other appropriate devices.

3.6.4 Winter Stabilization

In the event that the final phases of construction or restoration occur too late in the year for cleanup activities to adequately proceed, the following procedures will be implemented along the disturbed ROW at those locations until final restoration measures can be completed. The Company will file for review and written approval from the FERC, a winterization plan if construction continues into the winter season where conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring.

1. Install permanent interceptor dikes at specified intervals on all slopes, or as directed by the EI;
2. Install temporary sediment barriers adjacent to stream and wetland crossings, as well as other critical areas;
3. Seed and mulch the ROW and seed segregated topsoil piles in accordance with Appendix B; and

Remove flumes from waterbody crossings to reestablish natural stream flow.

3.6.5 Winter Construction Plans

If construction is planned to occur during winter weather conditions, develop and file a project-specific winter construction plan with the FERC application. The plan shall address:

1. Winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);
2. Stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and
3. Final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

3.7 Unauthorized Vehicle Access to ROW

The Company will offer to install and maintain measures to control unauthorized vehicle access to the ROW based on requests by the manager or owner of forested lands. These measures may include:

- Signs;

- Fences with locking gates;
- Slash and timber barriers, pipe barriers, or a line of boulders across the ROW; or
- Conifers or other appropriate shrubs with a mature height of 4 feet or less across the ROW.

4. SPECIAL CONSTRUCTION METHODS

The Company will utilize the following specialized construction procedures for agricultural areas, road crossings, and residential areas along the pipeline project. The project construction drawings, Line Lists, and Construction Contract will indicate the locations where specialized construction methods will be used.

4.1 Agricultural Areas

4.1.1 Drain Tiles

1. Attempt to locate existing drain tiles and irrigation systems.
2. Develop procedures for constructing through drain tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.
3. Engage qualified drain tile specialists, as needed, to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialist from the project area, if available.
4. Probe all drainage tile systems within the area of disturbance to check for damage.
5. Repair damaged drain tiles to their original condition (Figure 24). Filter-covered drain tiles may not be used unless the local soil conservation authorities and the landowner agrees in writing prior to construction.
6. Ensure that the depth of cover over the new pipeline is sufficient to avoid interference with drain tile systems (existing or proposed). For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

4.1.2 Irrigation

1. Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.
2. Repair any damage to the systems as soon as practical.

4.1.3 Soil Compaction Mitigation

1. Test topsoil and subsoil for compaction at regular intervals in agricultural areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to identify approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.
2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil. If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

4.2 Road Crossings

Unpaved private and public roads supporting minimal traffic volumes are usually crossed by boring or by means of an open cut, if this method is approved by the owner or appropriate road management agency. An open cut crossing may involve closing the road to all traffic and constructing an adequate detour around the crossing area, or excavating one-half of the road at a time allowing through traffic to be maintained

(Figure 25). The trench for an open cut crossing is excavated with a backhoe or similar equipment, all backfill is compacted, and the road resurfaced. All state, national, and interstate highways as well as all railroads must be crossed by boring (Figure 26), unless the crossing permit allows an open cut crossing. Access roads shall be used in accordance with Section 3.2.

4.3 Residential Areas

4.3.1 Construction Procedures

Specialized construction procedures will be utilized in areas of heavy residential or commercial/ industrial congestion where residences or business establishments are located within 50 feet of construction work areas.

1. Install safety fence at the edge of the construction ROW for a distance of 100 feet on either side of the residence or business establishment.
2. Attempt to maintain a minimum distance of 25 feet between any residence/business establishment and the edge of the construction work area for a distance of 100 feet on either side of the residence/business establishment.
3. Avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements.
4. Restore all lawn areas and landscaping immediately following cleanup operations, or as specified in landowner agreements.
5. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

4.3.2 Construction Techniques

In addition to the previously identified specialized procedures, smaller "spreads" of labor and equipment, operating independent of the mainline work force, will utilize either the stove pipe or drag section pipeline construction techniques in those areas of congestion where a minimum distance of 25 feet cannot be maintained between the residence (or business establishment) and the edge of the construction work area. In no case shall the temporary work area be located within 10 feet of a

residence unless the landowner agrees in writing, or the area is within the existing maintained ROW. The following techniques shall be utilized for a distance of 100 feet on either side of the residence or business establishment at the locations identified in the Construction Contract and/or Line List.

1. The stove pipe construction technique is a less efficient alternative to the mainline method of construction, typically used when the pipeline is to be installed in very close proximity to an existing structure or when an open trench would adversely impact a commercial/industrial establishment. The technique involves installing one joint of pipe at a time whereby the welding, weld inspection, and coating activities are all performed in the open trench. At the end of each day after the pipe is lowered-in, the trench is backfilled and/or covered with steel plates or timber mats. The length of excavation performed each day cannot exceed the amount of pipe installed.
2. The drag section construction technique, while less efficient than the mainline method, is normally preferred over the stove pipe alternative. This technique involves the trenching, installation, and backfill of a prefabricated length of pipe containing several segments all in one day. At the end of each day after the pipe is lowered-in, the trench is backfilled and/or covered with steel plates or timber mats. Use of the drag section technique will typically require adequate staging areas outside of the residential and/or commercial/industrial congestion for assembly of the prefabricated sections.

4.3.3 Cleanup and Restoration

1. Reseed all disturbed lawns with a seed mixture acceptable to landowner or comparable to the adjoining lawn.
2. Landowners shall be compensated for damages to ornamental shrubs and other landscape plantings based on the appraised value as set forth in the Guide for Plant Appraisal, authored by the Council of Tree and Landscape Appraisers (CTLA), 8th Edition and published in 1992 by the International Society of Arboriculture.
3. Landowners shall be compensated for damages in a fair and reasonable manner, and as specified in the damage provision within the controlling easement on each property.

5. WATERBODY CROSSINGS

The following section describes the construction procedures and mitigation measures that will be used for pipeline installations at waterbodies. The intent of these procedures is to minimize the extent and duration of project related disturbances within waterbodies.

5.1 Waterbody Definitions

The term “**waterbody**” as used in this Plan includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes. In this Plan, waterbodies are characterized into three main categories depending on the width of the waterbody. The categories are as follows:

- A “**minor waterbody**” includes all waterbodies less than or equal to 10 feet wide at the water’s edge at the time of construction.
- An “**intermediate waterbody**” includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water’s edge at the time of construction.
- A “**major waterbody**” includes all waterbodies greater than 100 feet wide at the water's edge at the time of construction.
- A “**state designated waterbody**” includes all perennial waterbodies that support coldwater fisheries and warmwater fisheries considered significant by the state.
- A “**non-state designated waterbody**” includes intermittent drainage ditches, intermittent streams, and perennial warmwater streams **not** considered significant by the state.

The waterbody crossing procedures described in this Plan comply with the Section 404 Nationwide permit program terms and conditions (33 CFR Part 330).

5.2 General Waterbody Procedures

Pipeline construction across waterbody channels may result in short term water quality impacts. Decisions regarding waterbody crossing techniques will be based on agency consultations. Mobilization of construction equipment, trench excavation, and backfilling will be performed in a manner that will minimize the potential for erosion and sedimentation within the waterbody channel. Erosion control measures will be implemented to confine water quality impacts within the immediate construction area and to minimize impacts to downstream areas. The length of the crossing, the sensitivity of the area, existing conditions at the time of the crossing, and permit requirements will determine the most appropriate measures to be used.

5.2.1 Time Window for Construction

1. Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:
 - a. Coldwater Fisheries – June 1 through September 30; and
 - b. Coolwater and Warmwater Fisheries – June 1 through November 30.

5.2.2 Temporary Equipment Bridges

A temporary equipment bridge is a structure that may be installed across a waterbody to provide a means for construction equipment to cross the stream while minimizing impacts to the channel bottom or banks.

1. Until the equipment bridge is installed, only clearing equipment and equipment necessary for installation of equipment bridges may cross the waterbody and the number of crossings shall be limited to one crossing per piece of equipment, unless otherwise authorized by the appropriate permitting agency.
2. Construct equipment bridges to maintain unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:
 - a. Equipment pads and culverts (Figure 27);
 - b. Clean crushed stone and culverts (Figure 28);
 - c. Flexi-float or portable bridges (Figure 29); or
 - d. Equipment pads or railroad car bridges without culverts
3. Construct crossings as close to perpendicular to the axis of the waterbody channel.
4. Design and maintain each equipment bridge to withstand the highest flows that would occur. Align culverts/flumes to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.
5. Do not use soil to construct or stabilize equipment bridges.
6. Design and maintain equipment bridges to prevent soil from entering the waterbody.
7. Remove temporary equipment bridges as soon as practicable after permanent seeding.
8. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the ROW is available, remove equipment bridges as soon as practical after final cleanup.

9. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges.

5.2.3 Clearing and Grading

1. Confine construction activities and ground disturbance to within the ROW boundaries shown on the construction drawings.
2. Restrict extra work areas (such as staging areas and additional spoil storage areas) to those shown only on the construction drawings. All extra work areas must be located at least 50 feet away from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. If site-specific conditions do not permit a 50-foot setback, the Company can receive written approval from the FERC to locate these extra work areas closer than 50 feet from the water's edge.
3. If the pipeline parallels a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the ROW except at the crossing location, except where maintaining this offset will result in greater environmental impact.
4. Clear the ROW adjacent to all waterbodies *up to the high water bank* (where discernible).
5. Immediately remove all cut trees and branches that inadvertently fall into a waterbody and stockpile in an upland area on ROW for disposal.
6. Grade the ROW adjacent to waterbodies *up to within 10 feet of the high water bank*, leaving an ungrubbed vegetative strip intact.
7. Clearing and grading operations may proceed through the 10-foot vegetative strip **only on the working side of the ROW** in order to install the equipment bridge and travel lane. Use temporary sediment barriers to prevent the flow of bank spoil into the waterbody.
8. Maintain adequate flow rates to protect aquatic life and prevent the interruption of existing downstream uses.

5.2.4 Installing Temporary Erosion and Sediment Control

1. Install sediment barriers immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench), until replacement by permanent erosion controls or restoration of adjacent upland areas is complete.
2. Install sediment barriers across the entire construction ROW at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Temporary or removable sediment barriers such as interceptor dikes or drivable berms as described in Section 3.5.4 may be used in lieu of sediment barriers in front of equipment bridges or timber mats across the travel lane.

These temporary sediment barriers can be removed during the construction day, but must be reinstalled after construction has stopped for the day and/or when heavy precipitation is imminent.

3. Install sediment barriers as necessary along the edge of the construction ROW to contain spoil within the ROW and prevent sediment flow into the waterbody where waterbodies are adjacent or parallel to the construction ROW and the ROW slopes toward the waterbody.
4. Use temporary trench plugs at all waterbody crossings to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody. Trench plugs shall be of sufficient size to withstand upslope water pressure.

5.2.5 Various Types of Crossings

Construction at waterbodies will be conducted using two principal crossing methods, a “dry” crossing and a “wet” crossing. The “dry” crossing procedure is further divided into a flumed crossing and a dam and pump crossing. These methods are designed to maintain downstream flow at all times and to isolate the construction zone from the stream flow by channeling the water flow through a flume pipe or by damming the flow and pumping the water around the construction area. The overall objective is to minimize siltation of the waterbody and to facilitate trench excavation of saturated spoil. Unless approved otherwise by the appropriate federal or state agency, pipeline construction and installation must occur using one of the two “dry” crossing methods for waterbodies state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat. The flumed and dam and pump crossing methods are applicable to waterbodies up to 30 feet wide at the water’s edge at the time of construction. The two “dry” crossings are further described below in Sections 5.2.5.2 and 5.2.5.3.

The “wet” crossing procedure involves open cutting the waterbody without isolating the construction zone from the stream flow. The objective of this method is to complete the waterbody crossing as quickly as practical in order to minimize the duration of impacts to aquatic resources. All streams, their classifications, timing windows, and crossing procedures will be identified in the Clearance Package/Permit Book and on the construction drawings. Table 6-1 outlines the general procedures to be followed at all waterbody crossings.

5.2.5.1 General Crossing Procedures

1. Dewater trench in accordance with the procedures described in Section 3.5.6.
2. For minor waterbodies:
 - a. Place all spoil from the waterbody within the construction ROW at least 10 feet from the water’s edge or in the extra work areas shown on the construction drawings. Use sediment barriers to prevent flow of spoil or heavily silt-laden water into the waterbody.
3. For intermediate waterbodies:

- a. Less than 30 feet in width, place all spoil from the waterbody within the construction ROW at least 10 feet from the water's edge or in the extra work areas shown on the construction drawings. Use sediment barriers to prevent flow of spoil or heavily silt-laden water into the waterbody.
 - b. Greater than 30 feet in width, spoil may be temporarily sidecast into the waterbody provided that site specific approval is received from the appropriate permitting agency.
4. For major waterbodies:
 - a. Place all upland bank spoil from the waterbody within the construction ROW at least 10 feet from the water's edge or in the extra work areas shown on the construction drawings. Use sediment barriers to prevent flow of spoil or heavily silt laden water into the waterbody.
 5. Restore and stabilize the banks and channel in accordance with Section 5.2.6.
 6. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for "waterbodies" as defined in Section 5.1 of this Plan.

5.2.5.2 Flumed Crossing

The flumed crossing method utilizes a flume pipe(s) to transport stream flow across the disturbed area and allows trenching to be done in drier conditions (Figure 30). The flume pipe(s) installed across the trench will be sized to accommodate anticipated stream flows. This method is utilized for perennial waterbodies (minor and intermediate) up to 30 feet wide that are state designated fisheries including coldwater fisheries and warmwater fisheries considered significant by the state. Flumes are generally not recommended for use on a watercourse with a broad unconfined channel, unstable banks, a permeable substrate, excessive stream flow, or where the installation and construction of the flume crossing will adversely affect the bed or banks of the stream.

1. Cross all minor waterbodies that are state-designated fisheries, as identified in the Clearance Package/ Permit Book, using a dry crossing technique (Figures 30, 31).
2. All construction equipment must cross state-designated fisheries on an equipment bridge as specified in Section 5.2.2.
4. The flumed crossing shall be installed as follows:
 - a. Install flume pipe(s) after blasting and other rock breaking measures (if required), but before trenching;
 - b. Properly align flume pipe(s) to prevent bank erosion and streambed scour;

- c. Use sand bags or equivalent dam diversion structure to provide a seal at either end of the flume to channel water flow (some modifications to the stream bottom may be required to achieve an effective seal);
- d. **Do not remove flume pipe** during trenching, pipe laying (thread pipe underneath the flume pipe(s)), or backfilling activities, or initial streambed restoration efforts unless authorized by agency permits; and
- e. Remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

5.2.5.3 *Dam and Pump Crossing*

The dam and pump method is presented as an alternative dry crossing procedure to the flumed crossing. The dam and pump crossing is accomplished by utilizing pumps to transport stream flow across the disturbed area (Figure 31). This method involves placing sandbags across the existing stream channel upstream from the proposed crossing to stop water flow and downstream from the crossing to isolate the work area. Pumps are used to pump the water across the disturbed area and back into the stream further downstream. This method is intended for use at perennial waterbodies (minor and intermediate) up to 30 feet wide and state designated fisheries including coldwater fisheries and warmwater fisheries considered significant by the state. The dam and pump procedure allows for more space and flexibility during trenching and pipe installation, which shortens the duration of time spent at the waterbody.

1. The dam and pump method may be used for crossings of waterbodies where pumps can adequately transfer stream flow volumes around the work area, and where there are no concerns about sensitive species passage.
2. Implementation of the dam and pump crossing method will meet the following performance criteria:
 - a. Use sufficient pumps, including onsite backup pumps, to maintain downstream flows;
 - b. Construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
 - c. Screen pump intakes to minimize entrainment of fish;
 - d. Prevent streambed scour at pump discharge; and
 - e. Continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.
3. The dam and pump crossing shall be installed as follows:
 - a. Install and properly seal sandbags at the upstream and downstream location of the crossing;
 - b. Create an in-stream sump using sandbags if a natural sump is unavailable for the intake hose;

- c. Initiate pumping of the stream around the work area prior to excavating the trench;
- d. Screen all intake hoses to prevent the entrainment of fish and other aquatic life;
- e. Direct all discharges from the pumps through energy dissipaters to minimize scour and siltation;
- f. Monitor pumps at all times until construction of the crossing is completed; and
- g. Following construction, remove the equipment crossing and sandbag dams.

5.2.5.4 Wet Crossing

This construction technique is typically used to cross waterbodies that are non state-designated as well as intermediate and major waterbodies with substantial flows that cannot be effectively culverted or pumped around the construction zone using the dry crossing techniques (Figure 32). Non-state designated waterbodies include perennial warmwater streams not considered significant by the state, intermittent drainage ditches, and intermittent streams-

The wet-ditch crossing shall be installed as follows:

1. For minor waterbodies:
 - a. Equipment bridges are not required at non state-designated fisheries or protected status (e.g. agricultural or intermittent drainage ditches). However, if an equipment bridge is used, it must be constructed in accordance with Section 5.2.2;
 - b. Limit use of equipment operating in the waterbody to that needed to construct the crossing;
 - c. Complete trenching and backfilling in the waterbody (not including blasting and other rock breaking measures) within 24 continuous hours; and
 - d. If a flume is installed within the waterbody during mainline activities, it can be removed just prior to lowering in the pipeline. The 24-hour timeframe starts as soon as the flume is removed.
2. For intermediate waterbodies:
 - a. Limit use of equipment operating in the waterbody to that needed to construct the crossing. All other construction equipment must cross on an equipment bridge as specified in Section 5.2.2; and
 - b. Attempt to complete trenching and backfill work within the waterbody (not including blasting and other rock breaking measures) within 48 continuous hours, unless site-specific conditions make completion within 48 hours infeasible.
3. For major waterbodies:
 - a. Company will develop site-specific crossing plans to be submitted for approval by the FERC and the appropriate permitting agency; and

- b. Construct the crossing in accordance with the measures contained in this Plan to the maximum extent practical.

5.2.5.5 Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, prepare a plan that includes:

1. Site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;
2. Justification that disturbed areas are limited to the minimum needed to construct the crossing;
3. Identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;
4. A description of how an inadvertent release of drilling mud would be contained and cleaned up; and
5. A contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

5.2.6 Restoration

1. Return all waterbody banks to preconstruction contours or to stable angle of repose as approved by the EI.
2. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.
3. Use clean gravel or native cobbles for the upper 12 inches of trench backfill in all waterbodies identified in the Clearance Package/Permit Book as coldwater fisheries.
4. For wet crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing the crossing. For dry crossings, complete bank stabilization before returning flow to the waterbody channel.
5. Limit the placement of riprap to the slopes along the disturbed waterbody crossing.
6. Install erosion control fabric along waterbodies with low flow conditions (Figure 33).
7. Revegetate disturbed riparian areas with conservation grasses and legumes in accordance with the recommended Upland Seed Mix in Appendix B. In the event that final cleanup is deferred more

than 20 days after the trench is backfilled, all slopes within 100 feet of waterbodies shall be mulched with 3 tons/acre of straw.

8. Remove all temporary sediment barriers when replaced by permanent erosion controls or when restoration of adjacent upland areas is successful as specified in Section 8.1.
9. Install a permanent interceptor dike and a trench plug at the base of slopes near each waterbody crossed. Locate the trench plug immediately upslope of the interceptor dike. Permanent interceptor dikes may not be installed in agricultural areas.

TABLE 5-1: GENERAL WATERBODY CROSSING PROCEDURES

WATERBODY CROSSING ACTIVITIES	WATERBODY TYPE					
	MINOR		INTERMEDIATE		MAJOR	
	Non-State ¹ Designated	State ² Designated	Non-State ³ Designated	State ² Designated	Non-State ³ Designated	State ² Designated
Flumed Crossing (Dry) <i>Section 5.2.5.2, Figure 30</i>		X		X		
Dam and Pump Crossing (Dry) <i>Section 5.2.5.3, Figure 31</i>		X		X		
Wet Crossing <i>Section 5.2.5.4, Figure 32</i>	X		X	X	X	X
Construction timing window during the year <i>Section 5.2.1</i>		X		X		X
Time to complete construction of crossing (not including blasting) ⁴	24 Hours		48 Hours			
Equipment bridge required ⁵		X	X	X	X	X

¹ Includes agricultural intermittent drainage ditches, intermittent streams, and perennial warmwater streams not considered significant by the state.

² Includes all perennial waterbodies that support coldwater fisheries and warmwater fisheries considered significant by the state.

³ Includes perennial warmwater streams not considered significant by the state.

⁴ If a flume is installed within the waterbody during mainline activities, it can be removed just prior to lowering in the pipeline. The 24-hour timeframe starts as soon as the flume is removed.

⁵ An equipment bridge may not be required for a waterbody being crossed by a horizontal directional drill.

6. WETLAND CROSSINGS

6.1 Definition

The term “**Wetland**” as used in this Plan includes any area that satisfies the requirements of the current Federal methodology for identifying and delineating wetlands. Wetland areas have been delineated prior to construction and are identified on the construction drawings.

The wetland crossing procedures described in this Plan comply with the Section 404 Nationwide permit program terms and conditions (33 CFR Part 330). The requirements outlined below do not apply to wetlands in cultivated or rotated cropland. Standard upland protective measures including workspace and topsoiling requirements, will apply to these agricultural wetlands.

6.2 General Procedures

6.2.1 *Clearing and Grading*

1. Limit construction activity and ground disturbance in wetland areas to a construction ROW width of 75 feet or as shown on the construction drawings. With written approval from the FERC for site-specific conditions, construction ROW width within the boundaries of federally delineated wetlands may be expanded beyond 75 feet.
2. Wetland boundaries and buffers must be clearly marked in the field with signs and /or highly visible flagging until construction-related ground disturbing activities are complete.
3. Restrict extra work areas (such as staging areas and additional spoil storage areas) to those shown only on the construction drawings. All extra work areas must be located at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. If site-specific conditions do not permit a 50-foot setback, the Company can receive written approval from the FERC to locate these extra work areas closer than 50 feet from the wetland.
4. Aboveground facilities shall not be located in any wetland, except as permitted or where the location of such facilities outside of wetlands would prohibit compliance with DOT regulations.
5. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment or operate normal equipment on timber riprap, prefabricated equipment mats or terra mats on the working side of the ROW during clearing operations. Do not use more than two layers of timber riprap to stabilize the ROW.
6. Cut vegetation just above ground level and grind stumps to ground level, leaving existing root systems in place. Immediately remove all cut trees and branches from the wetland and stockpile in an upland area on ROW for disposal. Woody debris can be burned in wetlands, if approved by

the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

7. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the ROW in wetlands unless the Chief Inspector and EI determine that safety-related construction constraints require removal of tree stumps from under the working side of the ROW.
8. Do not cut trees outside of the construction ROW to obtain timber for riprap or equipment mats.
9. Cleared materials (slash, logs, brush, wood chips) shall not be permanently placed within wetland areas.

6.2.2 Temporary Erosion and Sediment Control

1. Install sediment barriers immediately after initial ground disturbance at the following locations:
 - a. Within the ROW at the edge of the boundary between wetland and upland;
 - b. Across the entire ROW immediately upslope of the wetland boundary to contain spoil within the ROW and prevent sediment flow into the wetland;
 - c. Along the edge of the ROW, where the ROW slopes toward the wetland, to protect adjacent, off ROW wetland; and
 - d. Along the edge of the ROW as necessary to contain spoil and sediment within the ROW through wetlands.
2. Maintain all sediment barriers throughout construction and reinstall as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete in accordance with Section 8.1.

6.2.3 Crossing Procedure

1. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.
2. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to stabilize the ROW.
3. Perform topsoil segregation in accordance with Section 3.5.3.1 and trench dewatering in accordance with Section 3.5.6.
4. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.
5. Use “push pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow.

6. Install trench plugs at wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology at locations where the pipeline trench may drain a wetland.
7. Restore pre-construction wetland contours to maintain the original wetland hydrology.
8. Install a permanent interceptor dike and a trench plug at the base of slopes near the boundary between the wetland and adjacent upland areas. In addition, install sediment barriers as outlined in Section 3.5.2. Permanent interceptor dikes shall not be installed in agricultural areas.
9. Restore segregated topsoil to its original position after backfilling is complete. When required, additional fill material imported from off the ROW must be approved by the EI. The original wetland contours and flow regimes will be restored to the extent practical.

6.2.4 Cleanup and Restoration

1. Revegetate the ROW with annual ryegrass at 40 lbs/acre PLS or with the recommended Wetland Seed Mix in Appendix B, unless standing water is present.
2. **Do not use mulch, lime or fertilizer in wetland areas unless required in writing by the appropriate federal or state agency.**
3. Mulch the disturbed ROW only when required by the appropriate land management or state agency, as identified in the Clearance Package/Permit Book.
4. In the event that final cleanup is deferred more than 20 days after the trench is backfilled, all slopes adjacent to wetlands shall be mulched with 3 tons/acre of straw for a minimum of 100 feet on each side of the crossing.
5. Remove all timber riprap and prefabricated equipment mats upon completion of construction.
6. Develop specific procedures in coordination with the appropriate federal or state agencies, where necessary, to prevent the invasion or spread of invasive species and noxious weeds (such as purple loose strife and phragmites).
7. Ensure that all disturbed areas permanently revegetate in accordance with Section 8.1.
8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after upland revegetation and stabilization of adjacent upland areas are successful as specified in Section 8.1.

7. SPILL PREVENTION CONTROL

7.1 The Contractor shall adhere to the Company's SPCC Plan at all times.

1. Do not store hazardous materials, chemicals, fuels, or lubricating oils within 100 feet of any wetland, waterbody or within any designated municipal watershed area where feasible. If the 100-foot setback cannot be met, this activity can be performed within the 100-foot setback, with EI approval, if done in accordance with the SPCC Plan.
2. Refuel all construction equipment at least 100 feet from any wetland or waterbody, where feasible. If the 100-foot setback cannot be met, this activity can be performed within the 100-foot setback, with EI approval, if done in accordance with the SPCC Plan.
3. Do not perform fondu or concrete coating activities within 100 feet of any wetland or waterbody, unless the location is an existing industrial site designated for such use. If the 100-foot setback cannot be met, these activities can be performed within the 100-foot setback, with EI approval, if done in accordance with the SPCC Plan. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;
4. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and
5. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

8. POST CONSTRUCTION ACTIVITIES

8.1 Post-Construction Monitoring

All projects conducted under this Plan, with the exception of insitu pipe replacements (i.e. DOT-mandated replacements, line lowerings, and anomaly repairs), shall meet the monitoring requirements set forth in this section. Company personnel shall perform the following:

1. Establish and implement a program to monitor the success of restoration upon completion of construction and restoration activities;
2. Conduct follow-up inspections of all disturbed areas, as necessary to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons;
3. Revegetation in non agricultural areas shall be considered successful if the vegetative cover is sufficient to prevent the erosion of soils on the disturbed ROW and density and cover are similar to that in adjacent undisturbed area. Sufficient coverage in upland areas is defined when vegetation has a uniform 70 percent vegetative coverage. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise. Revegetation efforts (such as fertilizing or reseeding) will continue until revegetation is successful;
4. Restoration shall be considered successful if the ROW surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the land owner or land managing agency), revegetation is successful, and proper drainage has been restored;
5. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in active agricultural areas until restoration is successful;
6. Make efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary;
7. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful. Wetland revegetation will be considered successful if all of the following criteria are satisfied: the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation); Vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction; if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

8. For any wetland where vegetation is not successful at the end of 3 years after construction, the Company shall develop and implement (in consultation with a professional wetland ecologist) a plan to actively revegetate the wetland with native wetland herbaceous and woody plant species; and
9. Inspect all temporary remaining erosion and sedimentation controls during routine patrols to ensure proper functioning. Any deficiencies found will be reported and corrected as needed. Once the area has revegetated and stabilized, the erosion controls will be removed.

8.2 Post-Construction Maintenance

All projects conducted under this Plan, with the exception of insitu pipe replacements (i.e. DOT-mandated replacements, line lowerings, and anomaly repairs), shall meet the maintenance requirements set forth in this section. The following requirements restrict the amount of routine vegetation mowing or clearing that can occur on new pipeline facilities. Where the newly established pipeline ROW is located on other existing ROWs not affiliated with the Company, the easement holder or owner will continue to maintain their ROWs using procedures specified in their vegetative management programs.

8.2.1 Uplands

Routine maintenance of the ROW is required to allow continued access for routine pipeline patrols, maintaining access in the event of emergency repairs, and visibility during aerial patrols. In upland areas, maintenance of the ROW will involve clearing the entire ROW of woody vegetation.

1. Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall be conducted no more frequently than once every 3 years. However, to facilitate periodic corrosion and leak surveys, a 10-foot wide corridor centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot wide corridor in a herbaceous state.
2. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.

8.2.2 Waterbodies and Wetlands

1. Routine vegetation mowing or clearing practices on the construction ROW adjacent to waterbodies will consist of maintaining a riparian strip that measures 25 feet back from the mean high water mark. This riparian area will be allowed to permanently revegetate with native plant species across the entire ROW.
2. Routine vegetation mowing or clearing over the full width of the construction ROW in wetlands is prohibited.
3. To facilitate periodic corrosion and leak surveys at wetlands and waterbodies, a 10-foot wide corridor centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot

corridor in an herbaceous state. Trees and shrubs that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the ROW. Do not conduct any routine routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

4. Herbicides or pesticides shall not be used in or within 100 feet of a wetland or waterbody, except as specified by the appropriate federal or state agency.
5. Time of year restrictions (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

8.3 Reporting

The Company shall maintain records that identify by milepost:

1. Method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;
2. Acreage treated;
3. Dates of backfilling and seeding; and
4. Names of landowners requesting special seeding treatment and a description of the follow-up actions.
5. the location of any subsurface drainage repairs or improvements made during restoration; and
6. any problem areas and how they were addressed.

For the authorized projects, the Company will file quarterly activity reports documenting the results of follow-up inspections and any problem areas, including those identified by the landowner, and corrective actions taken for at least 2 years following construction.

A wetland revegetation monitoring report identifying the status of the wetland revegetation efforts will be filed at the end of 3 years following construction, and annually thereafter documenting progress in these wetlands until revegetation is successful.

APPENDIX A

FIGURES

<u>FIGURE NUMBER</u>	<u>STANDARD NUMBER</u>	<u>DRAWING TITLE</u>
FIGURE #1	ES-0001	TYPICAL CONSTRUCTION WIDTHS ACQUIRING NEW PERMANENT RIGHT-OF-WAY
FIGURE #2	ES-0002	TYPICAL CONSTRUCTION WIDTHS NOT ACQUIRING NEW PERMANENT RIGHT-OF-WAY (MULTIPLE LINE SYSTEM)
FIGURE #3	ES-0003	TYPICAL CONSTRUCTION WIDTHS NOT ACQUIRING NEW PERMANENT RIGHT-OF-WAY (SINGLE LINE SYSTEM)
FIGURE #4	ES-0004	ACCESS ROAD CROSS SECTION
FIGURE #5	ES-0005	ROCK ACCESS PAD INSTALLATION AND MAINTENANCE
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FIGURE #9	ES-0009	STRAW BALE INSTALLATION FOR A CHECK DAM IN A DRAINAGE WAY
FIGURE #10	ES-0010	STORM DRAIN INLET PROTECTION
FIGURE #11	ES-0011	R.O.W. TOPSOIL SEGREGATION TECHNIQUES
FIGURE #12	ES-0012	INTERCEPTOR DIKE INSTALLATION AND MAINTENANCE
FIGURE #13	ES-0013	TYPICAL TRENCH DETAIL
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FIGURE #19	ES-0019	ALTERNATE DEWATERING STRUCTURE FOR HYDROSTATIC TESTING
FIGURE #20	ES-0020	CHEVRON INTERCEPTOR DIKE INSTALLATION AND MAINTENANCE
FIGURE #21	ES-0021	ROCK LINED DRAINAGE SWALE INSTALLATION AND MAINTENANCE
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FIGURE #23	ES-0023	EROSION CONTROL FABRIC INSTALLATION
FIGURE #24	ES-0024	DRAIN TILE REPAIR PROCEDURE
FIGURE #25	ES-0025	TYPICAL PAVED ROAD CROSSING CONTROL MEASURES (OPEN CUT)
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FIGURE #29	ES-0029	TEMPORARY EQUIPMENT BRIDGE (FLEX-FLOAT OR PORTABLE)
FIGURE #30	ES-0030	TYPICAL FLUMED CROSSING
FIGURE #31	ES-0031	TYPICAL DAM AND PUMP CROSSING
FIGURE #32	ES-0032	TYPICAL WET CROSSING
FIGURE #33	ES-0033	TYPICAL MATTING OF STREAMBANKS
FIGURE #34	ES-0034	RIP-RAP PLACEMENT (TYPICAL)

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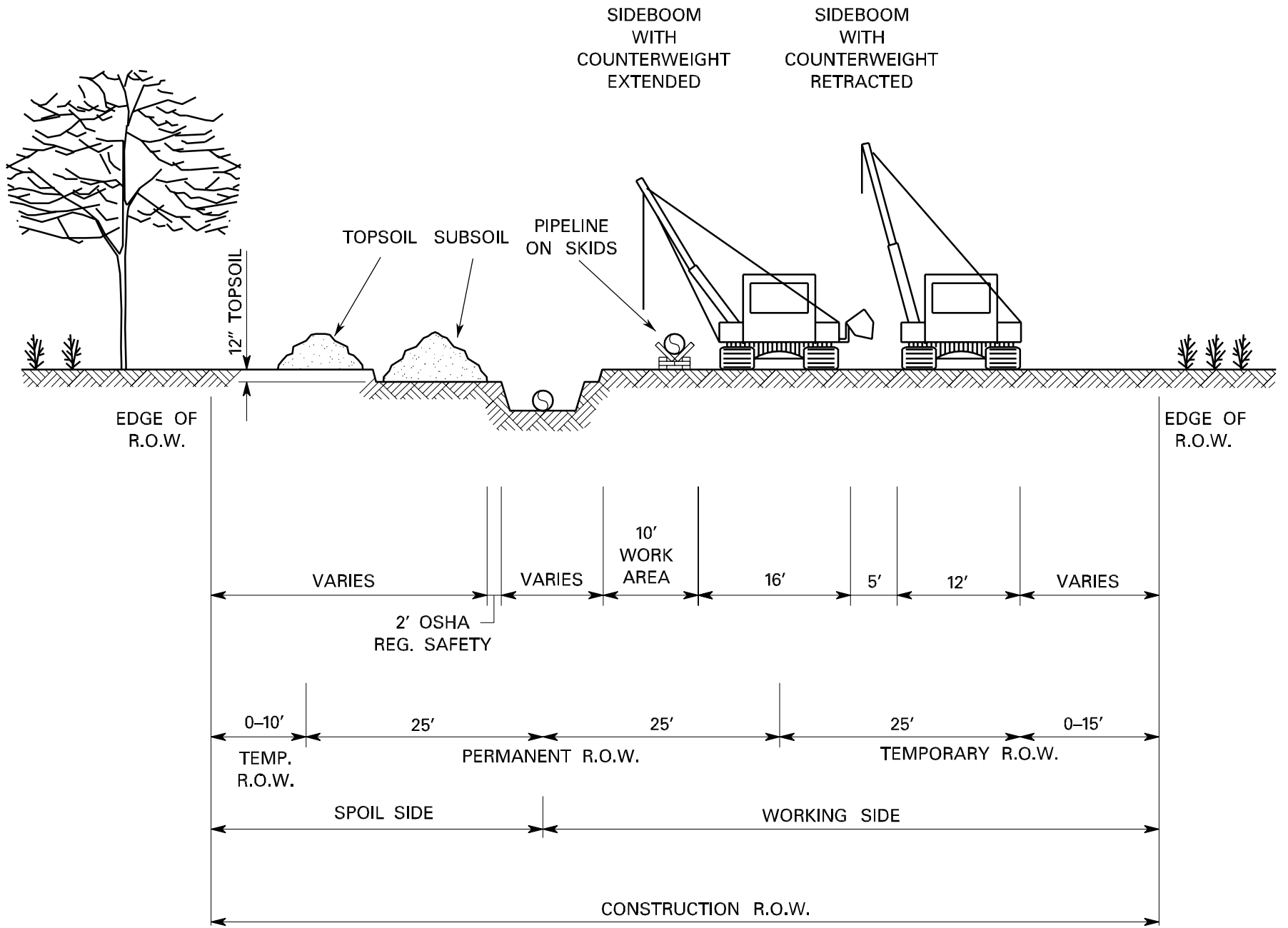
INDEX OF FIGURES

APPENDIX A

DWG.

ES-0000

REV.



PIPE DIAMETER	SPOIL SIDE (FT.)	WORKING SIDE (FT.)	CONSTRUCTION R.O.W. (FT.)
12" OR LESS	25	50	75
14" - 30"	35	50	85
36" - 42"	35	65	100
WETLANDS	25	50	75

NOTES:

- ALTHOUGH THE DIMENSIONS SHOWN ARE TYPICAL, SOME VARIATIONS MAY EXIST DUE TO SITE SPECIFIC CONDITIONS, UNLESS OTHERWISE INDICATED ON THE ALIGNMENT SHEETS, THE MAXIMUM WIDTH OF THE CONSTRUCTION RIGHT-OF-WAY SHALL BE AS SHOWN IN THE TABLE FOR THE APPROPRIATE PIPE DIAMETER.
- TOPSOIL AND SUBSOIL SHALL BE SEGREGATED WITHIN WETLAND, RESIDENTIAL, AGRICULTURAL, PASTURES, HAYFIELDS, AND OTHER AREAS AT LANDOWNER'S OR LAND MANAGING AGENCY'S REQUEST.

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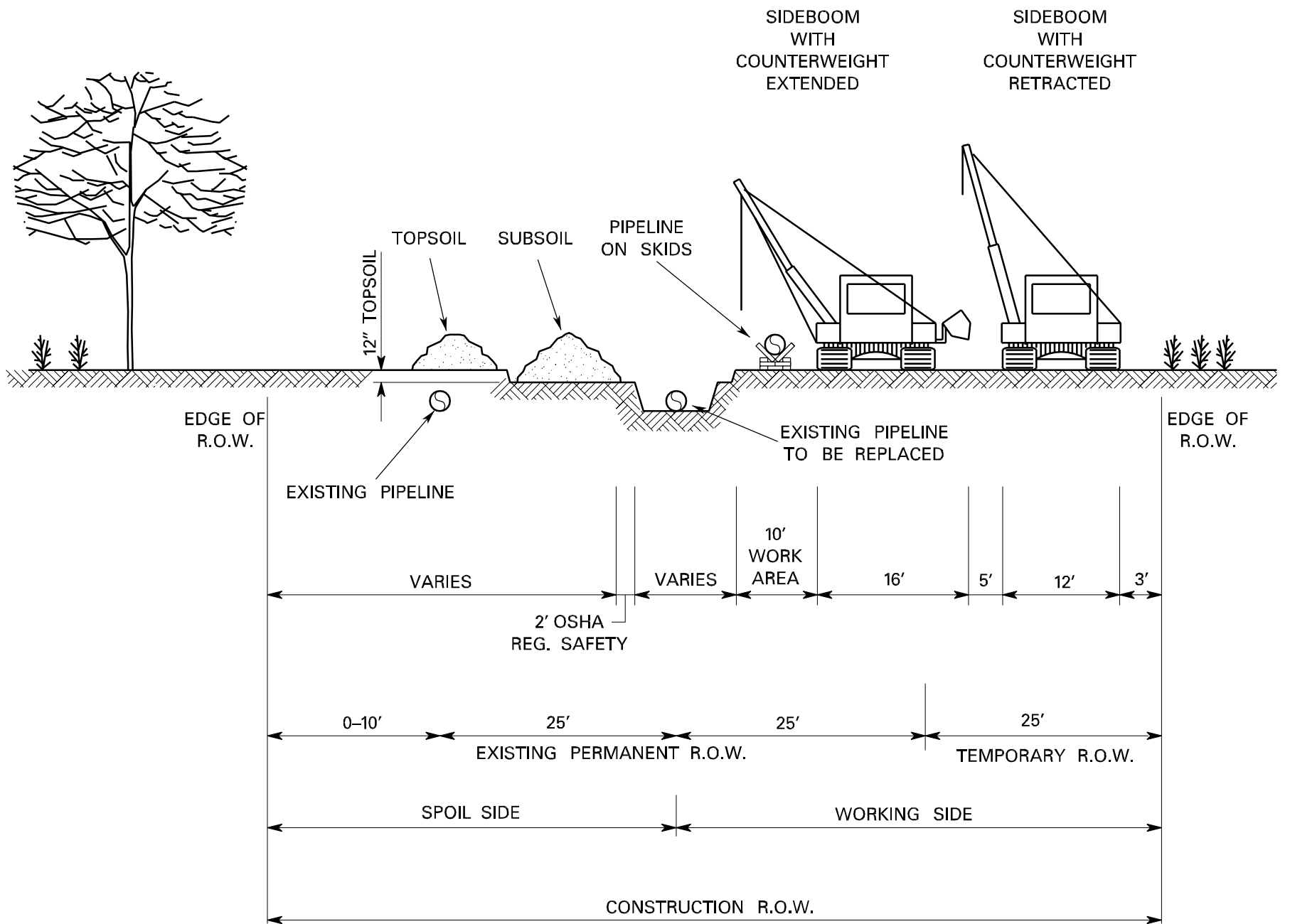
TYPICAL CONSTRUCTION WIDTHS ACQUIRING
NEW PERMANENT RIGHT-OF-WAY

FIGURE #1

DWG.

ES-0001

REV.



PIPE DIAMETER	SPOIL SIDE (FT.)	WORKING SIDE (FT.)	CONSTRUCTION R.O.W. (FT.)
12" OR LESS	25	50	75
14" - 30"	35	50	85
36" - 42"	35	50	85
WETLANDS	25	50	75

NOTES:

- ALTHOUGH THE DIMENSIONS SHOWN ARE TYPICAL, SOME VARIATIONS MAY EXIST DUE TO SITE SPECIFIC CONDITIONS. UNLESS OTHERWISE INDICATED ON THE ALIGNMENT SHEETS, THE MAXIMUM WIDTH OF THE CONSTRUCTION RIGHT-OF-WAY SHALL BE AS SHOWN IN THE TABLE FOR THE APPROPRIATE PIPE DIAMETER.
- TOPSOIL AND SUBSOIL SHALL BE SEGREGATED WITHIN WETLAND, RESIDENTIAL, AGRICULTURAL, PASTURES, HAYFIELDS, AND OTHER AREAS AT LANDOWNER'S OR LAND MANAGING AGENCY'S REQUEST.
- IF THE WORKING SIDE MUST BE GREATER THAN 50 FEET (i.e. TEMPORARY WORKSPACE IS GREATER THAN 25 FEET), COMPANY MUST REQUEST APPROVAL FROM THE F.E.R.C.

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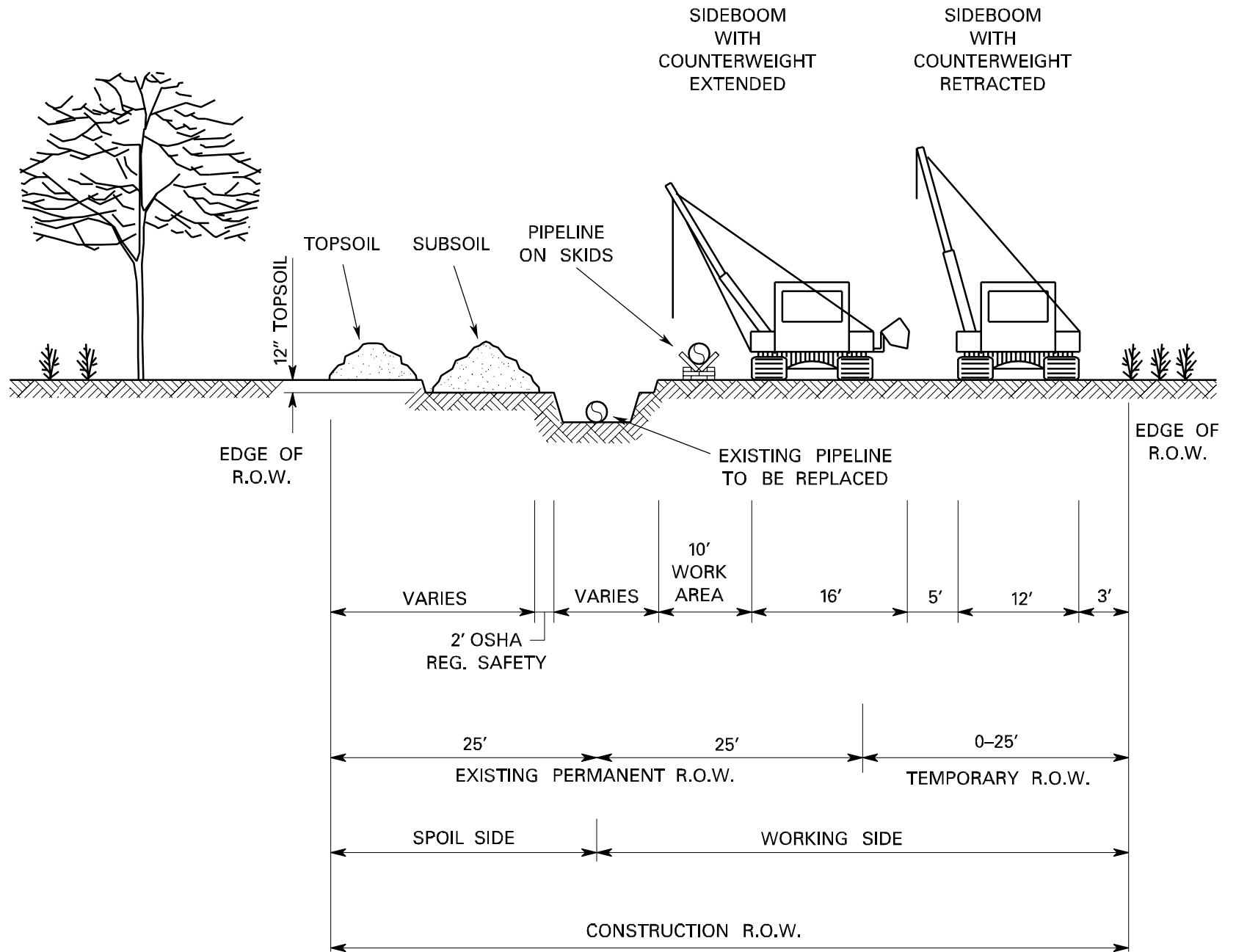
**TYPICAL CONSTRUCTION WIDTHS NOT ACQUIRING
NEW PERMANENT RIGHT-OF-WAY
(MULTIPLE LINE SYSTEM)**

FIGURE #2

DWG.

ES-0002

REV.



PIPE DIAMETER	SPOIL SIDE (FT.)	WORKING SIDE (FT.)	CONSTRUCTION R.O.W. (FT.)
12" OR LESS	25	25	50
14" - 30"	25	50	75
36" - 42"	25	50	75
WETLANDS	25	50	75

NOTES:

- ALTHOUGH THE DIMENSIONS SHOWN ARE TYPICAL, SOME VARIATIONS MAY EXIST DUE TO SITE SPECIFIC CONDITIONS. UNLESS OTHERWISE INDICATED ON THE ALIGNMENT SHEETS, THE MAXIMUM WIDTH OF THE CONSTRUCTION RIGHT-OF-WAY SHALL BE AS SHOWN IN THE TABLE FOR THE APPROPRIATE PIPE DIAMETER.
- TOPSOIL AND SUBSOIL SHALL BE SEGREGATED WITHIN WETLAND, RESIDENTIAL, AGRICULTURAL, PASTURES, HAYFIELDS, AND OTHER AREAS AT LANDOWNER'S OR LAND MANAGING AGENCY'S REQUEST.
- IF THE WORKING SIDE MUST BE GREATER THAN THE VALUES SHOWN IN THE TABLE, COMPANY MUST REQUEST APPROVAL FROM THE F.E.R.C.

jw/hor/ley
01/22/2003

I.G. ESE0003.DGN

TYPICAL CONSTRUCTION WIDTHS NOT ACQUIRING
NEW PERMANENT RIGHT-OF-WAY
(SINGLE LINE SYSTEM)

FIGURE #3

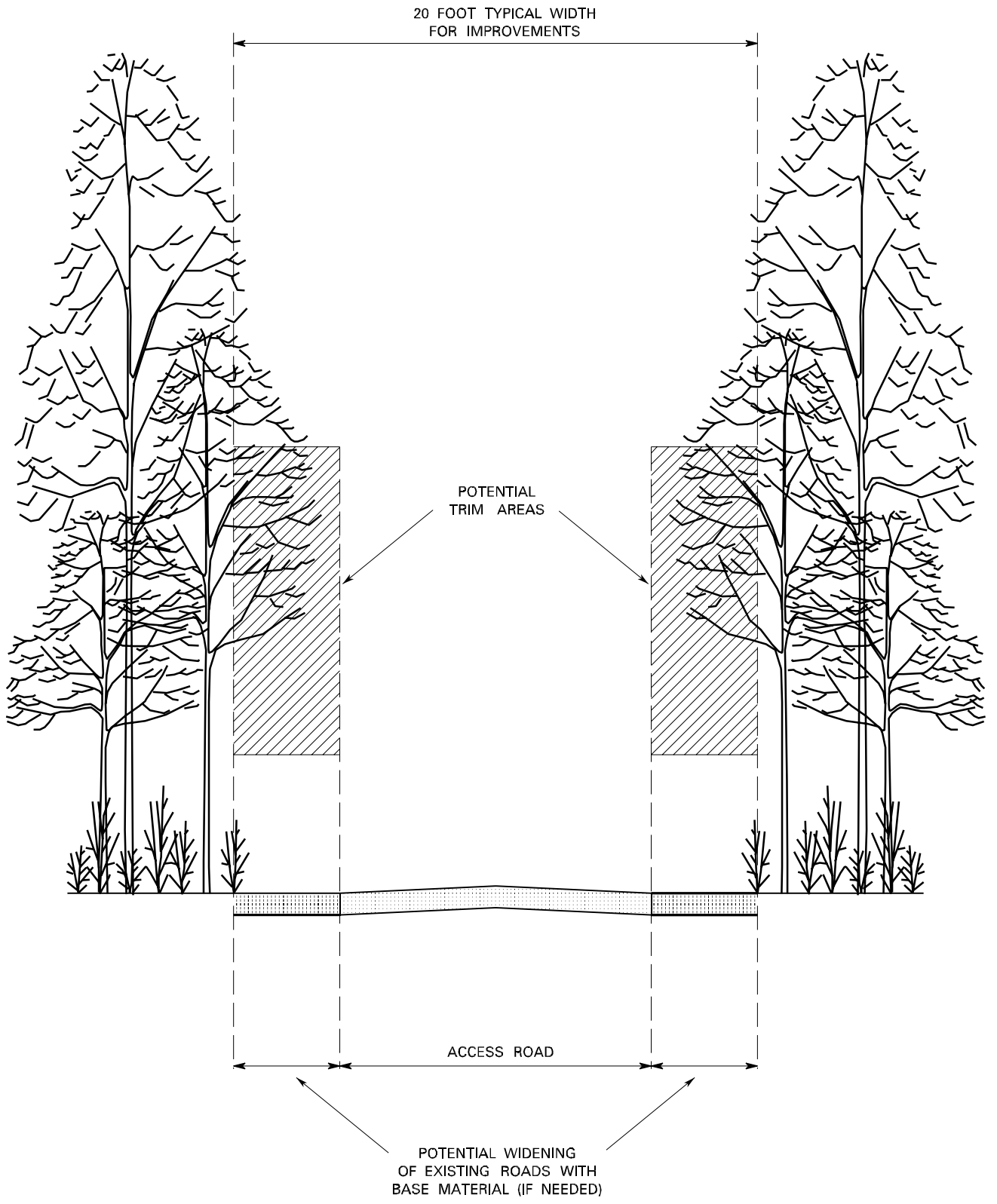
DWG.

ES-0003

REV.

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\$\$\$SYTIME\$\$\$

I.C. ESE0004.DGN



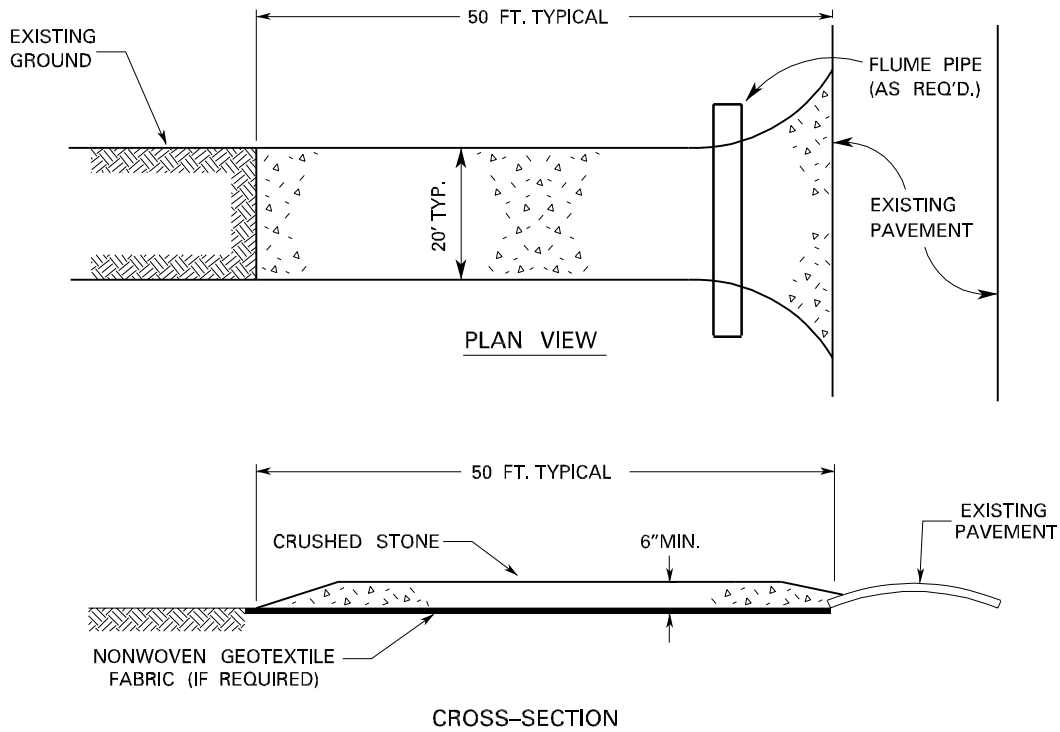
ACCESS ROAD CROSS SECTION

FIGURE #4

DWG.

ES-0004

REV.



CONSTRUCTION SPECIFICATIONS:

1. STONE SIZE = 4" - 6" (AVG.) CRUSHED STONE
2. ALL STONE MUST BE PLACED ON NON-WOVEN GEOTEXTILE FABRIC IF USED IN RESIDENTIAL OR ACTIVE AGRICULTURAL AREAS.
3. LENGTH = FIFTY (50) FOOT TYPICAL (IF SITE CONDITIONS ALLOW)
4. WIDTH = TWENTY (20) FOOT TYPICAL.
5. THICKNESS = SIX (6) INCHES MINIMUM.
6. ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A DRIVEABLE BERM OR OTHER TEMPORARY EROSION CONTROL DEVICE CAN BE USED.
7. THE ENTRANCE SHALL BE PERIODICALLY INSPECTED AND MAINTAINED IN A CONDITION THAT MINIMIZES TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. MAINTENANCE MAY INCLUDE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR THE REPAIR /CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ANY SEDIMENT THAT IS SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED AS SOON AS PRACTICAL.

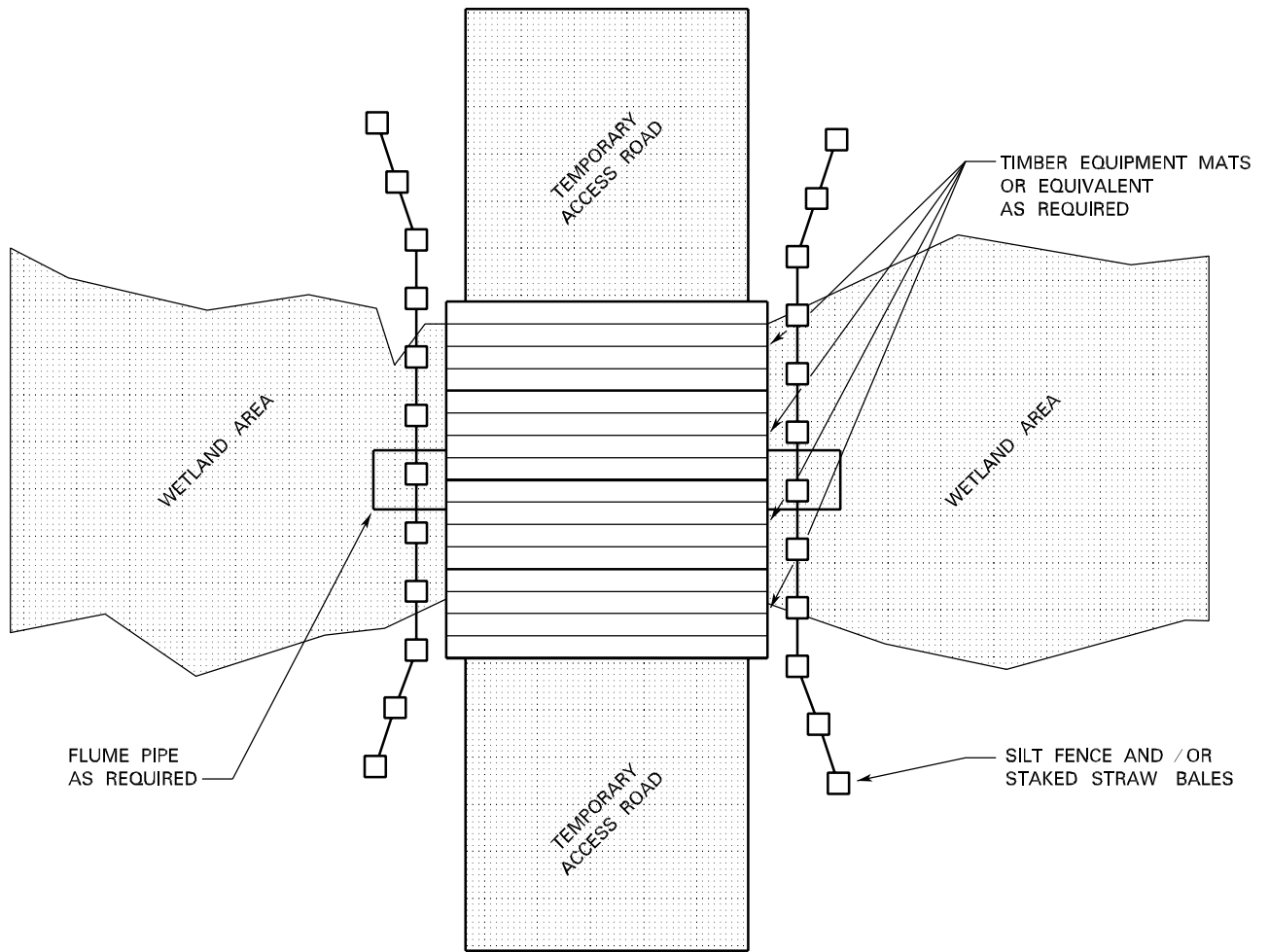
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1.G.E.S.E.0005.DGN

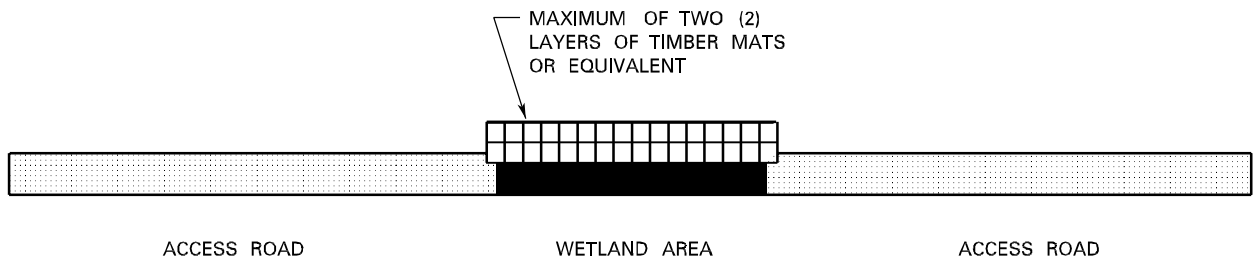
ROCK ACCESS PAD INSTALLATION
AND MAINTENANCE

FIGURE #5

DWG.	ES-0005	REV.
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PLAN VIEW
N.T.S.



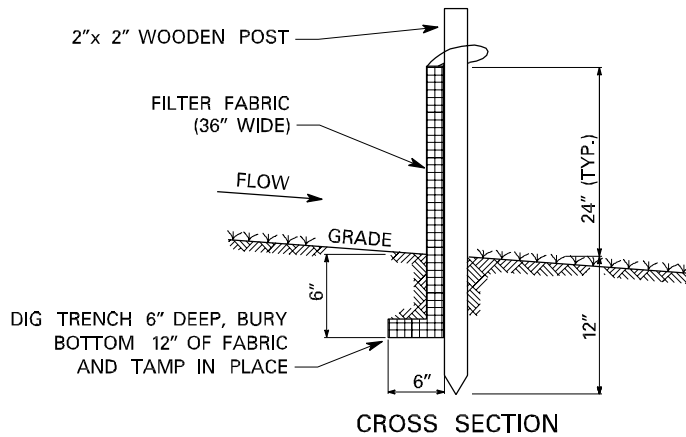
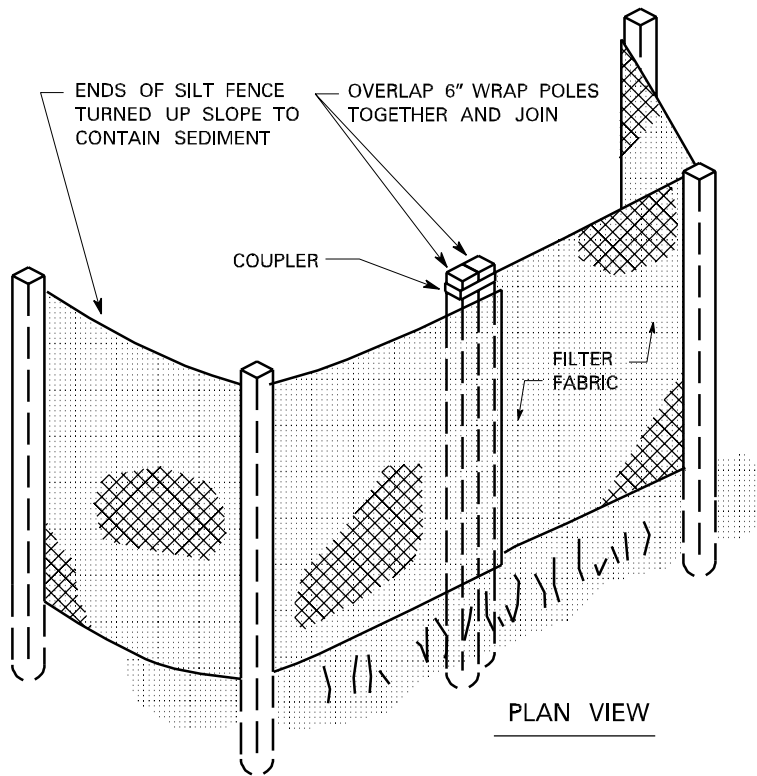
CROSS SECTION
N.T.S.

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I.C. ESE0006.DGN

TYPICAL TEMPORARY ACCESS ROAD
THROUGH WETLANDS

FIGURE #6	
DWG. ES-0006	REV.



INSTALLATION REQUIREMENTS:

- WHEN USING SILT FENCE, PLACE IT:
 - ◆ BETWEEN DISTURBED AREAS AND DOWN-SLOPE ENVIRONMENTAL RESOURCE AREAS
 - ◆ AT THE BASE OF ALL SLOPES NEXT TO WETLANDS, WATERBODIES, AND ROAD CROSSINGS
 - ◆ AT THE INLET AND OUTLET OF OPEN DRAINAGE STRUCTURES
 - ◆ APPROXIMATELY 6 FEET BEYOND THE TOE OF THE SLOPE TO GIVE THE SEDIMENT ROOM TO COLLECT
- USE SANDBAGS OR BACKFILLING TO KEY IN THE BOTTOM OF THE FABRIC WHERE IT IS NOT FEASIBLE TO TRENCH IT IN (LEDGES, ROCKY SOIL, LARGE ROOTS, ETC.)

MAINTENANCE REQUIREMENTS:

- INSPECT SILT FENCE:
 - ◆ DAILY IN AREAS OF ACTIVE CONSTRUCTION
 - ◆ WEEKLY IN AREAS WITH NO CONSTRUCTION
 - ◆ WITHIN 24 HOURS FOLLOWING EACH MAJOR STORM EVENT
- REPAIR OR REPLACE SILT FENCE AS NEEDED
- REMOVE ACCUMULATED SEDIMENTS TO AN UPLAND AREA AS NEEDED

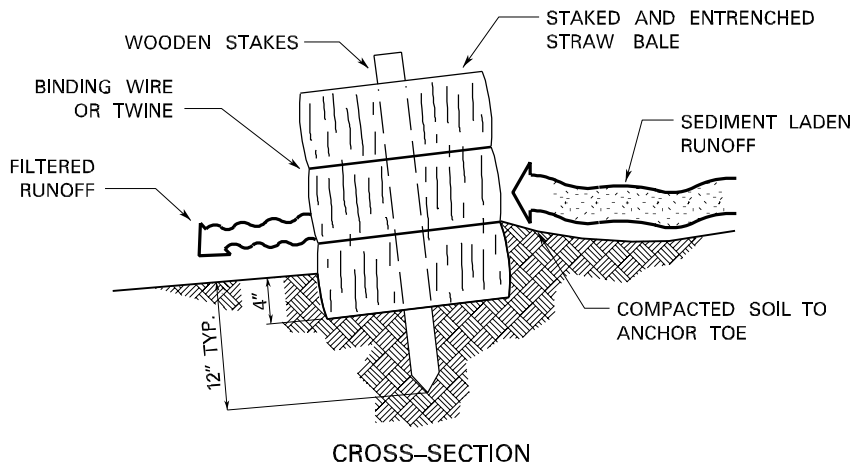
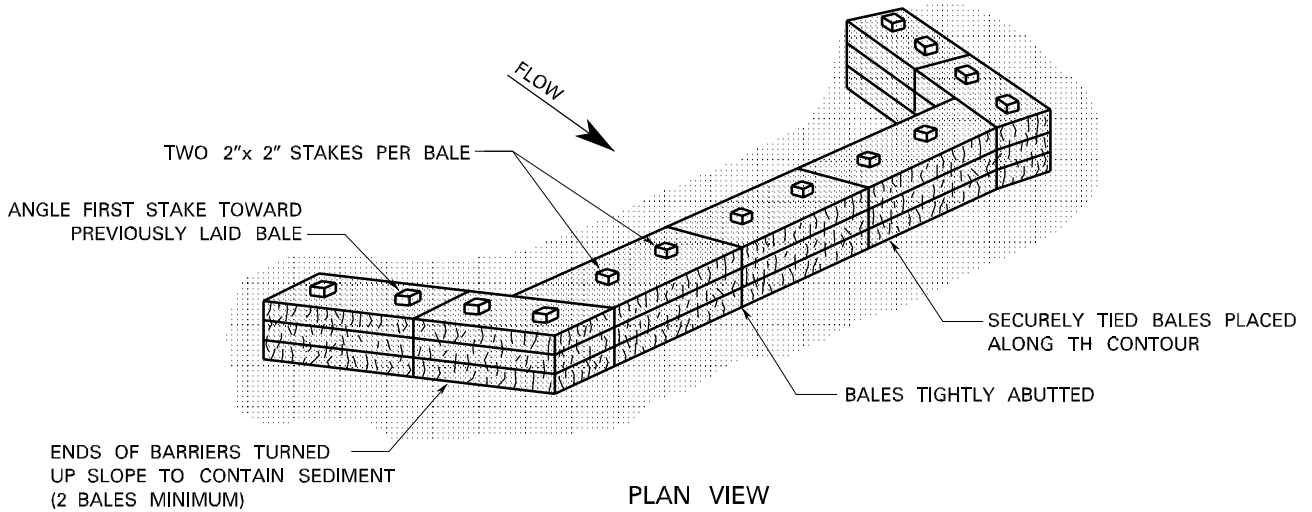
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I.G. ESE0007.DGN

SILT FENCE INSTALLATION AND MAINTENANCE

FIGURE #7

DWG. **ES-0007** REV.



INSTALLATION REQUIREMENTS:

- WHEN USING STRAW BALES, PLACE THEM:
 - ◆ WITH THEIR ENDS TIGHTLY ABUTTING AND EMBEDDED IN THE SOIL A TYPICAL OF 4".
 - ◆ BETWEEN DISTURBED AREAS AND DOWN-SLOPE ENVIRONMENTAL RESOURCE AREAS.
 - ◆ AT THE BASE OF ALL SLOPES NEXT TO WETLANDS, WATERBODIES, AND ROAD CROSSINGS
 - ◆ AT THE INLET AND OUTLET OF OPEN DRAINAGE STRUCTURES.
 - ◆ APPROXIMATELY 6 FEET BEYOND THE TOE OF THE SLOPE TO GIVE THE SEDIMENT ROOM TO COLLECT.
- KEY IN THE BOTTOM OF THE BALE, IN AREAS WHERE IT IS NOT FEASIBLE TO TRENCH IT IN (LEDGES, ROCKY SOIL, LARGE TREE ROOTS, ETC.), USE NATIVE SOIL AS BACKFILL UP-SLOPE OF THE BALE.
- IF USED IN CONJUNCTION WITH SILT FENCE, BALES ARE PLACED UPSLOPE OF THE SILT FENCE AND DO NOT NEED TO BE TRENCHED IN.

MAINTENANCE REQUIREMENTS:

- INSPECT BALES:
 - ◆ DAILY IN AREAS OF ACTIVE CONSTRUCTION.
 - ◆ WEEKLY IN AREAS WITH NO CONSTRUCTION.
 - ◆ WITHIN 24 HOURS FOLLOWING EACH MAJOR STORM EVENT.
- REPAIR OR REPLACE BALES AS NEEDED.
- REMOVE ACCUMULATED SEDIMENTS TO AN UPLAND AREA AS NEEDED.

\$\$\$ USERNAME \$\$\$
\$\$\$ SYSTEM \$\$\$

I.C. ESE0008.DGN

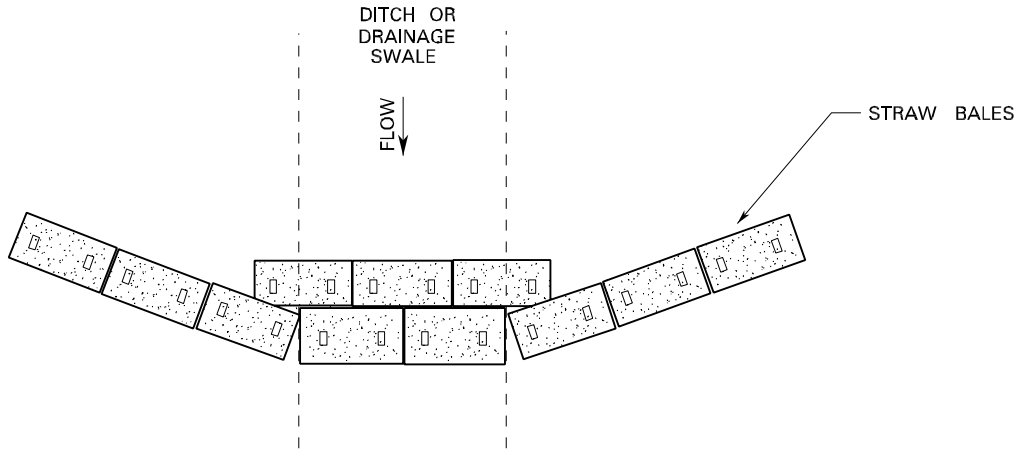
STRAW BALE INSTALLATION AND MAINTENANCE

FIGURE #8

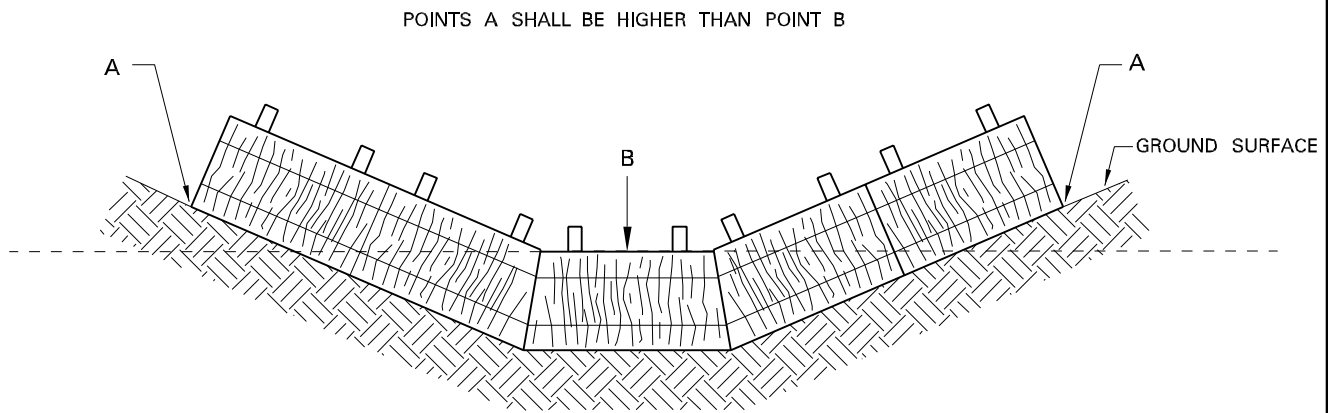
DWG.

ES-0008

REV.



PLAN VIEW
N.T.S.



CROSS-SECTION
N.T.S.

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16.ESE0009.DGN

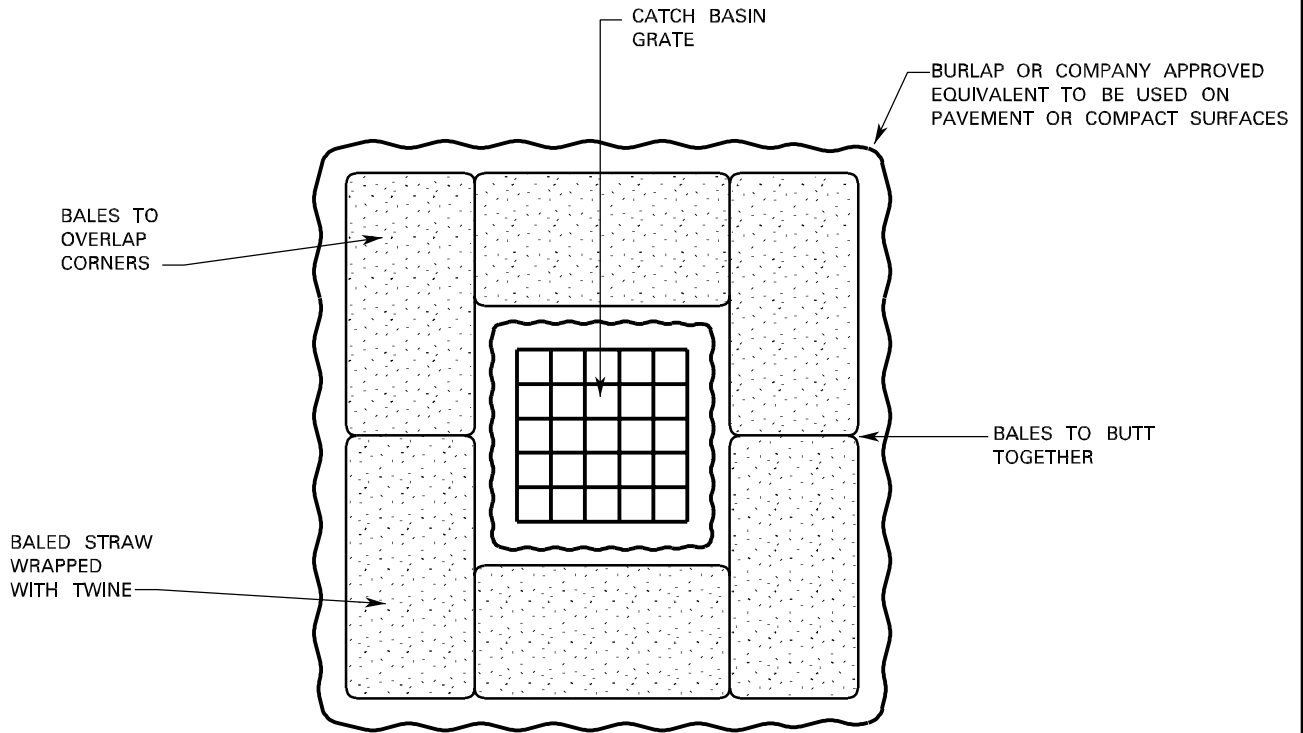
STRAW BALE INSTALLATION
FOR A CHECK DAM IN A
DRAINAGE WAY

FIGURE #9

DWG.

ES-0009

REV.



1. SURROUND STREET DRAINAGE STRUCTURE INLET WITH BALES PRIOR TO CONSTRUCTION AND MAINTAIN UNTIL CONSTRUCTION IS COMPLETED.
2. FOR BALES PLACED ON PAVEMENT (OR COMPACT SURFACES), PLACE BURLAP OR COMPANY APPROVED EQUIVALENT BETWEEN PAVEMENT AND BALE.
3. REMOVE ACCUMULATED SEDIMENT.

\$\$\$\$\$USERNAME\$\$\$\$\$
 \$\$\$SYTIME\$\$\$\$\$

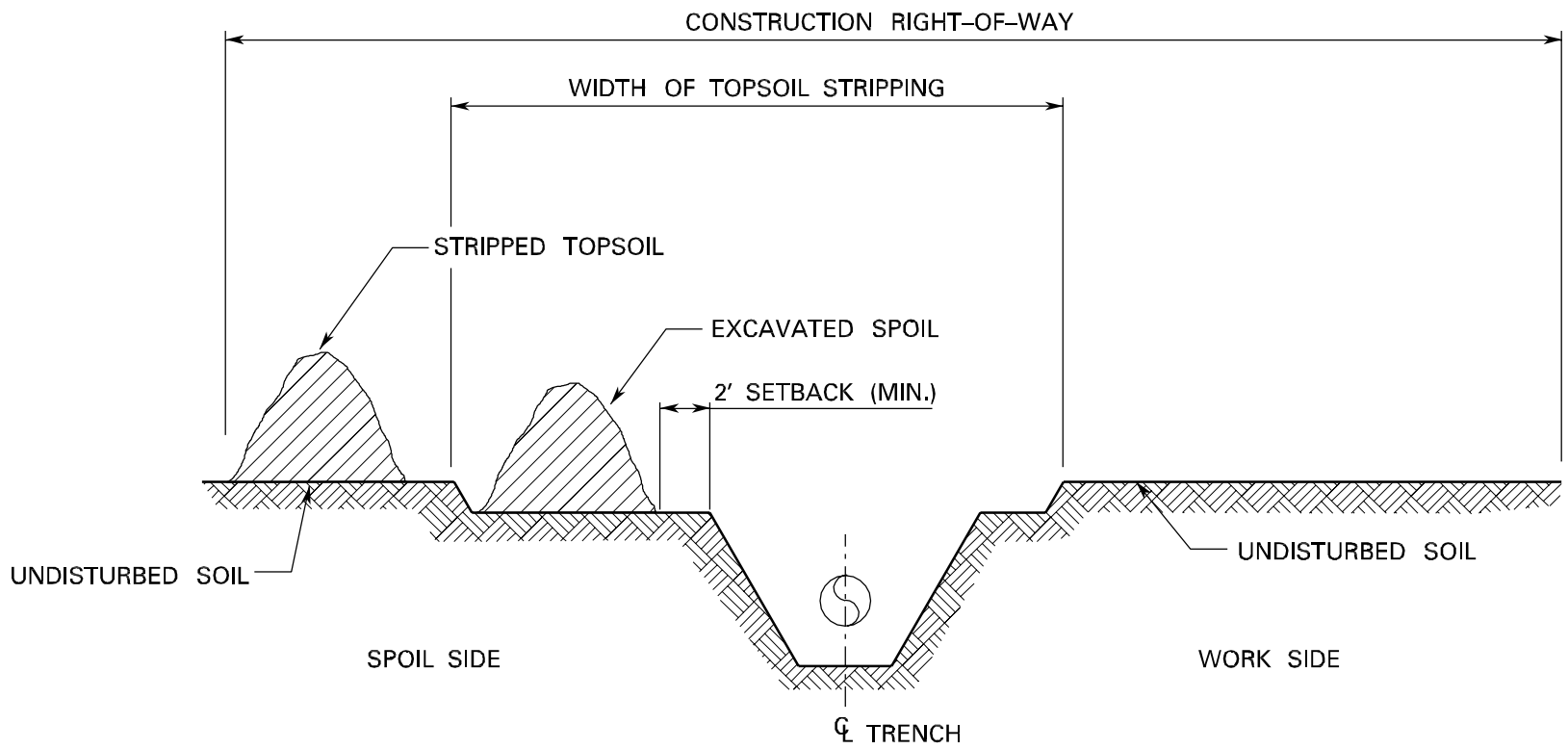
I.C. ESE0010.DGN

STORM DRAIN INLET PROTECTION

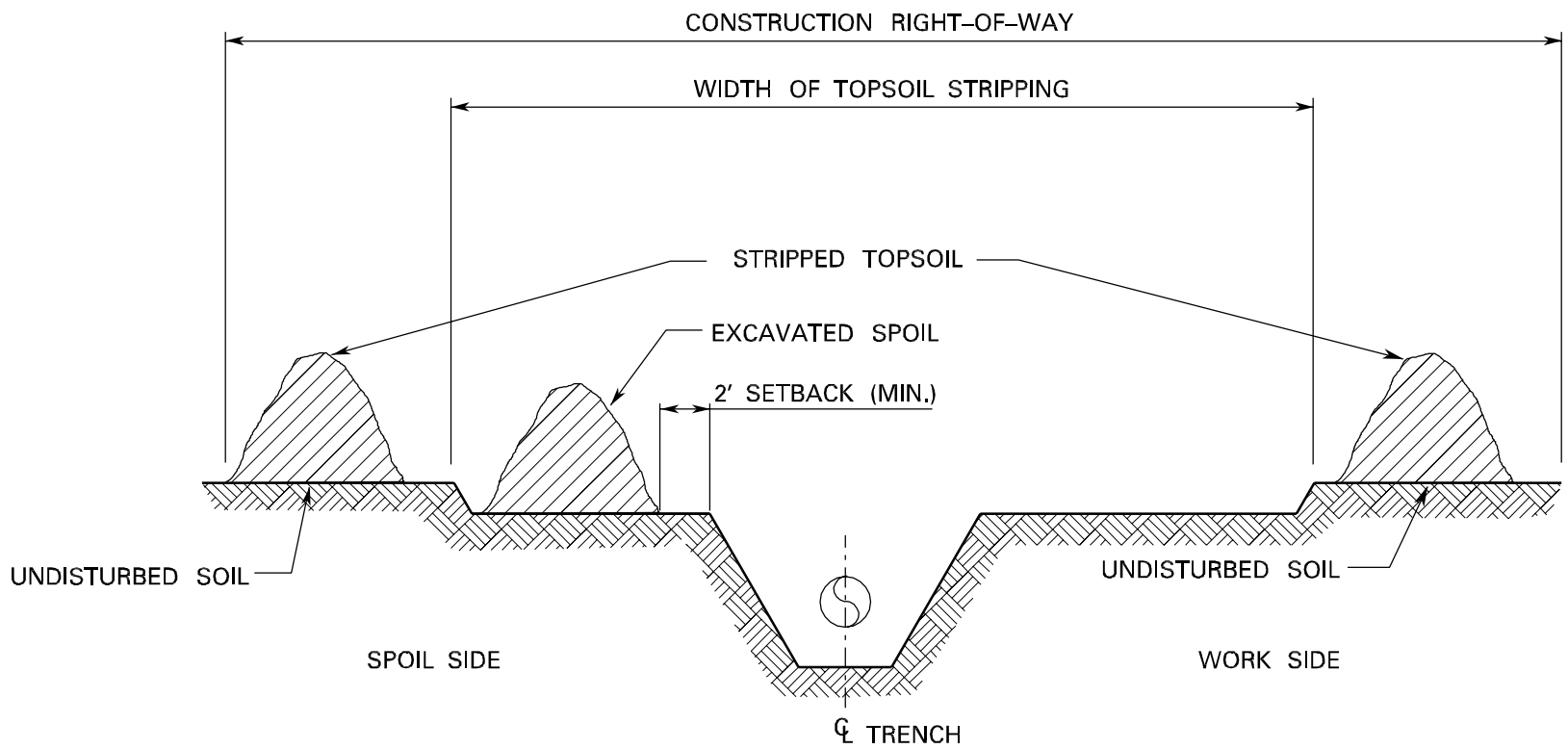
FIGURE #10

DWG. ES-0010

REV.



DITCH PLUS SPOILSIDE TOPSOIL SEGREGATION



FULL RIGHT-OF-WAY TOPSOIL STRIPPING

NOTES:

1. TOPSOIL MAY BE STORED IN LOCATIONS AS SHOWN ABOVE, OR AT OTHER COMPANY APPROVED LOCATIONS WITHIN THE CONSTRUCTION R.O.W.
2. LEAVE GAPS IN SPOIL PILES FOR WATER RUN-OFF.
3. R.O.W. MAY BE EXPANDED UP TO 25' IN NON WETLAND AREAS FOR FULL R.O.W. TOPSOIL SALVAGE.

JmwhorLey
01/22/2003

I.G. ESE0011.DGN

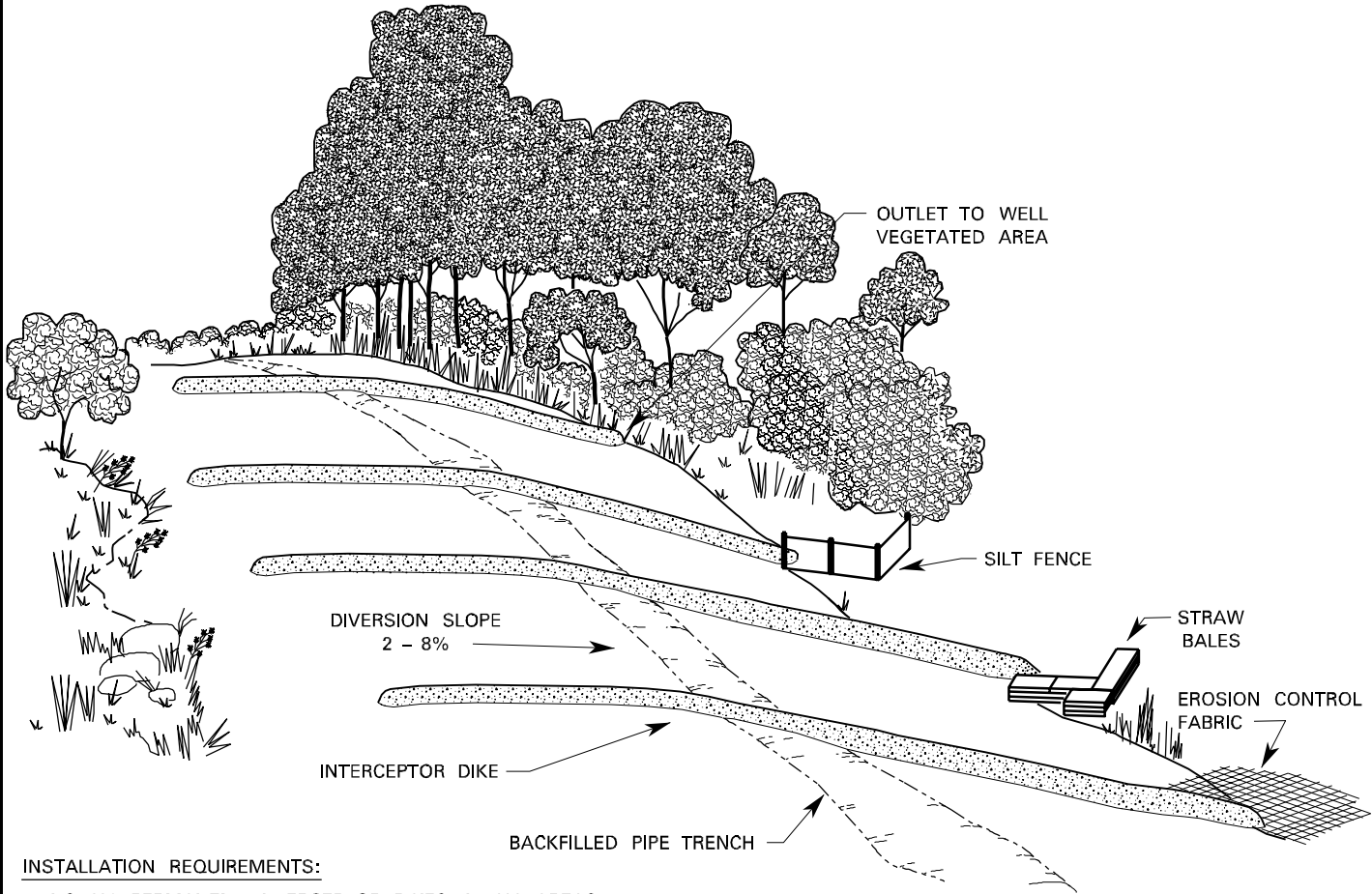
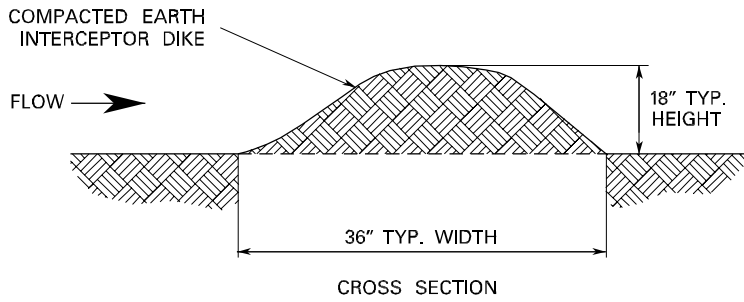
**R.O.W. TOPSOIL SEGREGATION
TECHNIQUES**

FIGURE #11

DWG.

ES-0011

REV.



INSTALLATION REQUIREMENTS:

- INSTALL PERMANENT INTERCEPTOR DIKES IN ALL AREAS EXCEPT RESIDENTIAL OR AGRICULTURAL AS NECESSARY TO AVOID EXCESSIVE EROSION (UNLESS AUTHORIZED BY LANDOWNER OR LAND MANAGING AGENCY IN AGRICULTURAL OR RESIDENTIAL AREA).

- MUST BE INSTALLED ON SLOPES GREATER THAN 5% WHERE THE BASE OF THE SLOPE IS LESS THAN 50 FEET FROM A WATERBODY, WETLAND OR ROAD CROSSING AT THE FOLLOWING MINIMUM SPACING:

SLOPE (%)	SPACING (FT.)
5 - 15	300
>15 - 30	200
>30	100

- CONSTRUCT USING EARTH FILLED SACKS, STAKED STRAW BALES, SILT FENCE, OR SOIL FOR TEMPORARY OR COMPACTED EARTH AND ROCK FOR PERMANENT
- INSTALL WITH A 2 - 8% OUTFALL ANGLE.

- POSITION OUTFALL TO PREVENT SEDIMENT DISCHARGE INTO WETLANDS, WATERBODIES, OR OTHER SENSITIVE RESOURCES.

- FILTER RUN-OFF WATER BY CONSTRUCTING THE OUTLET IN A WELL VEGETATED STABLE AREA, OR BY USING AN ENERGY DISSIPATING DEVICE (SILT FENCE, STRAW BALES, EROSION CONTROL FABRIC), AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.

MAINTENANCE REQUIREMENTS:

- INSPECT DURING AND FOLLOWING CONSTRUCTION AND MAKE REPAIRS AS NEEDED.
- KEEP THE CHANNEL FREE OF DEBRIS AND OBSTRUCTIONS.
- SEED AND MULCH PERMANENT INTERCEPTOR DIKES FOLLOWING CONSTRUCTION.

tcsmith
02/18/2003

I.G. ESE0012.DGN

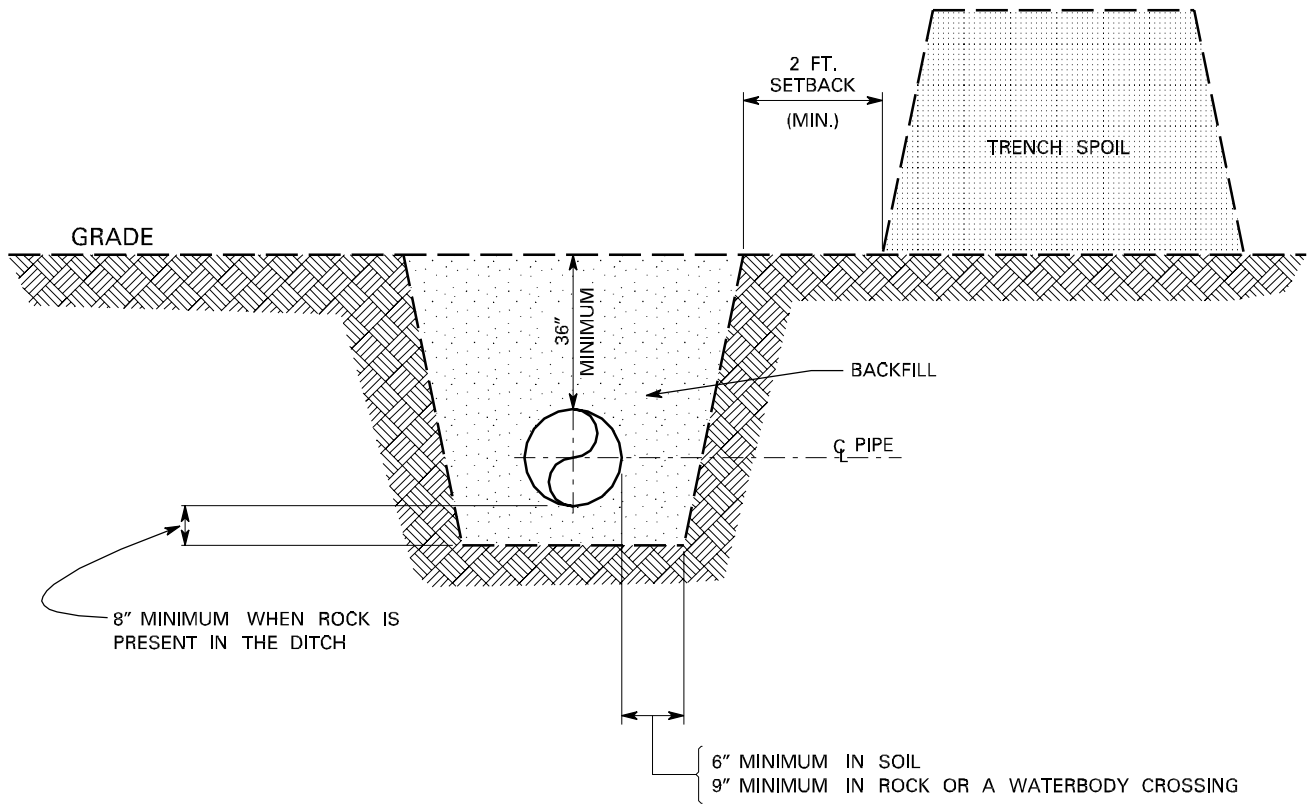
INTERCEPTOR DIKE INSTALLATION AND MAINTENANCE

FIGURE #12

DWG.

ES-0012

REV.



CROSS-SECTION VIEW OF TYPICAL TRENCH

NOTES:

1. ALL ORIGINAL CONTOURS WILL BE RE-ESTABLISHED UPON COMPLETION OF PIPE INSTALLATION. EXCEPT IN WETLANDS, A CROWN MAY BE LEFT TO ACCOUNT FOR DITCH SETTLING, AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. IN COLD WATER FISHERY STREAMS, THE TOP 12" OF THE TRENCH WILL BE BACKFILLED WITH CLEAN GRAVEL OR NATIVE COBBLES.

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\$\$\$\$\$SYTIME\$\$\$\$\$

I.C. ESE0013.DGN

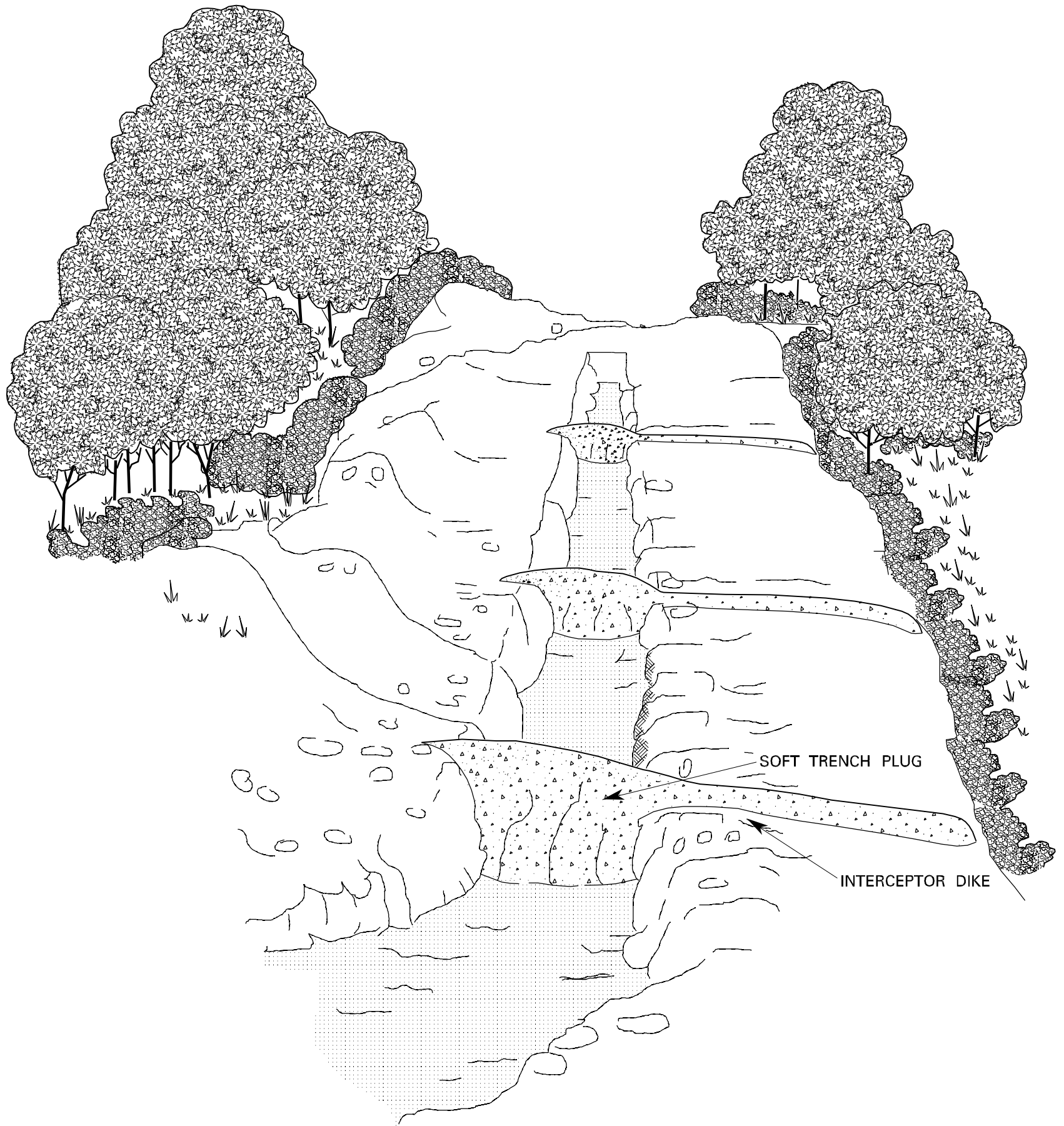
TYPICAL TRENCH DETAIL

FIGURE #13

DWG.

ES-0013

REV.



NOTES:

1. TEMPORARY TRENCH PLUGS MAY BE USED IN CONJUNCTION WITH INTERCEPTOR DIKES TO PREVENT WATER FROM OVERFLOWING INTO SENSITIVE RESOURCE AREAS.
2. DIVERT TRENCH OVERFLOW TO A WELL-VEGETATED OFF-R.O.W. LOCATION OR INSTALL APPROPRIATE ENERGY DISSIPATING DEVICE.

jwhorley
01/22/2003

I.G. ESE0014.DGN

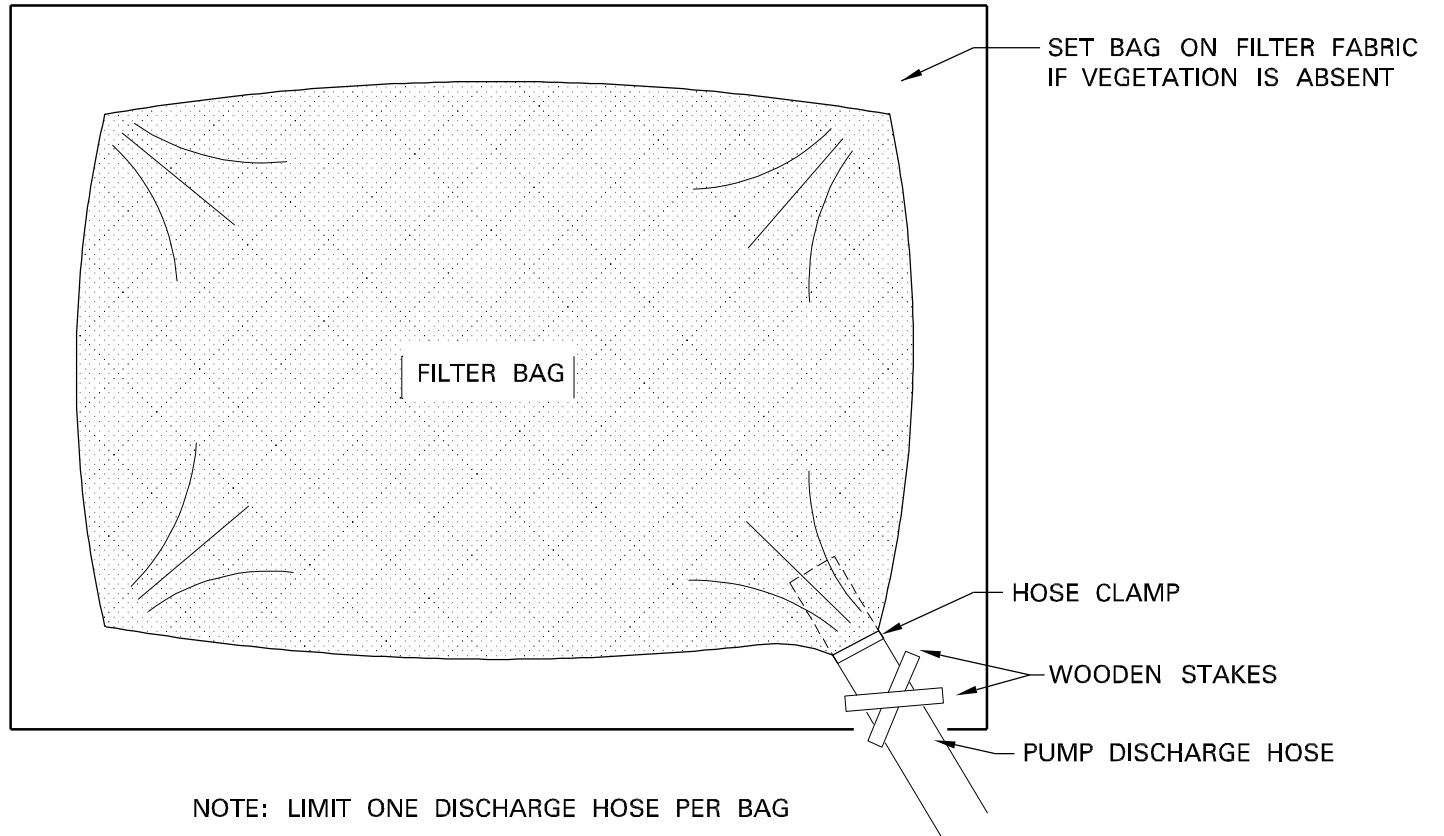
TEMPORARY TRENCH PLUGS

FIGURE #14

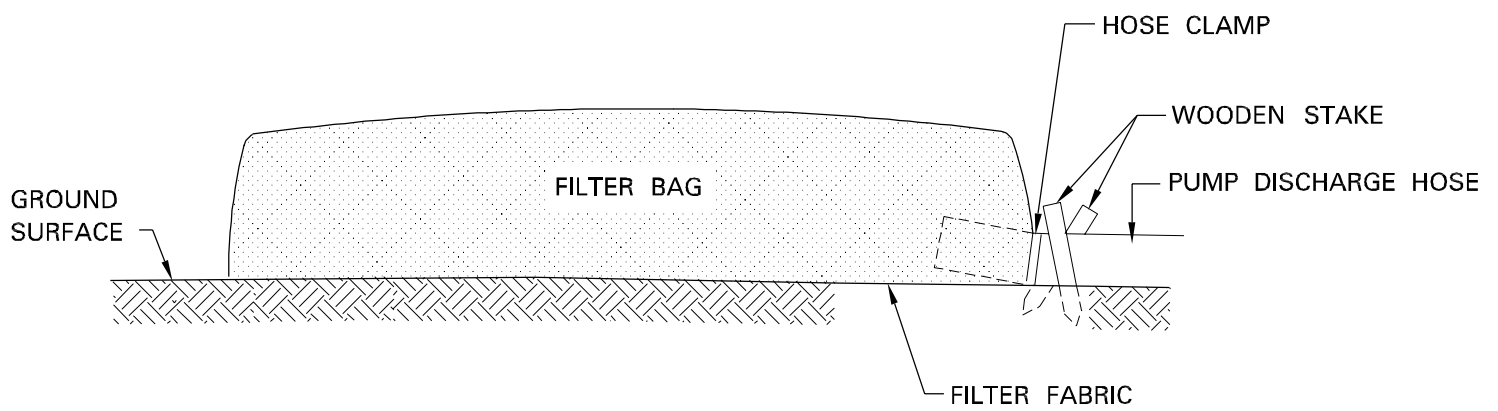
DWG.

ES-0014

REV.



PLAN VIEW



CROSS-SECTION

NOTES:

1. REMOVE DEWATERING STRUCTURE AS SOON AS POSSIBLE AFTER COMPLETION OF DEWATERING ACTIVITIES.

i.g. ESE0015.dgn

jwhorley
01/22/2003

FILTER BAG

FIGURE #15

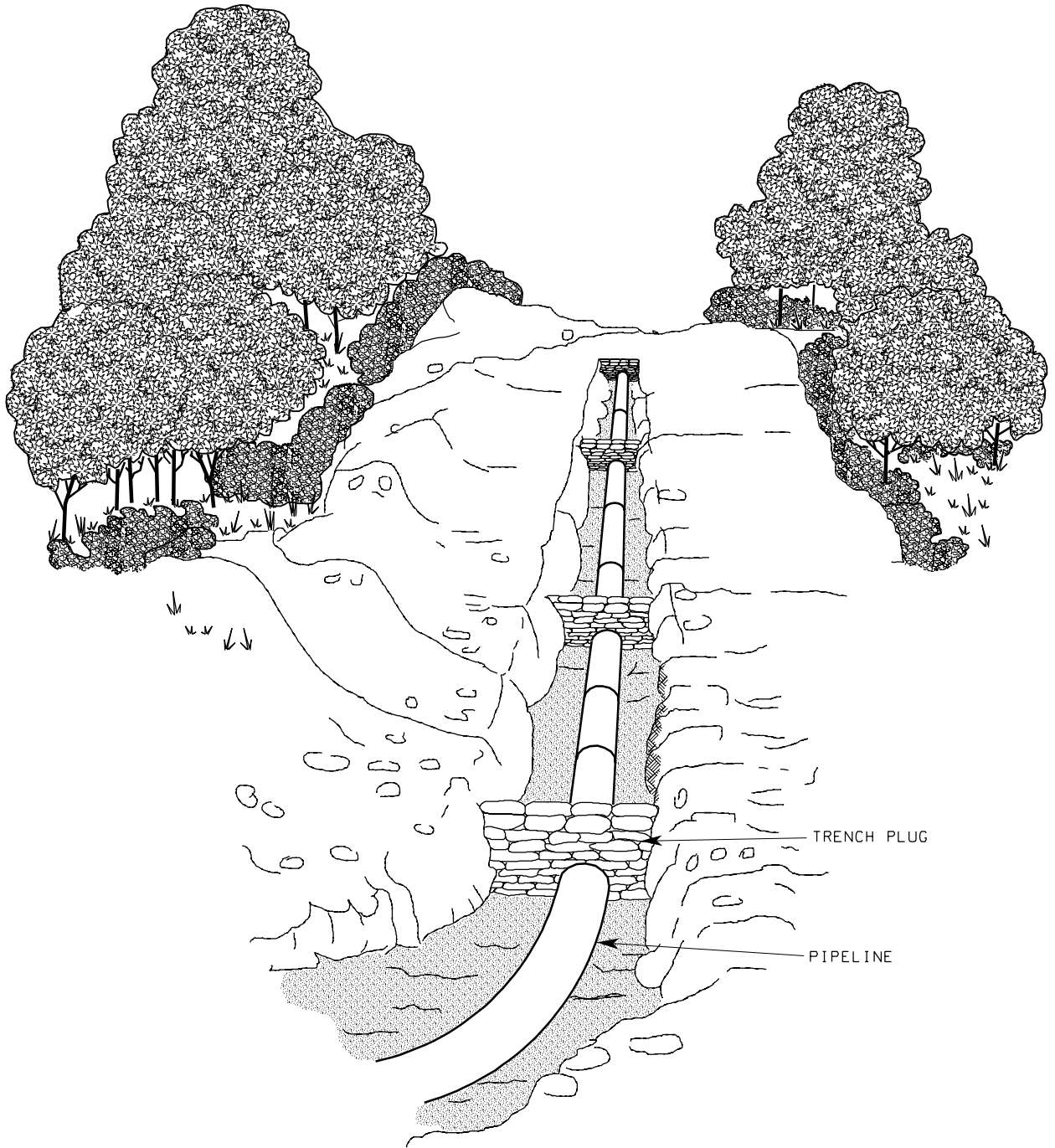
DWG.

ES-0015

REV.

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I.C. ESE0016.DGN



SLOPE (%)	SPACING (FT)
5-15	300
> 15-30	200
> 30	100

PERMANENT TRENCH PLUGS

FIGURE #16

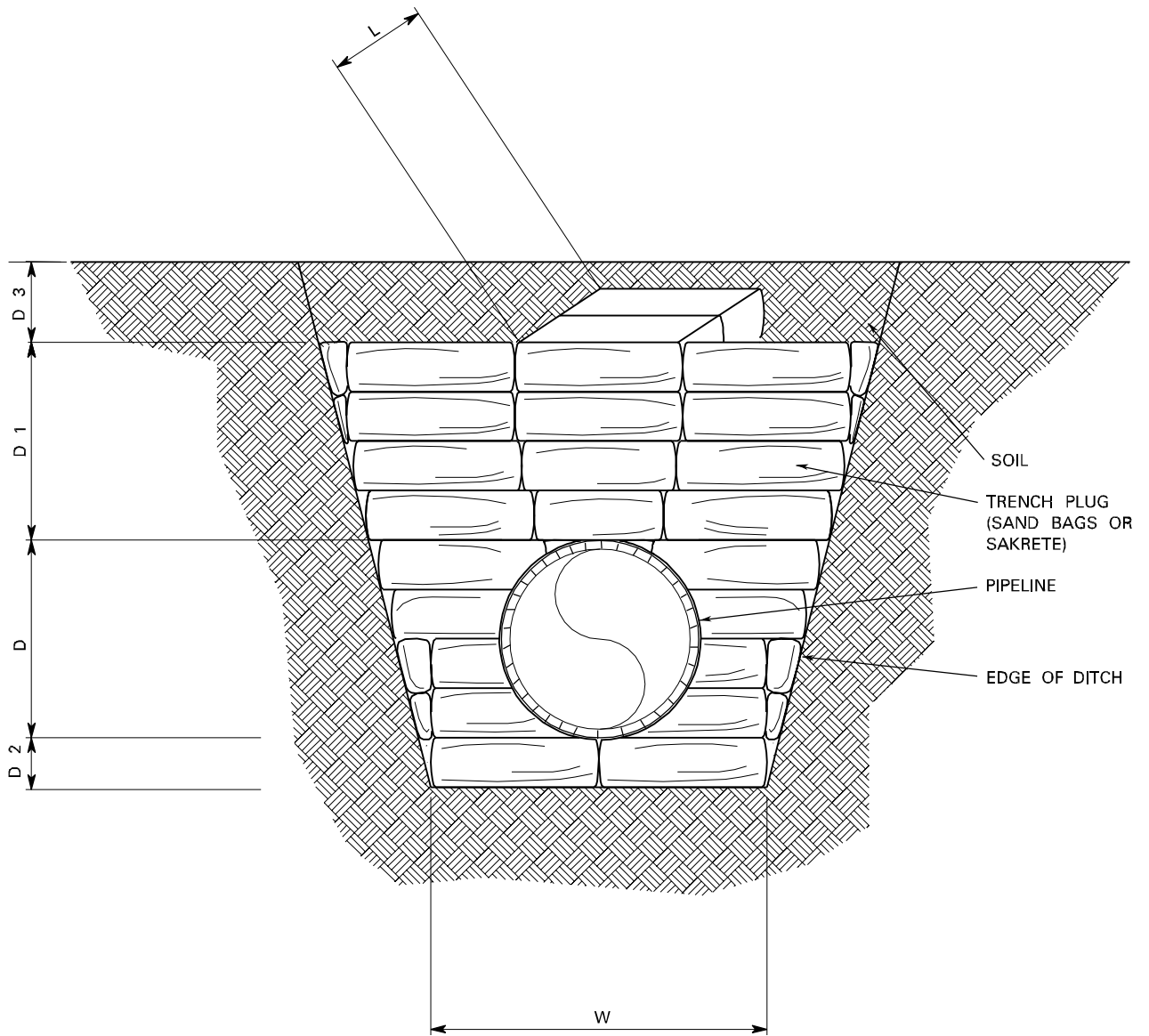
DWG.

ES-0016

REV.

\$\$\$USERNAME\$\$\$
\$\$\$SYTIME\$\$\$

I.G. ESE0017.DGN



- D = PIPE DIAMETER
- D1 = APPROXIMATELY 24"
- D2 = APPROXIMATELY 6" (8" MIN. IN ROCK)
- D3 = APPROXIMATELY 12"
- W = D + 2 TO 4 FEET
- L = APPROXIMATELY 18" - 24"
- D1 + D3 = 36" MINIMUM

NOTE:

USE OF SAKRETE SHALL REQUIRE PRIOR COMPANY APPROVAL.

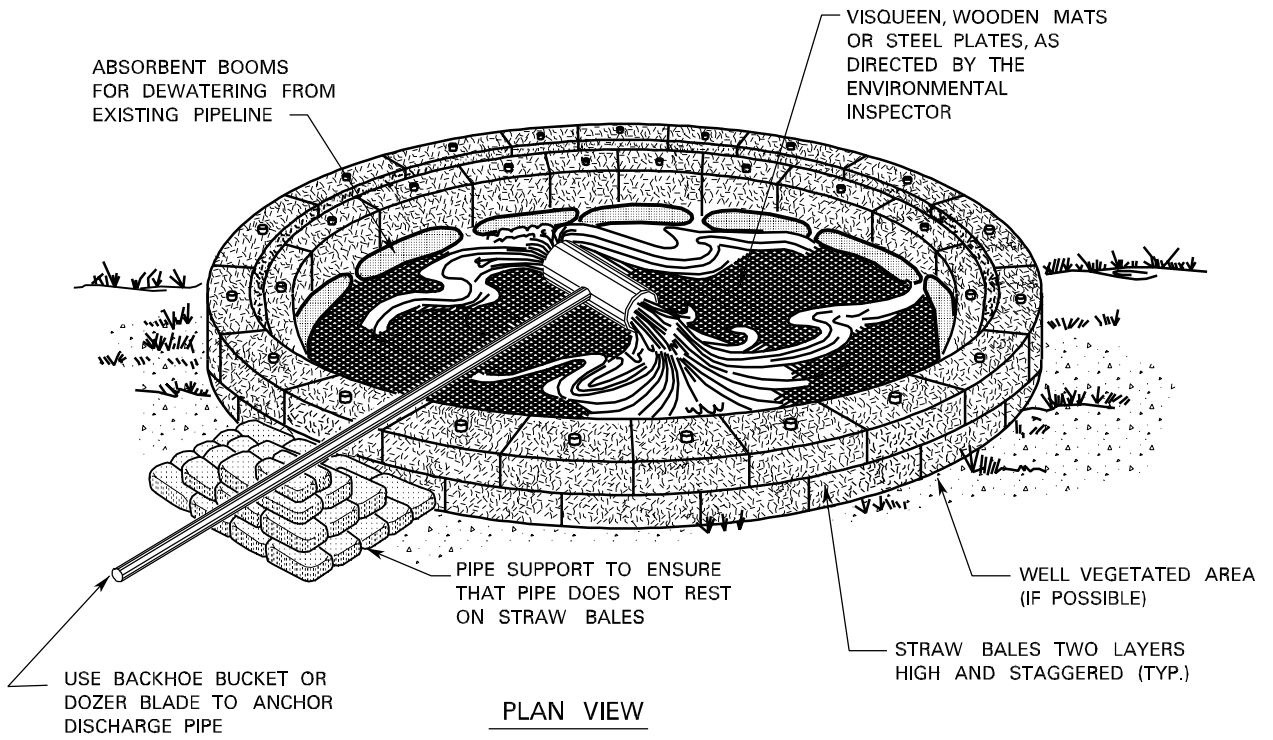
TRENCH PLUG DETAIL

FIGURE #17

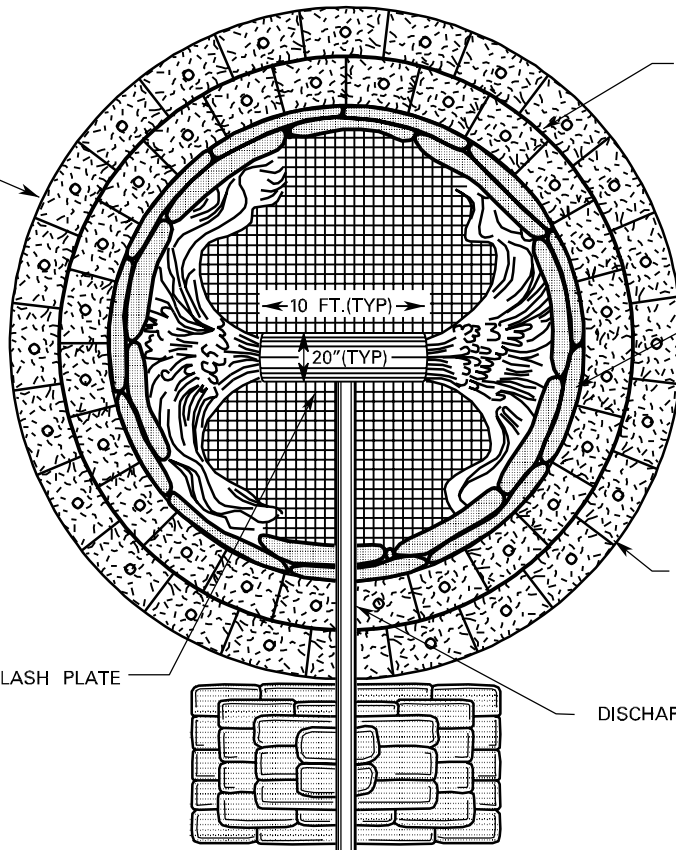
DWG.

ES-0017

REV.



30-35 FT. INSIDE DIA. (TYP.)
OR AS DIRECTED BY THE
ENVIRONMENTAL
INSPECTOR



TOP VIEW

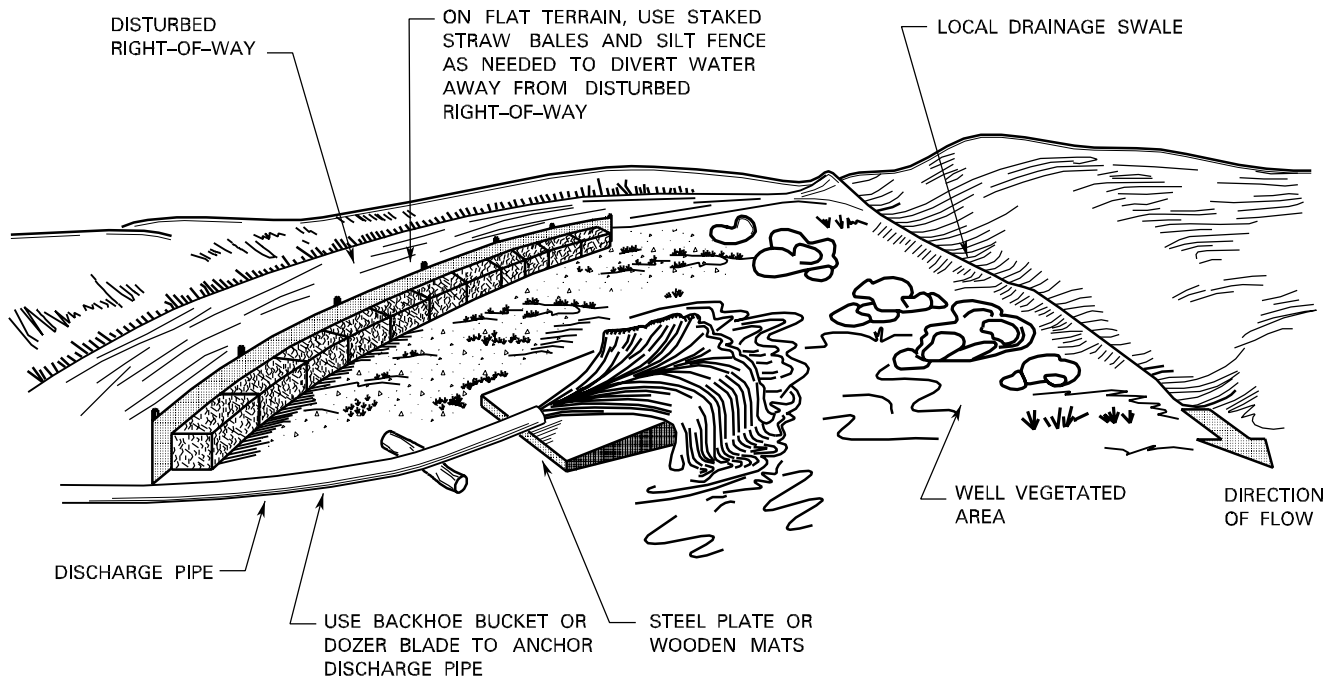
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I.G. ESE0018.DGN

DEWATERING STRUCTURE FOR
HYDROSTATIC TESTING

FIGURE #18

DWG.	ES-0018	REV.
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NOTE:

1. THIS DEWATERING STRUCTURE CAN ONLY BE USED FOR SMALL DISCHARGES FROM NEW PIPELINES WHEN A HYDROSTATIC TEST PACKAGE HAS NOT BEEN ISSUED. IT IS SUBJECT TO APPROVAL BY THE ENVIRONMENTAL INSPECTOR.

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I.G. ESE0019.DGN

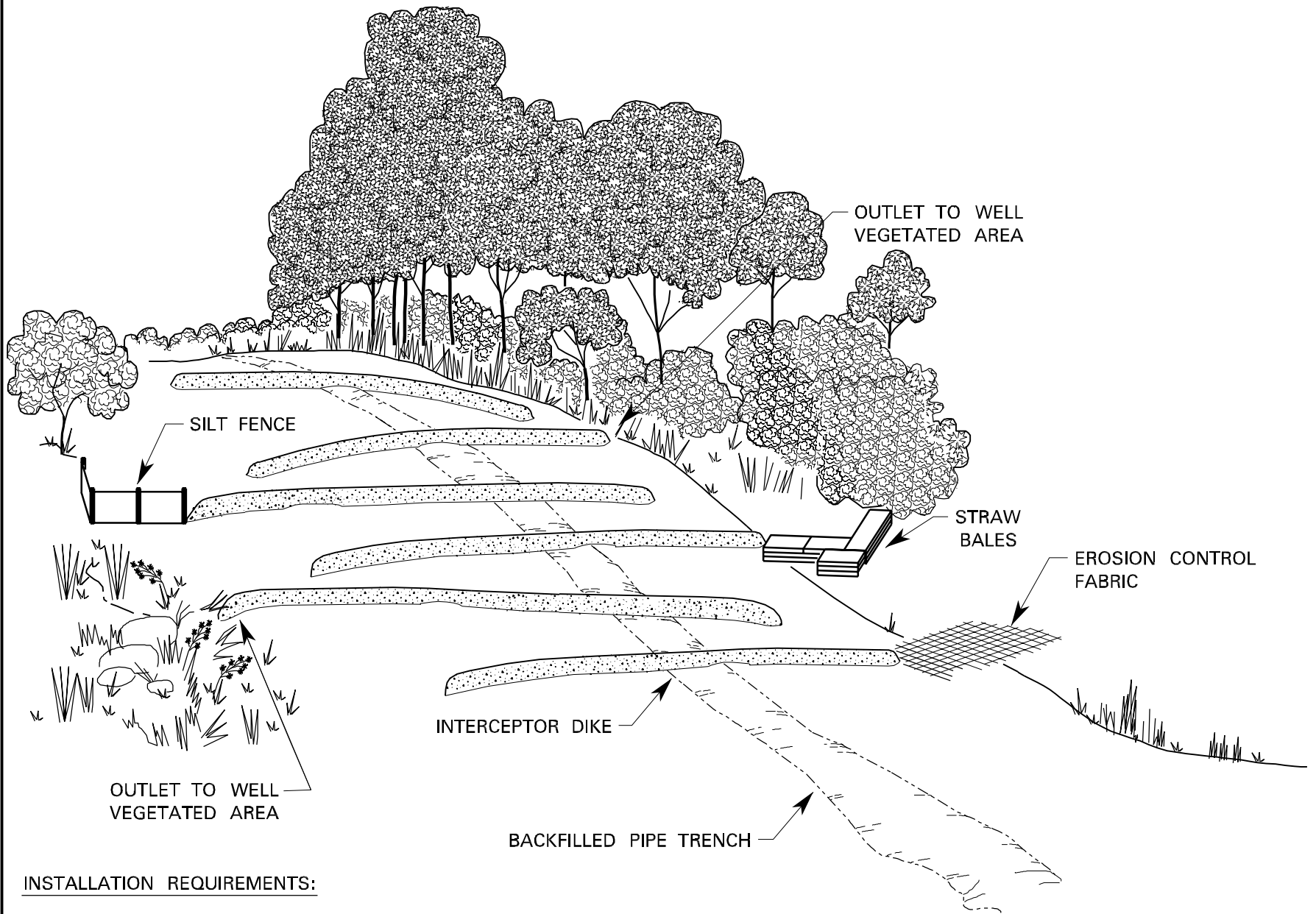
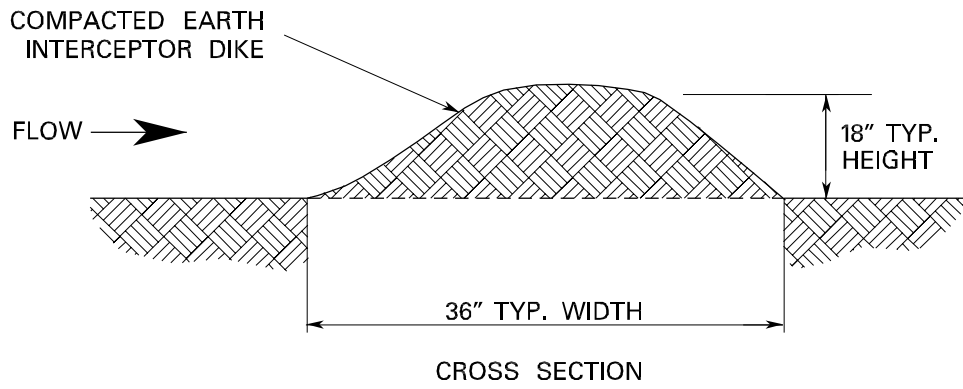
ALTERNATE
DEWATERING STRUCTURE FOR
HYDROSTATIC TESTING

FIGURE #19

DWG.

ES-0019

REV.



INSTALLATION REQUIREMENTS:

- INSTALL IN ALL AREAS EXCEPT RESIDENTIAL OR AGRICULTURAL (UNLESS AUTHORIZED BY LANDOWNER OR LAND MANAGING AGENCY).
- CONSTRUCT USING EARTH FILLED SACKS OR STAKED STRAW BALES FOR TEMPORARY OR COMPACTED EARTH AND ROCK FOR PERMANENT.
- INSTALL WITH A 2 - 8% OUTFALL ANGLE.
- FOR TEMPORARY CHEVRON INTERCEPTOR DIKES, POSITION OUTFALL TO PREVENT SEDIMENT DISCHARGE INTO WETLANDS, WATERBODIES, OR OTHER SENSITIVE RESOURCES.
- FILTER RUN-OFF WATER BY CONSTRUCTING AN OUTLET USING AN ENERGY DISSIPATING DEVICE (SILT FENCE, STRAW BALES, EROSION CONTROL FABRIC), AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.

MAINTENANCE REQUIREMENTS:

- INSPECT DURING AND FOLLOWING CONSTRUCTION AND MAKE REPAIRS AS NEEDED.
- KEEP THE CHANNEL FREE OF DEBRIS AND OBSTRUCTIONS.
- SEED AND MULCH PERMANENT INTERCEPTOR DIKES FOLLOWING CONSTRUCTION.

jw/whor/ley
01/22/2003

I.G. ESE0020.DGN

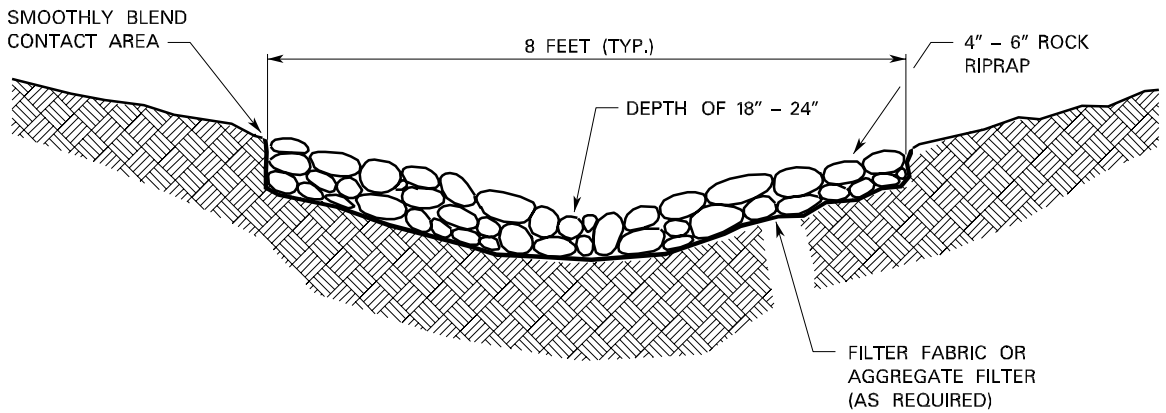
**CHEVRON INTERCEPTOR DIKE
INSTALLATION AND MAINTENANCE**

FIGURE #20

DWG.

ES-0020

REV.



INSTALLATION REQUIREMENTS:

1. RIPRAP CHANNELS CAN BE CONSTRUCTED WITH GRASS-LINED SLOPES WHERE SITE CONDITIONS WARRANT.
2. STABILIZE CHANNEL INLET POINTS AND INSTALL OUTLET PROTECTION (AS NEEDED) DURING CHANNEL INSTALLATION.
3. INSTALL ENERGY DISSIPATING DEVICE (AS NEEDED) TO PREVENT SCOUR TO THE RECEIVING OUTLET.
4. REMOVE ALL TREES, BRUSH, AND OTHER OBJECTIONABLE MATERIAL FROM THE CHANNEL.
5. INSTALL FILTER FABRIC OR GRAVEL LAYER TO PREVENT PIPING (AS REQUIRED)

MAINTENANCE REQUIREMENTS:

1. INSPECT CHANNEL DURING AND FOLLOWING CONSTRUCTION AND MAKE REPAIRS AS NEEDED.
2. KEEP THE CHANNEL FREE OF DEBRIS AND OBSTRUCTIONS.

\$\$\$USERNAME\$\$\$
 \$\$\$SYTIME\$\$\$

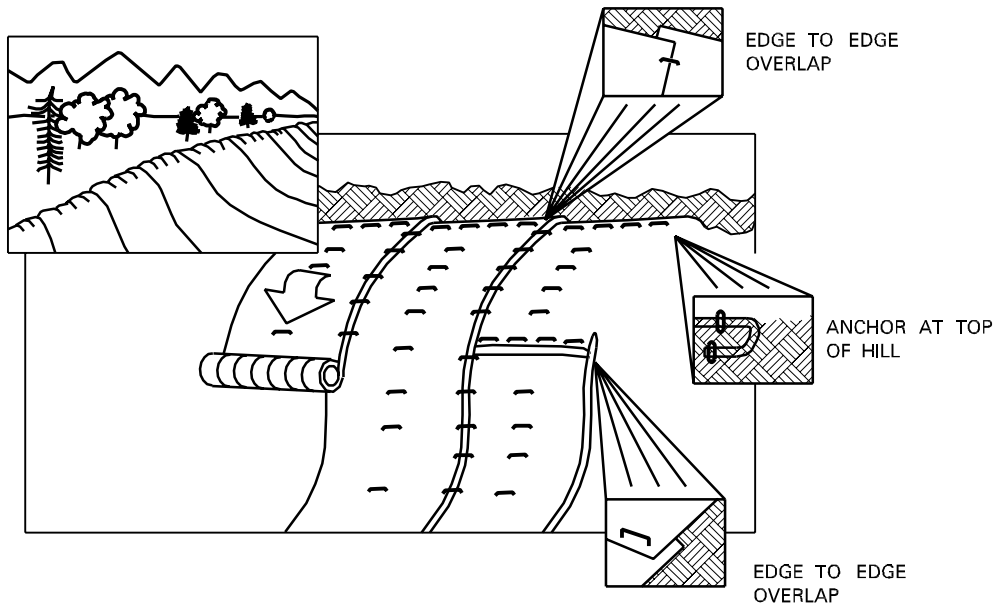
I.C. ESE0021.DGN

ROCK LINED DRAINAGE SWALE
 INSTALLATION AND MAINTENANCE

FIGURE #21

DWG. ES-0021

REV.



NOTES:

1. EROSION CONTROL MATTING (BLANKETS) SHALL BE USED AT LOCATIONS IDENTIFIED IN THE PLAN AND/OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. EROSION CONTROL MATTING SHALL MEET THE REQUIREMENTS SPECIFIED IN THE PLAN AND/OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
3. STAPLES SHALL BE MADE OF 11 GAUGE WIRE, U-SHAPED WITH 6" LEGS AND A 1" CROWN. STAPLES SHALL BE DRIVEN INTO THE GROUND FOR THE FULL LENGTH OF THE STAPLE LEGS.
4. MATTING SHALL BE INSTALLED ACCORDING TO MANUFACTURER SPECIFICATIONS OR AS STATED BELOW:
 - EXTEND TOP OF BLANKET 3 FEET PAST THE UPPER EDGE OF THE SLOPE.
 - ANCHOR ("KEY") THE UPPER EDGE OF THE BLANKET INTO THE SLOPE USING A 6" DEEP TRENCH AND ROLL THE BLANKET DOWN THE HILL. DOUBLE STAPLE EVERY 12" BEFORE BACKFILLING AND COMPACTING TRENCH.
 - AVOID STRETCHING EROSION CONTROL MATTING (LOOSELY) DURING INSTALLATION.
 - BRING MAT ROLL BACK OVER THE TOP OF THE TRENCH AND CONTINUE TO ROLL DOWN SLOPE. STAPLE EVERY 12" WHERE MAT EXITS THE TRENCH AT THE TOP OF THE SLOPE.
 - WHEN BLANKETS ARE SPLICED DOWN-SLOPE TO ADJOINING MATS (SLOPE OR STREAM BANK MATS), THE UPPER BLANKET SHALL BE PLACED OVER THE LOWER MAT (SHINGLE STYLE) WITH APPROXIMATELY 6" OF OVERLAP. STAPLE THROUGH THE OVERLAPPED AREA EVERY 12".
 - OVERLAP ADJACENT BLANKETS 6". STAPLE EDGES OF BLANKETS AND CENTER EVERY 36".
5. IN LIVESTOCK AREAS WHERE EROSION CONTROL MATTING IS APPLIED TO THE SLOPES, FENCING WILL BE USED IF NECESSARY TO EXCLUDE LIVESTOCK, WITH PERMISSION OF THE LANDOWNER.
6. MONITOR WASHOUTS, STAPLE INTEGRITY OR MAT MOVEMENT. REPLACE OR REPAIR AS NECESSARY.

\$\$\$USERNAME\$\$\$
 \$\$\$SYTIME\$\$\$

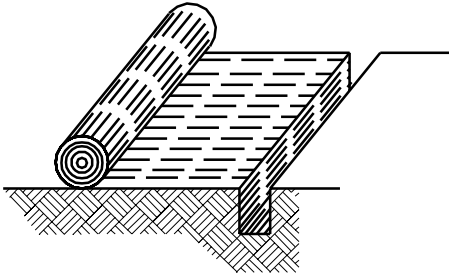
I.C. ESE0022.DGN

TYPICAL MATTING ON SLOPES

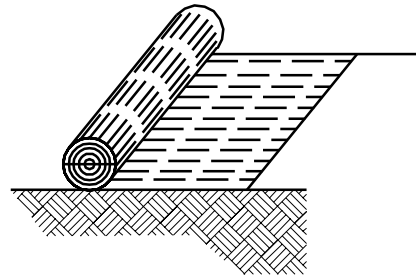
FIGURE #22

DWG. **ES-0022** REV.

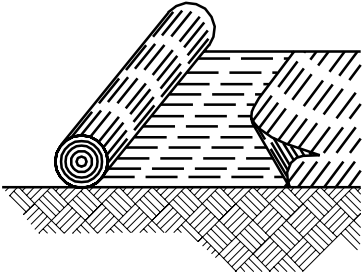
A. BURY THE TOP END OF THE JUTE STRIPS
IN A 6" TRENCH (TYPICAL)



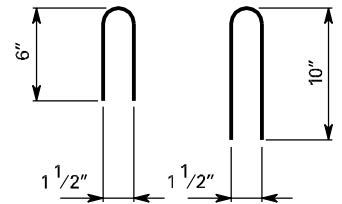
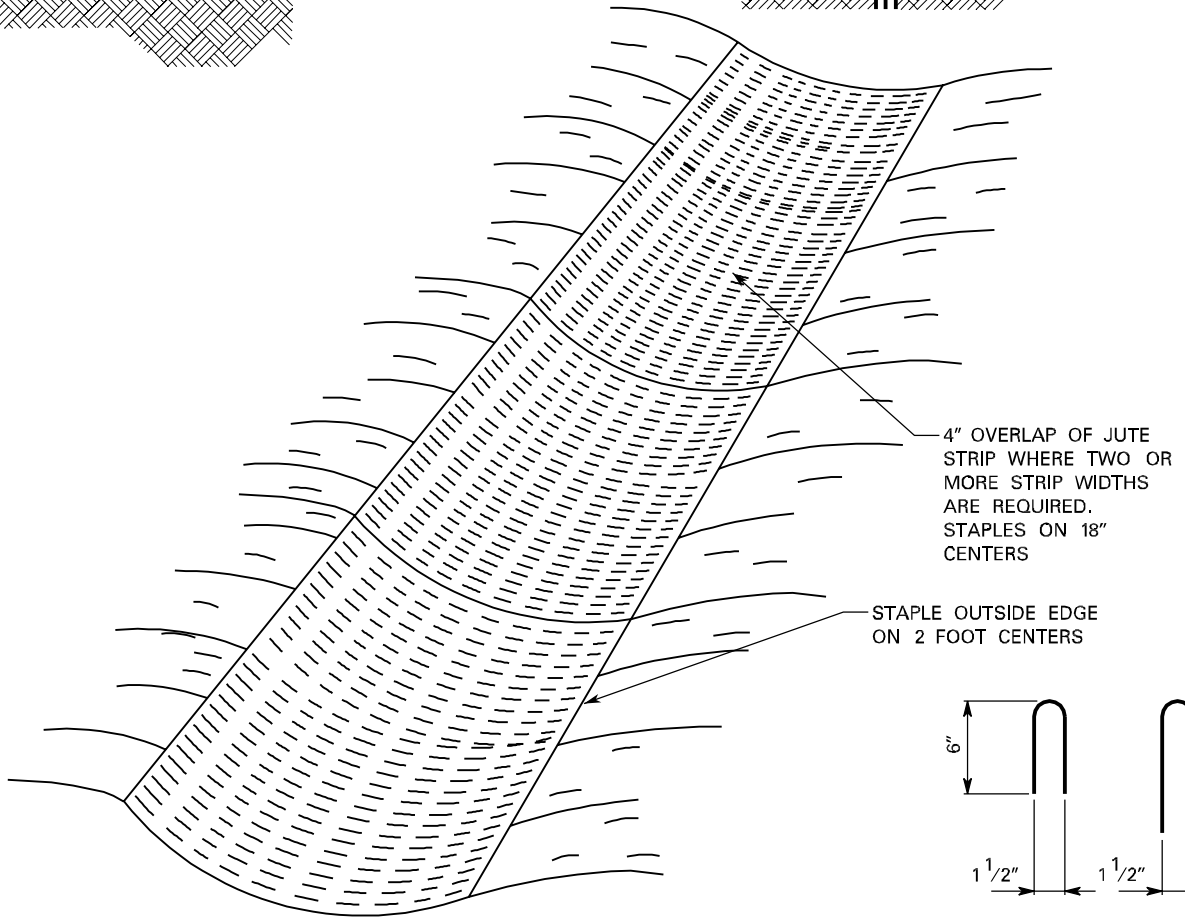
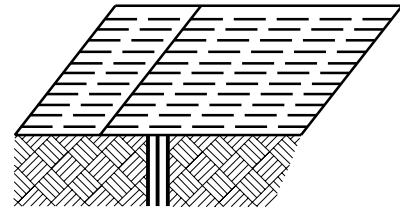
B. DOUBLE STAPLE EVERY 12" BEFORE
BACKFILLING AND COMPACTING.



C. BURY AND TAMP UPPER END OF LOWER
STRIP AS IN "A" AND "B". OVERLAP END
OF TOP STRIP 4" AND STAPLE.



D. WHERE FABRIC STOPS, FOLD, BURY,
AND TAMP JUTE STRIPS IN SLIT TRENCH.
PROVIDE DOUBLE ROW OF STAPLES



TYPICAL STAPLES
NO. 11 GAUGE WIRE

\$\$\$USERNAME\$\$\$
\$\$\$SYTIME\$\$\$

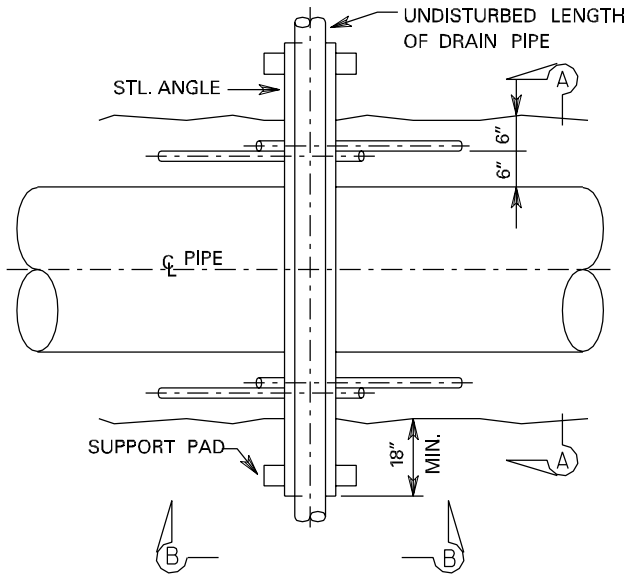
I.C. ESE0023.DGN

EROSION CONTROL FABRIC
INSTALLATION

FIGURE #23

DWG. ES-0023

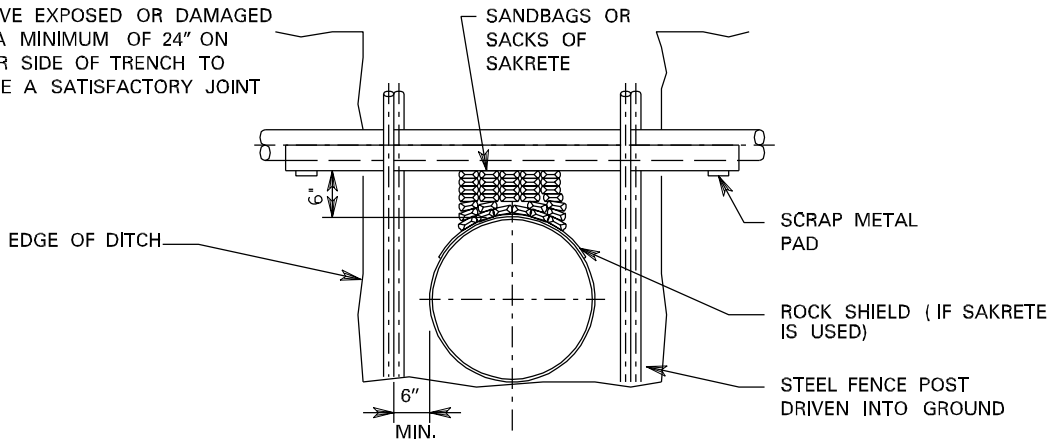
REV.



PLAN VIEW

N.T.S.

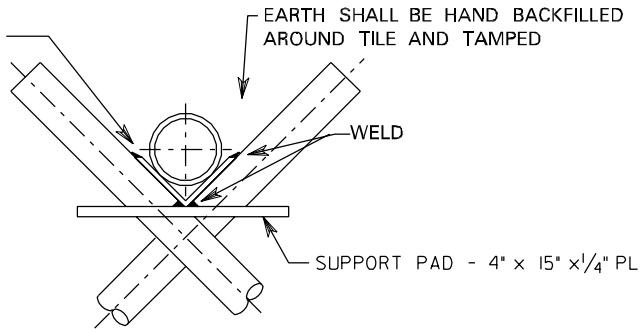
REMOVE EXPOSED OR DAMAGED TILE A MINIMUM OF 24" ON EITHER SIDE OF TRENCH TO INSURE A SATISFACTORY JOINT



SECTION "A-A"

N.T.S.

TO SUPPORT 4" & 6" TILE USE 4" x 1/4" ANGLE
 " 8" " 6" x 7/16" "
 " 10" " 6" x 7/16" "
 " 12" " 8" x 1/2" "
 " 16" " 8" x 1/2" "



SECTION "B-B"

N.T.S.

NOTE:
 USE OF SAKRETE SHALL REQUIRE PRIOR COMPANY APPROVAL.

DRAIN TILE REPAIR PROCEDURE

FIGURE #24

DWG.

ES-0024

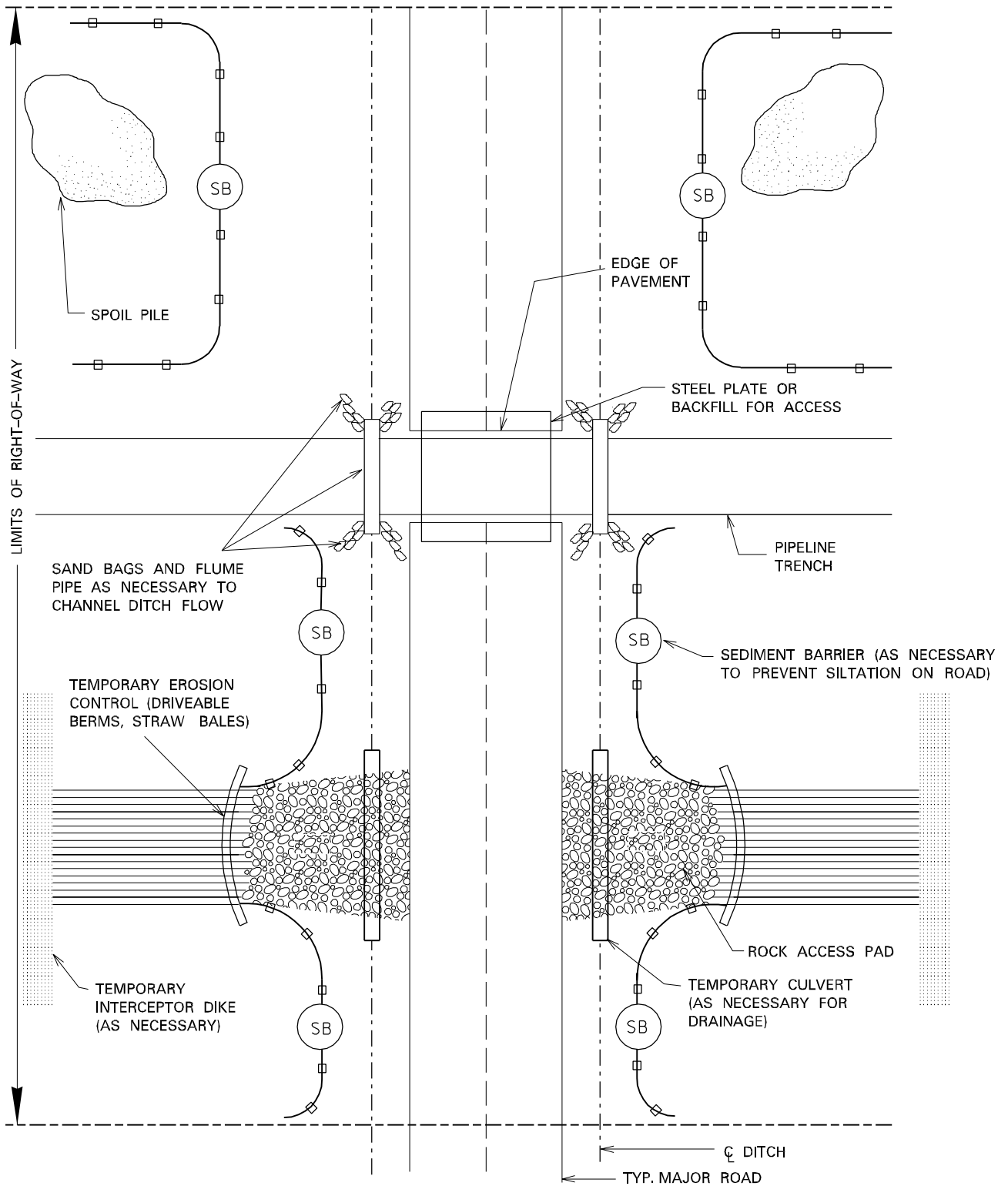
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I.G. ESE0024.DGN

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\$\$\$\$\$SYTIME\$\$\$\$\$

I.G. ESE0025.DGN



(SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND /OR STRAW BALES

TYPICAL PAVED ROAD CROSSING
CONTROL MEASURES (OPEN CUT)

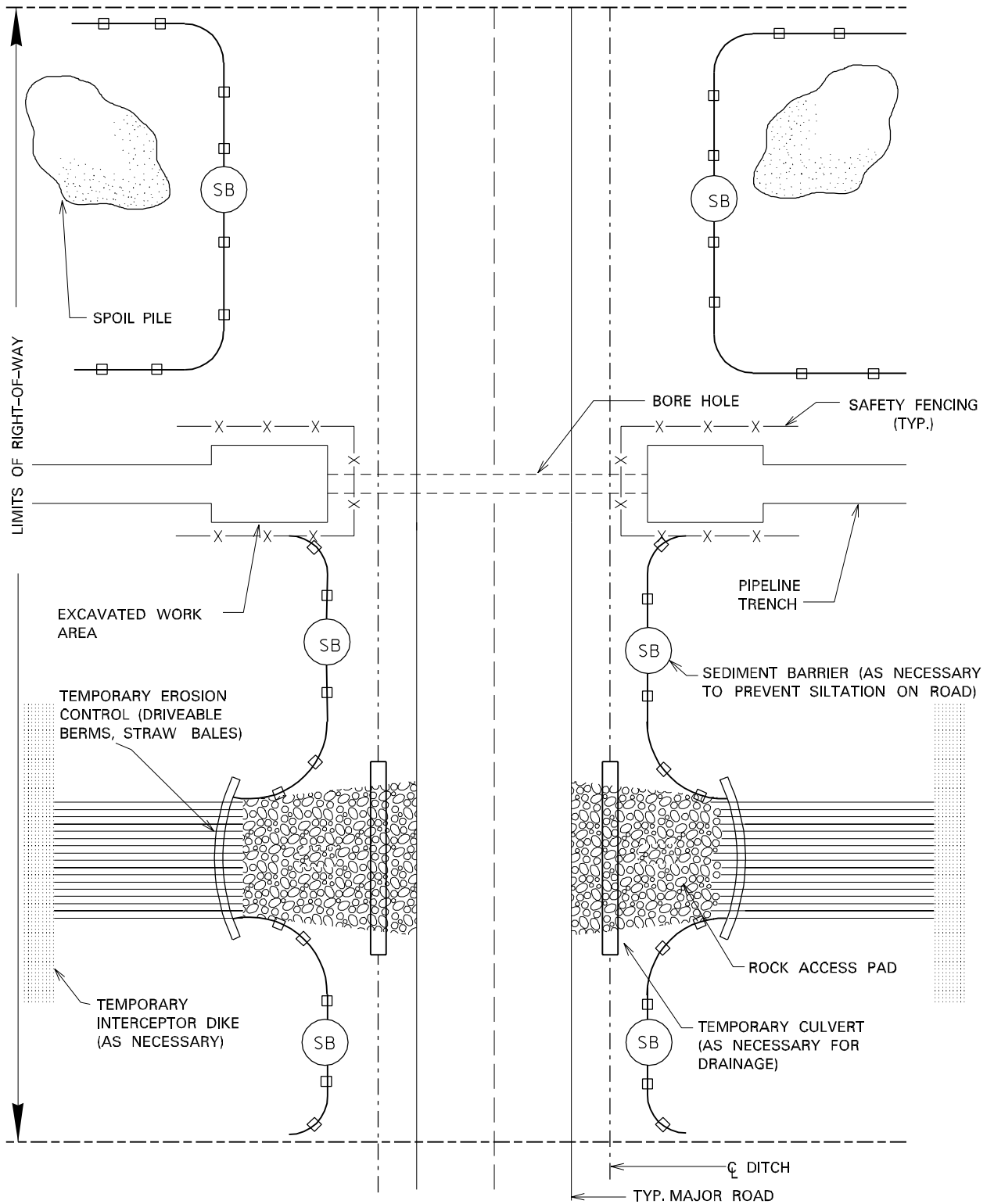
FIGURE #25

DWG. ES-0025

REV.

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I.G. ESE0026.DGN

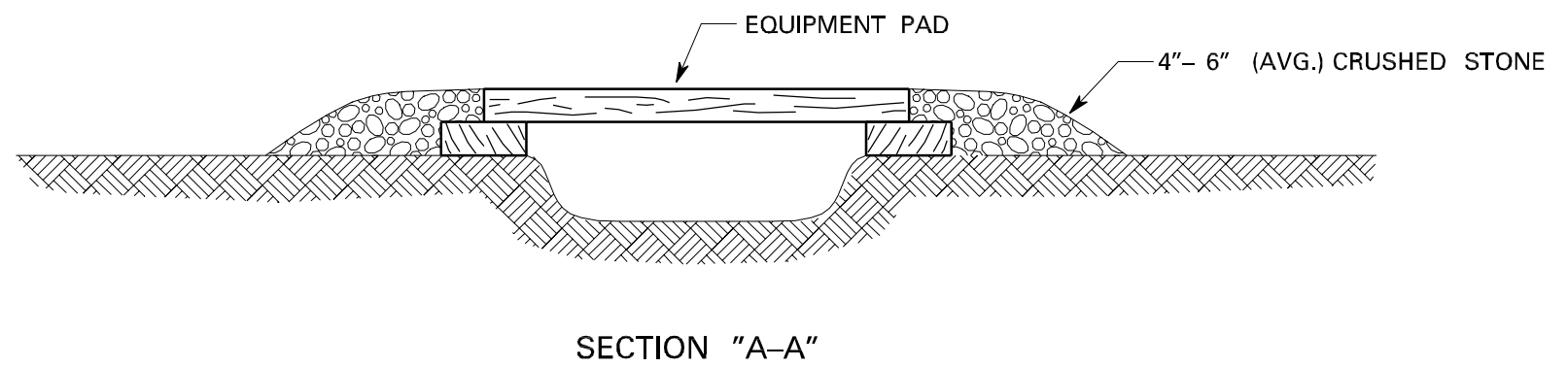
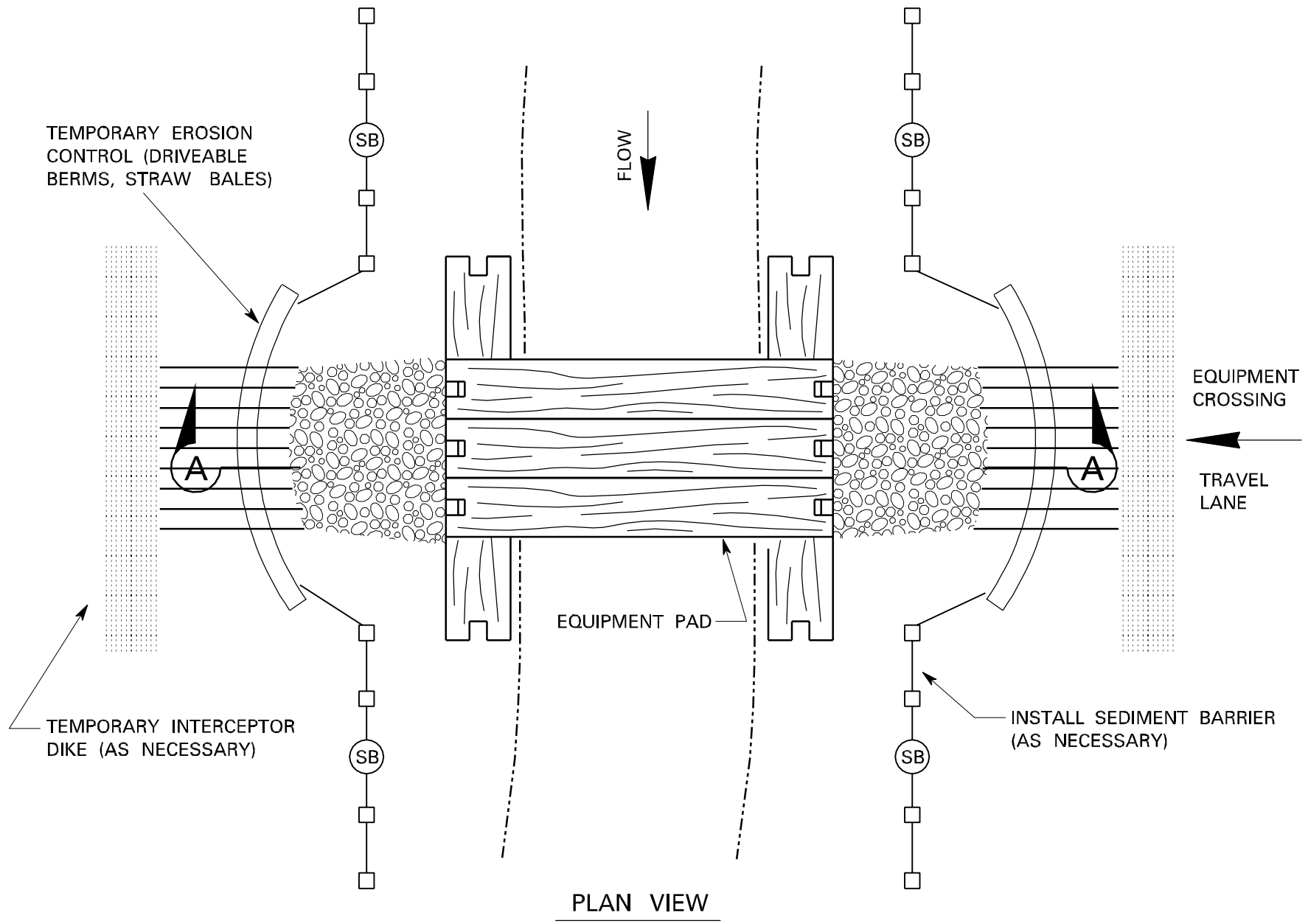


(SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND /OR STRAW BALES

TYPICAL PAVED ROAD CROSSING
CONTROL MEASURES (BORED)

FIGURE #26

DWG. ES-0026 REV.



NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR OTHER APPROPRIATE MATERIAL.
2. ADDITIONAL EQUIPMENT PADS CAN BE PUT SIDE BY SIDE IF EXTRA WIDTH IS REQUIRED.
3. EQUIPMENT PAD TYPICALLY CONSTRUCTED OF HARDWOOD; MUST ACCOMMODATE THE LARGEST EQUIPMENT USED.
4. CRUSHED STONE MUST EXTEND A MINIMUM OF 10 FEET FROM THE TOP OF THE BANK.
5. CONSTRUCT BRIDGE TO PREVENT SOIL FROM ENTERING WATERBODY.

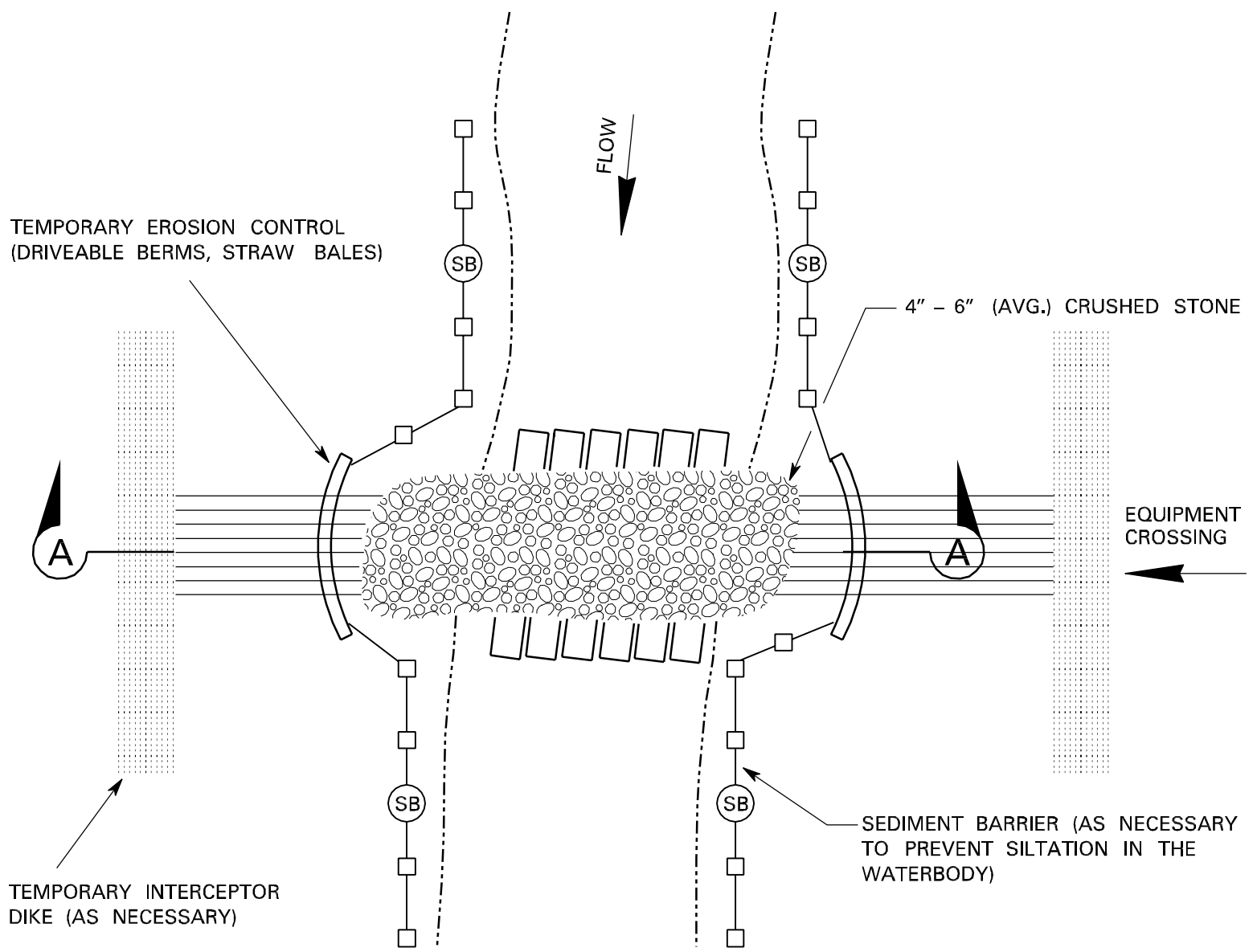
jwhorley
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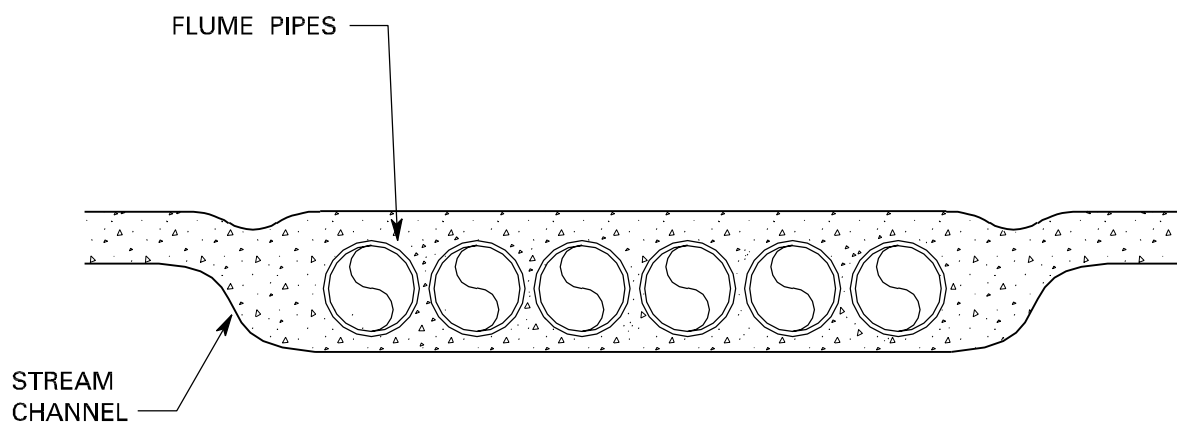
**TEMPORARY EQUIPMENT BRIDGE
(EQUIPMENT PADS AND CULVERTS)**

FIGURE #27

DWG. ES-0027	REV.
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PLAN VIEW



SECTION "A-A"

NOTES:

1. ALIGN FLUME PIPES TO PREVENT EROSION AND STREAMBED SCOUR.
2. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCES AND/OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS.

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**TEMPORARY EQUIPMENT BRIDGE
(CRUSHED STONE AND CULVERTS)**

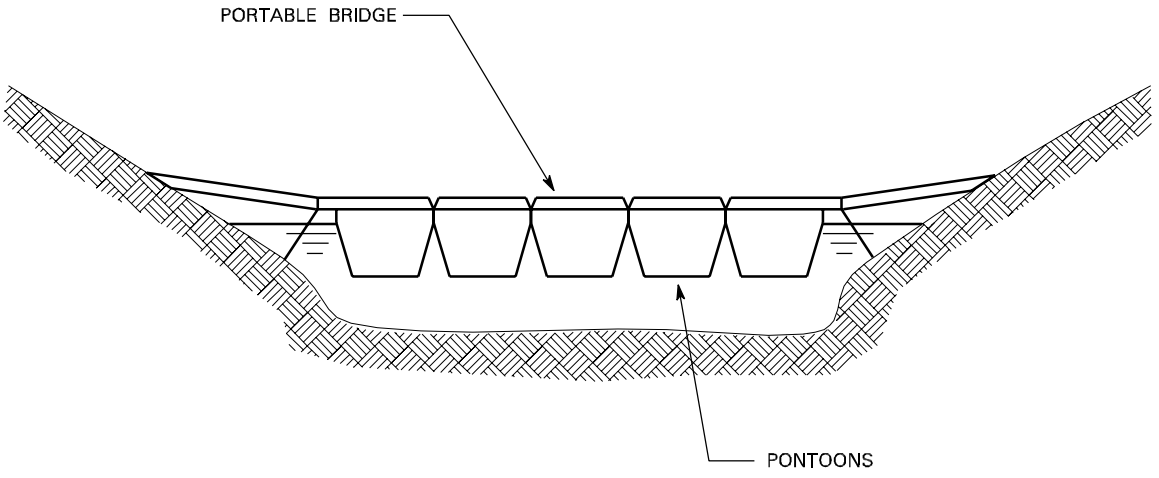
FIGURE #28

DWG.

ES-0028

REV.

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NOTES:

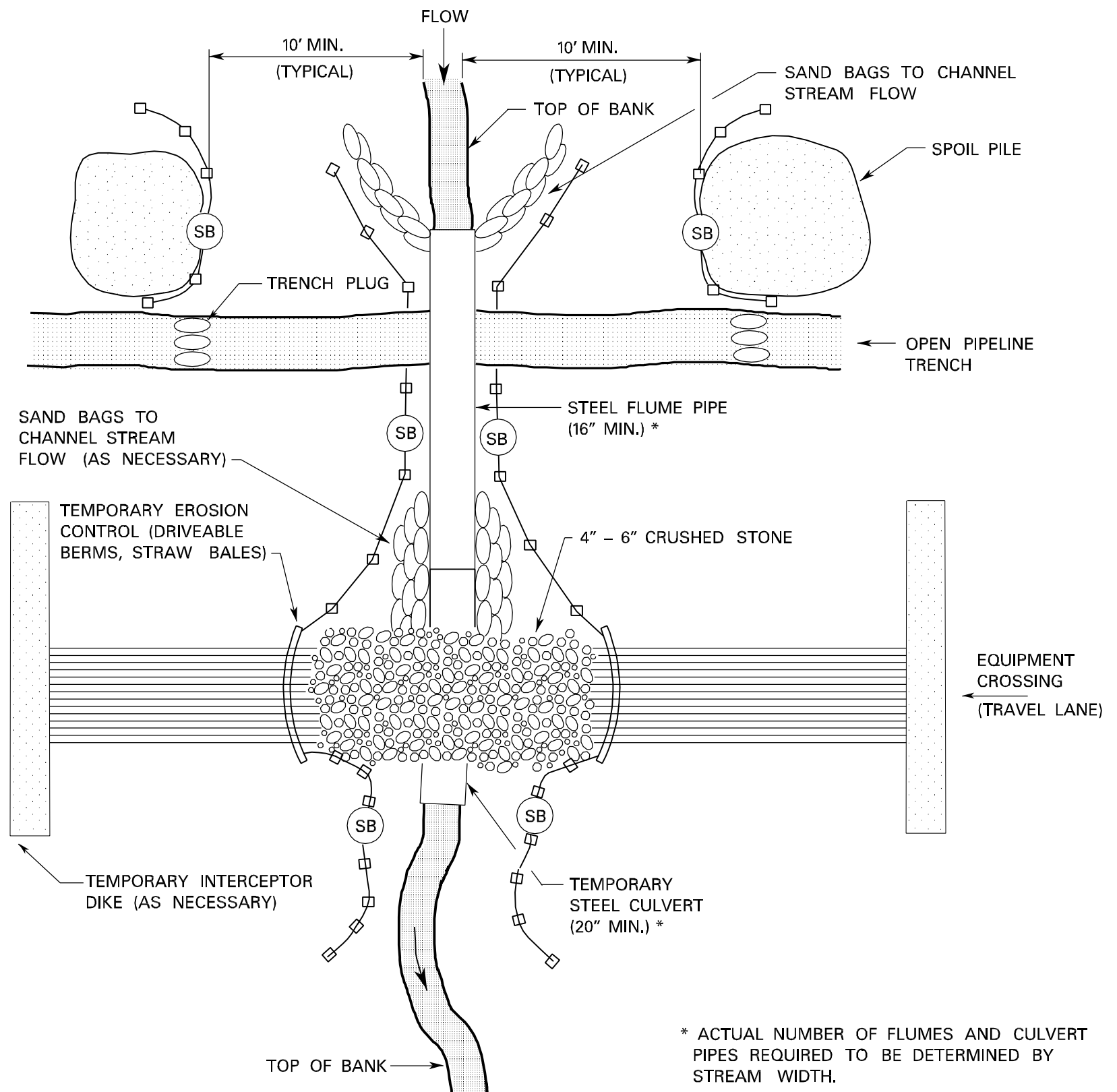
- 1. STABILIZE EDGES WITH SANDBAGS OR STONE.
- 2. REMOVE BRIDGE DURING CLEANUP.

I.C. ESE0029.DGN

TEMPORARY EQUIPMENT BRIDGE
(FLEXI-FLOAT OR PORTABLE)

FIGURE #29

DWG.	ES-0029	REV.
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* ACTUAL NUMBER OF FLUMES AND CULVERT PIPES REQUIRED TO BE DETERMINED BY STREAM WIDTH.

NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS.
2. SAND BAGS MUST BE FILLED WITH SAND FREE OF SILT, ORGANICS, AND OTHER MATERIAL.
3. ALIGN FLUME(S) TO PREVENT BANK EROSION AND STREAM SCOUR.
4. CONDUCT ALL IN-STREAM ACTIVITY (EXCEPT BLASTING OR OTHER ROCK BREAKING MEASURES) WITH THE FLUME(S) IN PLACE. FLUME PIPE(S) MAY NOT BE REMOVED FOR LOWERING IN OR INITIAL STREAMBED RESTORATION EFFORTS.
5. THE ENDS OF THE FLUME AND CULVERT MUST EXTEND TO AN UNDISTURBED AREA.

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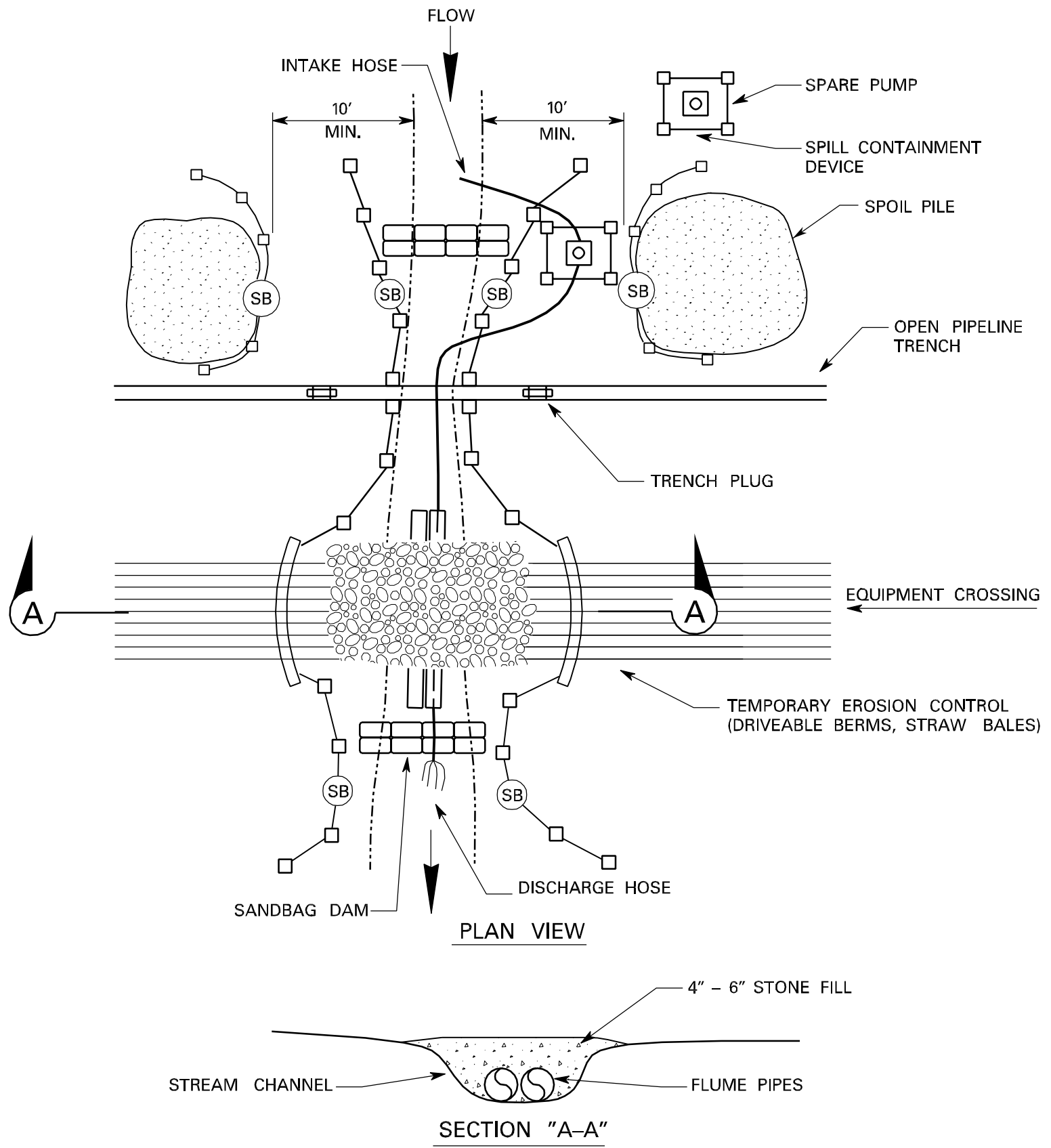
TYPICAL FLUMED CROSSING

FIGURE #30

DWG.

ES-0030

REV.



NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR OTHER APPROPRIATE MATERIALS
2. INSTALL AND SEAL SANDBAGS UPSTREAM AND DOWNSTREAM OF THE CROSSING.
3. CREATE AN UPSTREAM SUMP USING SANDBAGS IF NATURAL SUMP IS UNAVAILABLE FOR THE INTAKE HOSE.
4. EXCAVATE ACROSS STREAM CHANNEL FOLLOWING WATER REROUTING.
5. DO NOT REFUEL OR STORE FUEL WITHIN 100 FEET OF THE WATERBODY, WHERE FEASIBLE.
6. MONITOR PUMPS AT ALL TIMES DURING STREAM CROSSING PROCEDURE.
7. USE SUFFICIENT PUMPS, INCLUDING ONSITE BACKUP PUMPS, TO MAINTAIN DOWNSTREAM FLOW.
8. SCREEN PUMP INTAKES.
9. NUMBER OF FLUME PIPES FOR EQUIPMENT BRIDGE WILL VARY DEPENDING ON SITE CONDITIONS.

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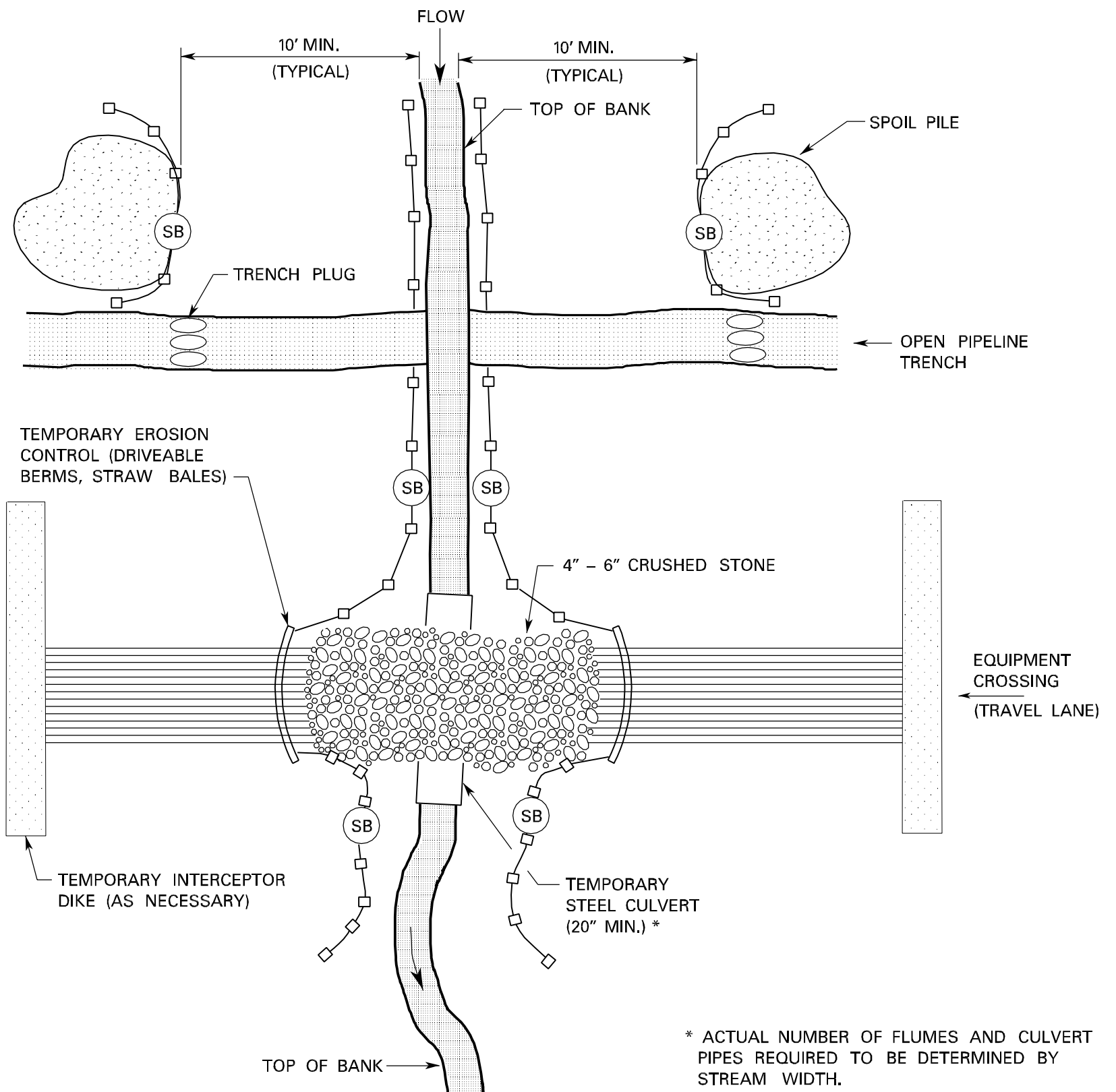
TYPICAL DAM AND PUMP CROSSING

FIGURE #31

DWG.

ES-0031

REV.



* ACTUAL NUMBER OF FLUMES AND CULVERT PIPES REQUIRED TO BE DETERMINED BY STREAM WIDTH.

NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR APPROPRIATE MATERIALS.
2. FOR MINOR WATERBODIES, COMPLETE TRENCHING AND BACKFILLING IN THE WATERBODY (NOT INCLUDING BLASTING OR OTHER ROCK BREAKING MEASURES) WITHIN 24 CONTINUOUS HOURS. IF A FLUME IS INSTALLED WITHIN THE WATERBODY DURING MAINLINE ACTIVITIES, IT CAN BE REMOVED JUST PRIOR TO LOWERING IN THE PIPELINE. THE 24-HOUR TIMEFRAME STARTS AS SOON AS THE FLUME IS REMOVED.
3. FOR INTERMEDIATE WATERBODIES, COMPLETE TRENCHING AND BACKFILLING IN THE WATERBODY (NOT INCLUDING BLASTING OR OTHER ROCK BREAKING MEASURES) WITHIN 48 CONTINUOUS HOURS, IF FEASIBLE.

TYPICAL WET CROSSING

FIGURE #32

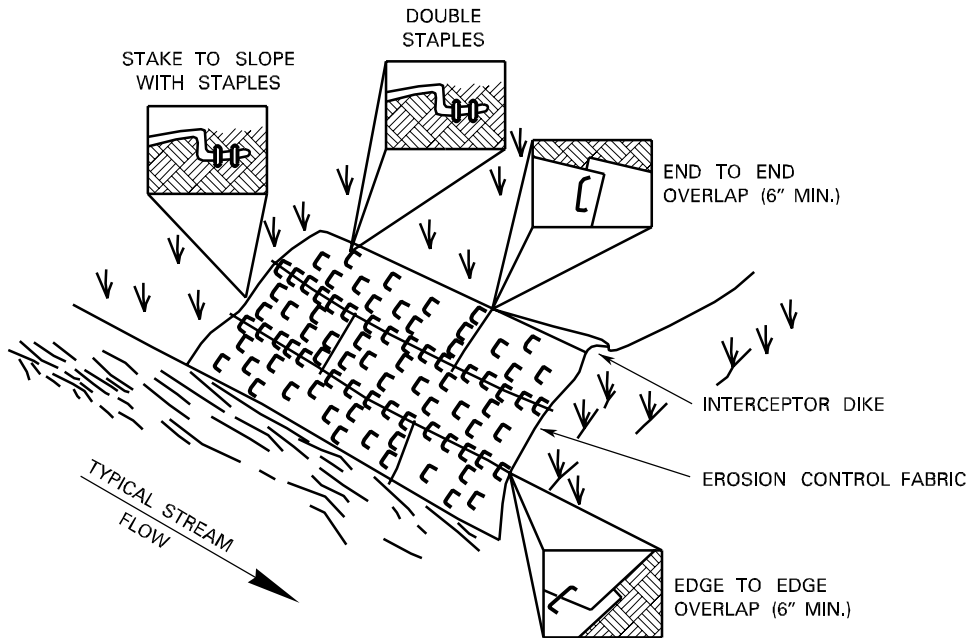
DWG.

ES-0032

REV.

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NOTES:

1. EROSION CONTROL MATTING SHALL BE PLACE ON THE BANKS OF FLOWING STREAMS WHERE VEGETATION HAS BEEN REMOVED OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. EROSION CONTROL MATTING SHALL MEET THE REQUIREMENTS SPECIFIED IN THE PLAN AND/OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
3. STAPLES SHALL BE MADE OF 11 GAUGE WIRE, U-SHAPED WITH 6" LEGS AND A 1" CROWN. STAPLES SHALL BE DRIVEN INTO THE GROUND FOR THE FULL LENGTH OF THE STAPLE LEGS. ALTERNATELY 1" WOODEN PEGS 6" LONG AND BEVELED TO SECURE MATTING.
4. MATTING SHALL BE INSTALLED ACCORDING TO MANUFACTURER SPECIFICATIONS OR AS STATED BELOW:
 - EXTEND TOP OF BLANKET 2 FEET PAST THE UPPER EDGE OF THE HIGH WATER MARK. IF AN INTERCEPTOR DIKE IS PRESENT ON THE APPROACH SLOPE, BEGIN THE BLANKET ON THE UPHILL SIDE OF THE INTERCEPTOR DIKE.
 - INSTALL BLANKET(S) ACROSS THE SLOPE IN THE DIRECTION OF THE WATER FLOW.
 - ANCHOR ("KEY") THE UPSTREAM EDGE OF THE BLANKET(S) INTO THE SLOPE USING A 6" DEEP TRENCH. DOUBLE STAPLE EVERY 12" BEFORE BACKFILLING AND COMPACTING TRENCH
 - ANCHOR (KEY") THE UPPER EDGE OF THE BLANKET INTO THE SLOPE USING A 6" DEEP TRENCH. DOUBLE STAPLE EVERY 12" BEFORE BACKFILLING AND COMPACTING TRENCH.
 - OVERLAP THE EDGES OF PARALLEL BLANKETS A MINIMUM OF 6". PLACE THE UPPER BLANKET OVER THE LOWER BLANKET (SHINGLE STYLE) AND STAPLE EVERY 12" ALONG THE LENGTH OF THE EDGE.
 - WHEN BLANKET ENDS ARE ADJOINED, PLACE THE UPSTREAM BLANKET OVER THE DOWNSTREAM BLANKET (SHINGLE STYLE) WITH APPROXIMATELY 6" OF OVERLAP AND STAPLE THROUGH THE OVERLAPPED AREA EVERY 12".
 - STAPLE DOWN THE CENTER OF THE BLANKET(S), THREE STAPLES IN EVERY SQUARE YARD.
5. IN LIVESTOCK AREAS WHERE EROSION CONTROL MATTING IS APPLIED TO THE STREAMBANKS, FENCING WILL BE USED IF NECESSARY TO EXCLUDE LIVESTOCK, WITH PERMISSION OF THE LANDOWNER.
6. MONITOR WASHOUTS, STAPLE INTEGRITY OR MAT MOVEMENT. REPLACE OR REPAIR AS NECESSARY.

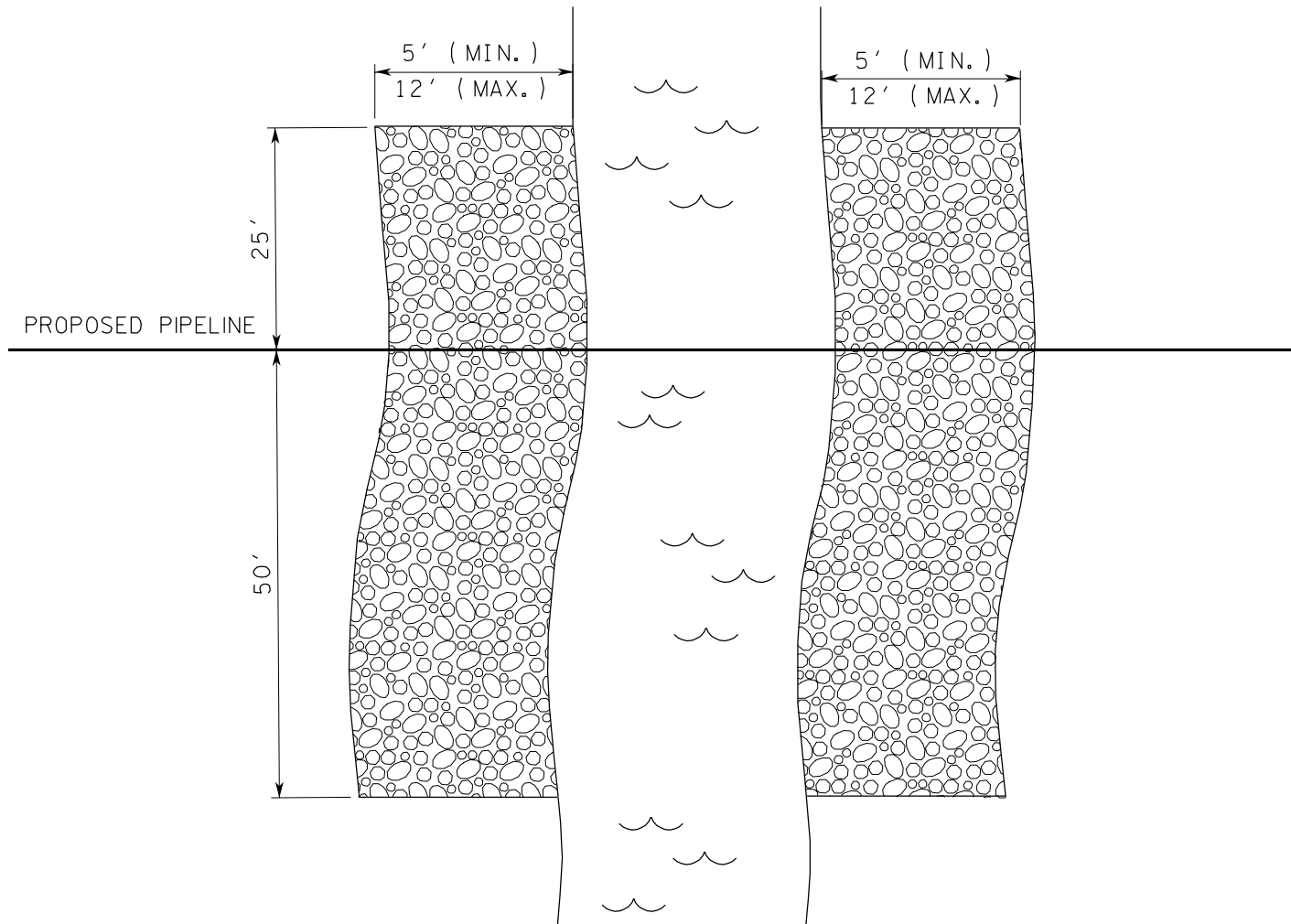
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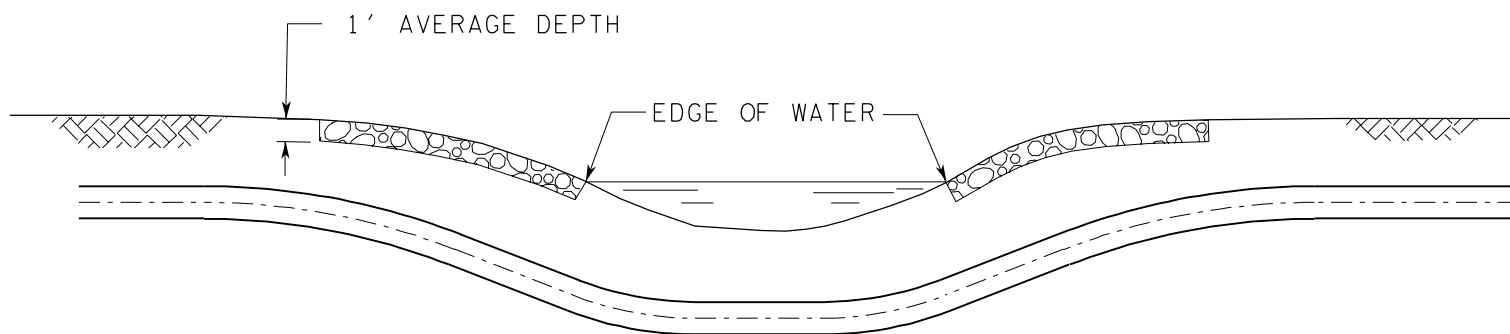
TYPICAL MATTING OF STREAMBANKS

FIGURE #33

DWG.	ES-0033	REV.
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PLAN



SECTION

NOTES:

1. RIP-RAP IS LESS THAN 500 FEET IN LENGTH.
2. RIP-RAP WILL NOT EXCEED AN AVERAGE OF ONE CUBIC YARD PER RUNNING FOOT.
3. RIP-RAP INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE PERMITS.

**RIP-RAP PLACEMENT
(TYPICAL)**

FIGURE #34

DWG.

ES-0034

REV.

jw/hgr/ley
01/23/2003

I.G. ese0034.dgn

APPENDIX B

SEED MIX RECOMMENDATIONS

SEED MIX RECOMMENDATIONS

“NORTHERN ZONE”¹

UPLAND AREAS

Lime	4.0 tons/acre
Fertilizer	1000 lbs./acre (10-20-20)
Mulch (Wheat Straw)	3.0 tons/acre
1. <u>Upland Seed Mix</u>	<u>75 lbs./acre Pure Live Seed (PLS)</u>
Kentucky Bluegrass	20%
Red Fescue ²	20%
Kentucky 31 Tall Fescue ²	15%
Redtop	10%
Perennial ryegrass	20%
White clover	5%
Birdsfoot Trefoil (Minimum 20% hard seed)	10%
2. <u>Pasture Mix</u>	<u>20 lbs./acre PLS</u>
<i>(For use only in disturbed managed pasture areas with landowner's permission.)</i>	
Kentucky Bluegrass	31%
Medium Red clover	26%
Norcen Trefoil	17%
Poly Perennial Rye	26%
3. <u>Recommended Seeding Dates:</u>	
<i>(For the establishment of temporary or permanent vegetation.)</i>	
Spring:	March 15 - May 30
Fall:	August 1 - October 15

WINTER STABILIZATION

If restoration can not occur prior to October 15, seed the ROW with 1.5 bushels per acre of winter rye or similar variety of rye as requested by the landowner. Mulch ROW at 3.0 tons per acre with wheat straw, including areas adjacent to streams and wetland crossings. Seed segregated topsoil piles with winter rye and mulch at a rate of 3.0 tons per acre.

WETLAND AREAS

DO NOT USE LIME OR FERTILIZER !!!

Mulch (Wheat Straw)	3.0 tons/acre
1. <u>Wetland Seed Mix</u>	
Annual Ryegrass	40 lbs./acre PLS

¹The Northern Zone is generally defined as extending north from the Northern borders of Arkansas and Tennessee.

²Fescue must be endophyte-free.

SEED MIX RECOMMENDATIONS

“SOUTHERN ZONE”¹

UPLAND AREAS

Lime (agricultural limestone)	2.5 tons/acre
Fertilizer (6-12-12)	950 lbs./acre
Mulch (Oats, Wheat or Bermudagrass Straw)	3.0 tons/acre

1. **Seed Mixture**²

Sorghum, Sudangrass, or Sudangrass Hybrids ³	40 lbs/acre Pure Live Seed (PLS)
Kentucky 31 Tall Fescue ⁴	10 lbs/acre PLS
Big Bluestem	10 lbs/acre PLS
Indiangrass	10 lbs/acre PLS
Bermudagrass	10 lbs/acre PLS
Sericea Lespedeza ⁵	10 lbs/acre PLS
White Clover ⁵	5 lbs/acre PLS
Birdsfoot Trefoil ⁵	10 lbs/acre PLS

2. **Recommended seeding dates:**

(For establishment of temporary or permanent vegetation.)

Spring:	March 15 - May 30
Fall:	August 1 - October 15

WINTER STABILIZATION

If restoration cannot occur prior to October 15, seed the ROW with 1.5 bushels per acre of winter rye or similar variety of rye as requested by the landowner. Mulch ROW at 3.0 tons per acre with wheat straw, including areas adjacent to stream and wetland crossings. Seed segregated topsoil piles with winter rye and mulch at a rate of 3.0 tons per acre.

WETLAND AREAS

DO NOT USE LIME OR FERTILIZER !!!

Mulch (Oats, Wheat, or Bermudagrass Straw)	3.0 tons/acre
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1. **Wetland Seed Mix:**

Annual Ryegrass	40 lbs/acre PLS
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¹The Southern Zone is generally defined as extending south from the Northern borders of Arkansas and Tennessee.

²An alternative seed mixture may be requested by the landowner(s).

³These species may be sold under the following trade names: DeKalb SX17, Greentreat II, Greentreat III, Tastemaker DR, Tastemaker III, FFR202, or Sordan 79.

⁴Fescue must be endophyte-free.

⁵Legumes should be treated with a species specific inoculate prior to seeding. Legume seed and soil should be scarified.