

INSTALLATION REQUIREMENTS:

- PERMANENT WATERBARS ARE REQUIRED AT ALL STREAM, RIVER AND OTHER WATERBODY CROSSINGS AS WELL AS UPSLOPE FROM ROADWAY AND RAILROAD CUT SLOPES
- INSTALL PERMANENT WATERBARS IN ALL AREAS EXCEPT RESIDENTIAL OR AGRICULTURAL AS NECESSARY TO AVOID EXCESSIVE EROSION
- ON SLOPES GREATER THAN 30 PERCENT, INSTALL WATERBARS WITH EROSION CONTROL BLANKET ON THE SWALE SIDE
- FILTER RUN-OFF WATER BY CONSTRUCTING THE DISCHARGE END IN A WELL VEGETATED STABLE AREA
- WATERBARS SHOULD BE FIELD ADJUSTED TO MAXIMIZE RUNOFF DISCHARGES TO NATURAL DRAINAGE COURSES

| MAXIMUM SPACING FOR WATERBARS | |
|-------------------------------|---------------|
| SLOPE (%) | SPACING (FT.) |
| <5 | 250 |
| 5 - 15 | 150 |
| >15 - 30 | 100 |
| >30 | 50 |

- INSTALL A PROTECTIVE LINER, WHEREVER ERODIBLE SOILS ARE PRESENT, OR WHERE THERE IS NOT SUFFICIENT VEGETATIVE GROWTH
- INSTALL WITH A 2% (TYP) OUTFALL ANGLE
- POSITION OUTFALL TO PREVENT SEDIMENT DISCHARGE INTO WETLANDS, WATERBODIES, OR OTHER SENSITIVE RESOURCES

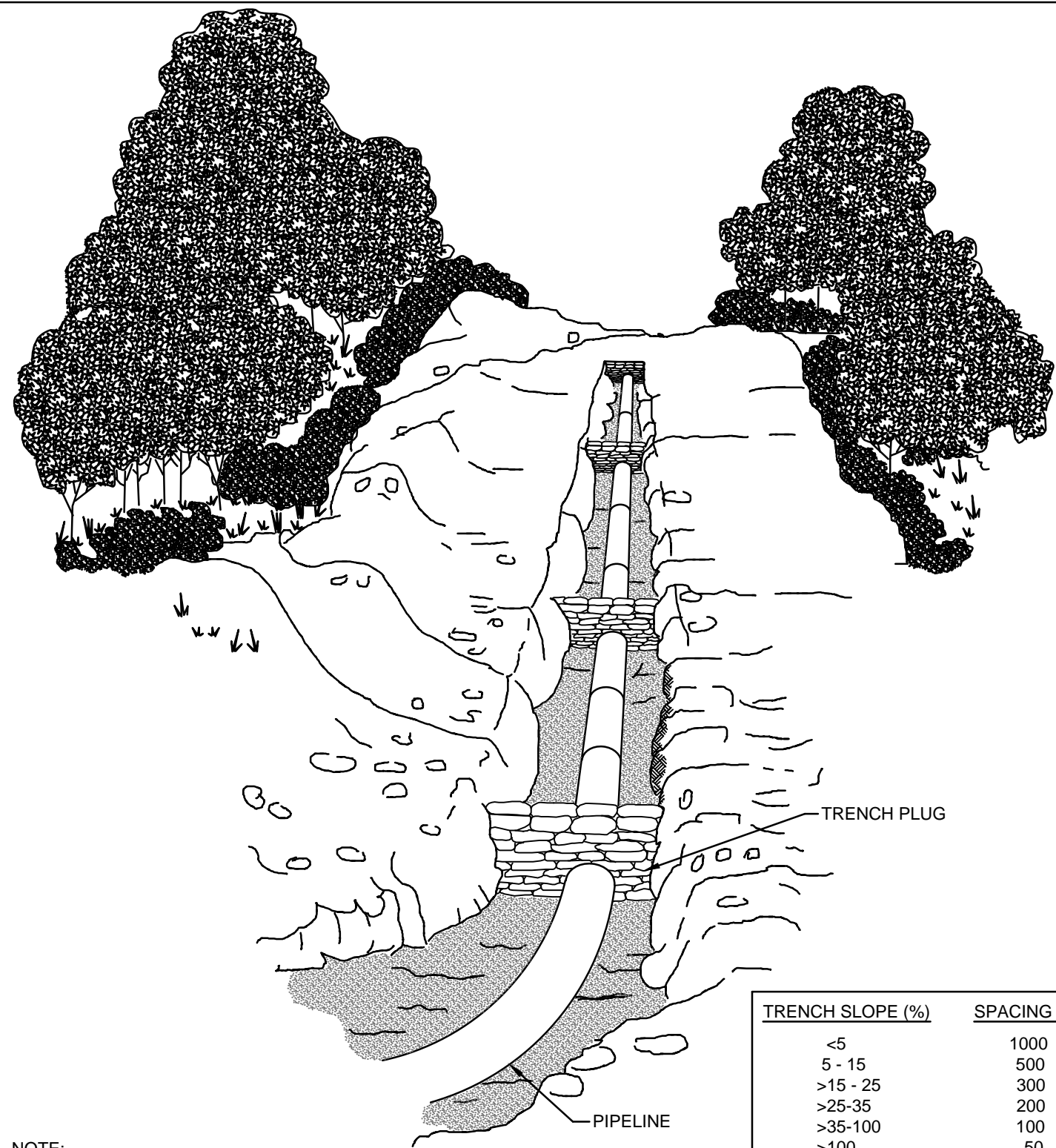
MAINTENANCE REQUIREMENTS:

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



PENNEAST PIPELINE PROJECT WATERBAR INSTALLATION AND MAINTENANCE

FIGURE 9



NOTE:

PLUG MATERIAL SHALL CONSIST OF CLAY, BENTONITE, SYNTHETIC FOAM, OR CONCRETE FILLED SACKS, EXCEPT WHERE TRENCH SLOPE IS GREATER THAN 100%, CEMENT FILLED BAGS SHALL BE USED.

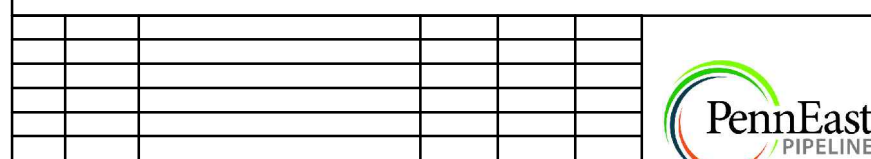
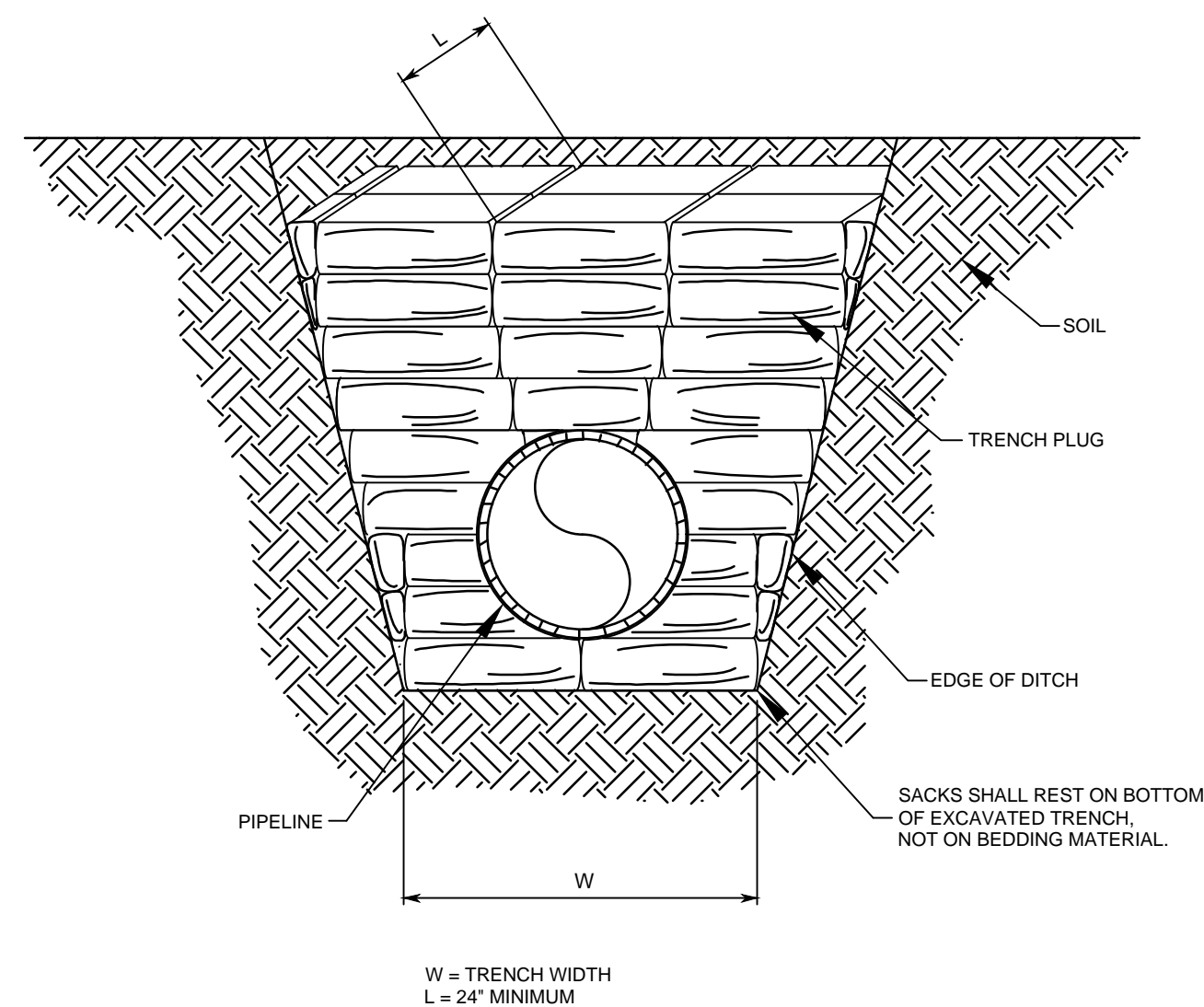
TOPSOIL SHALL NOT BE USED TO FILL SACKS.

PERMANENT IMPERVIOUS TRENCH PLUGS ARE REQUIRED FOR ALL WATERBODY AND WETLAND CROSSINGS, AS WELL AS UP SLOPE FROM ROADWAY AND RAILROAD CUT SLOPES.



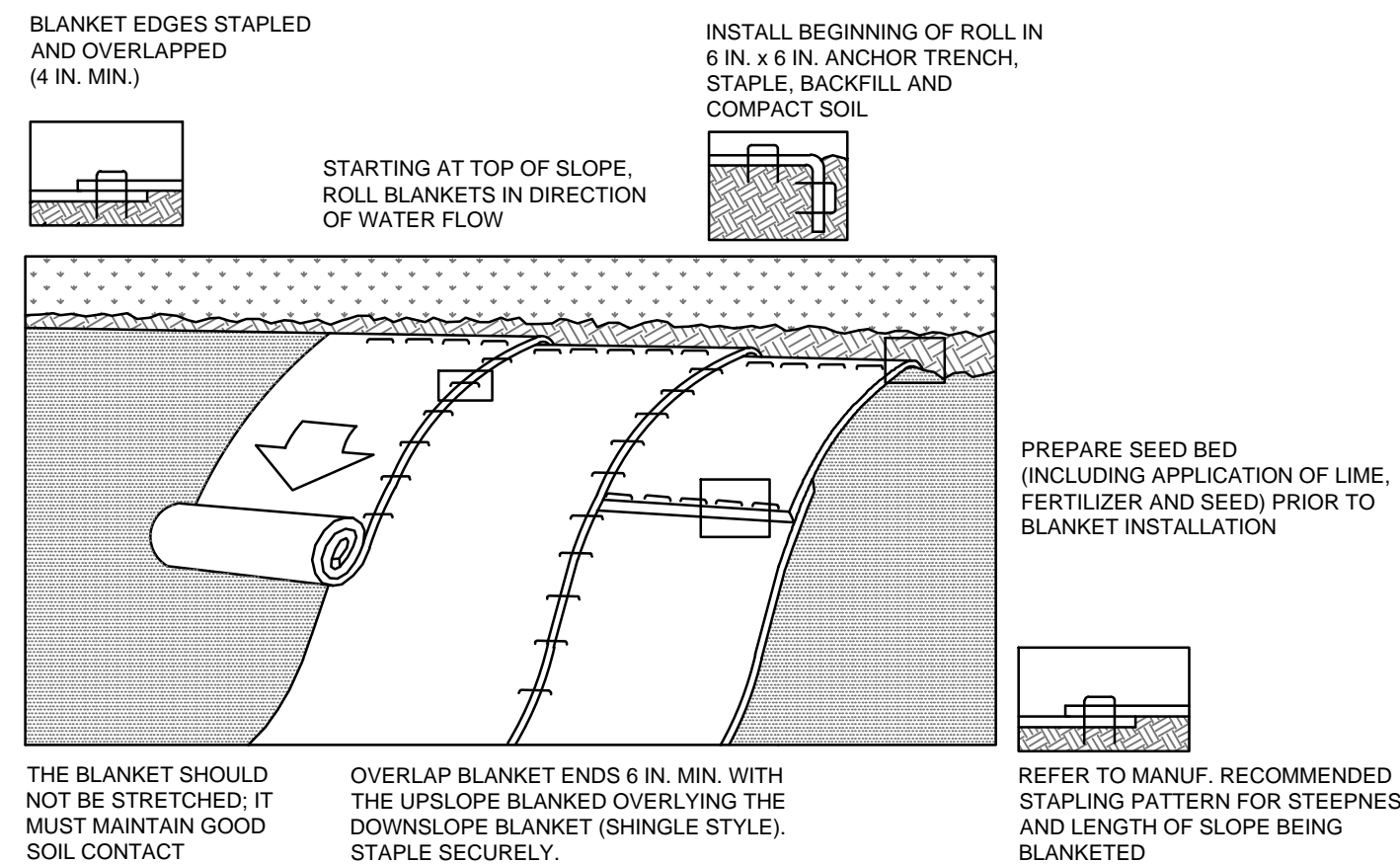
PENNEAST PIPELINE PROJECT PERMANENT TRENCH PLUGS FOLLOWING PIPELINE INSTALLATION

FIGURE 12



PENNEAST PIPELINE PROJECT TRENCH PLUG DETAIL

FIGURE 13



NOTES:

INSTALL EROSION CONTROL BLANKET ON ALL SLOPES 3H:1V OR STEEPER, WITHIN 50 FEET OF SURFACE WATERS, AND WITHIN 100 FEET OF SPECIAL PROTECTION WATERS.

SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.

PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.

SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.

BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.

THE BLANKET SHALL BE STAPLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

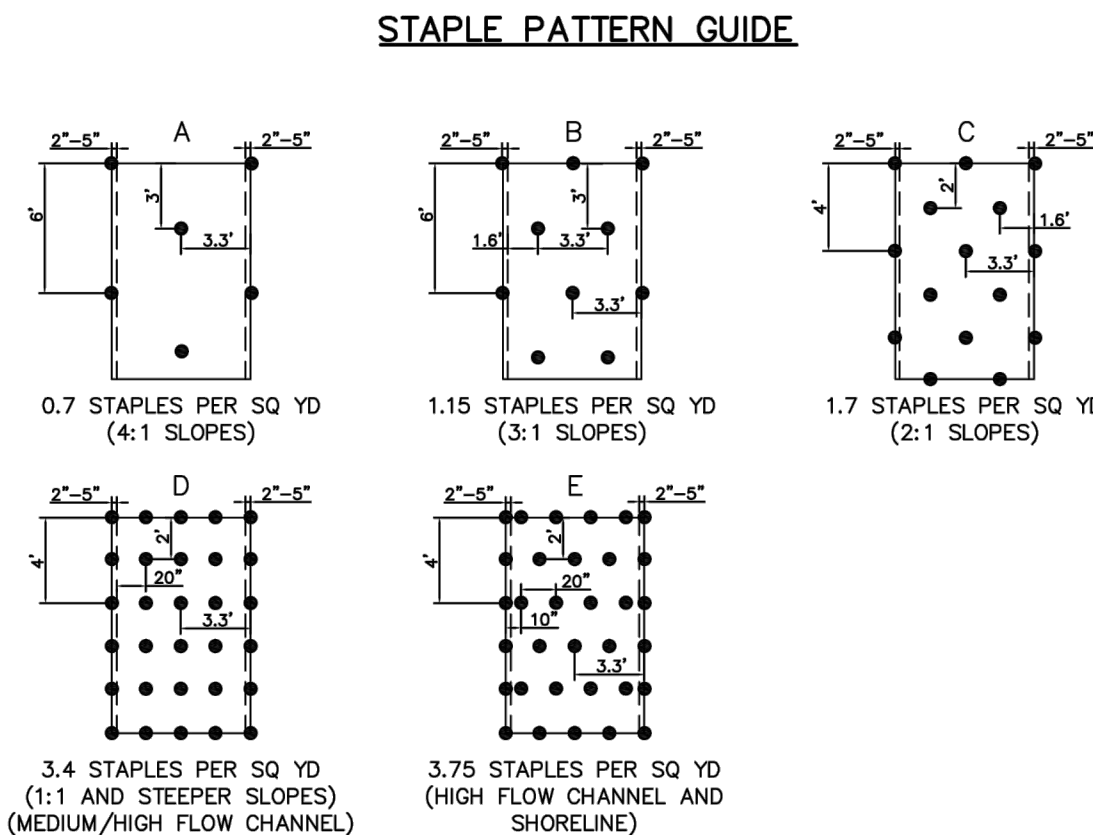
BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.

AGRICULTURAL LAND NOTE:
EROSION CONTROL BLANKET IS A TRIPPING HAZARD WHEN USED IN HOOVED ANIMAL PASTURES AND IS NOT COMPATIBLE WITH MOST CROP LAND MANAGEMENT. IN SUCH CASES, HAY, STRAW, OR HYDRAULICALLY-APPLIED MULCH SHOULD BE APPLIED UNLESS THE LAND IS PLOWED AND REPLANTED FOR CROP GROWTH WITHIN 4 DAYS. MULCH IN ANIMAL PASTURES SHOULD BE LIMITED TO HAY OR STRAW.



PENNEAST PIPELINE PROJECT EROSION CONTROL BLANKET INSTALLATION STANDARD CONSTRUCTION DETAIL #11-1

FIGURE 14A



NOTES:

- FOR SLOPES BETWEEN 3:1 AND 1:1, USE NORTH AMERICAN GREEN ERONET SC 150 OR OWNER APPROVED EQUAL MATERIAL/METHOD.
- IN AREAS WHERE LIVESTOCK ARE KEPT, USE NORTH AMERICAN GREEN BIONET SC 150 BN OR OWNER APPROVED EQUAL MATERIAL/METHOD.
- SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
- PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE
- SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
- BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE PROJECT LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
- THE BLANKET SHALL BE STAPLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS,
- BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.



PENNEAST PIPELINE PROJECT EROSION CONTROL BLANKET STAPLE PATTERN GUIDE

FIGURE 14B

HYDRAULICALLY APPLIED BLANKETS

Hydraulically applied blankets should not be used in areas of concentrated flow (e.g. channels).

A **Bonded Fiber Matrix (BFM)** can be an effective method of stabilizing steep slopes when used properly. BFMs make use of a cross-linked hydrocolloid tackifier to bond thermally processed wood fibers. Application rates vary according to site conditions. For slopes up to 3H:1V the BFM should be applied at a rate of 3,000 lb/acre. Steeper slopes may need as much as 4,000 lb/acre. In any case, manufa

BFMs should only be used when no rain is forecast for at least 48 hours following the application. This is to allow the tackifier sufficient time to cure properly. Once properly applied, a BFM is typically 90% effective in preventing accelerated erosion. **Bonded Fiber Matrix should not be applied between September 30 and April 1.**

Other fiber matrices that have been shown to be effective in preventing erosion on disturbed surfaces may be used in accordance with manufacturer's recommendations if sufficient supporting documentation is provided.

A **Flexible Growth Medium (FGM)** has the added component of 1/4 inch long, crimped organic or manmade fibers which add a mechanical bond to the chemical bond provided by BFMs. This increases the blanket's resistance to both raindrop impact and erosion due to runoff. Unlike BFMs, a flexible growth medium typically does not require a curing time to be effective. Properly applied, an FGM may be as much as 99% effective.

A **Polymer Stabilized Fiber Matrix (PSFM)** can also be an effective method of stabilizing steep slopes when used properly. PSFMs make use of a linear soil stabilizing tackifier that works directly on soil to maintain soil structure, maintain pore space capacity and flocculate dislodged sediment that will significantly reduce runoff turbidity. Properly applied, a PSFM may be as much as 99% effective.

PSFMs can be used in re-vegetation applications and for site winterization and/or dormant seeding — fall planting for spring germination — applications. Application rates vary according to site conditions and the following application rates are suggested. In any case, manufacturer's recommendations should be followed. The following are typical application rates:

| TABLE 11.7 Typical Polymer Stabilized Fiber Matrix Application Rates | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|
| Maximum Rainfall of ≤ 20" | | | | | | | |
| SLOPE | 6:1 | 5:1 | 4:1 | 3:1 | 2:1 | 1.5:1 | 1:1 |
| Soil Stabilizer (gals/acre) | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Fiber (lb/acre) | 1,500 | 1,500 | 1,500 | 1,800 | 2,000 | 2,500 | 3,000 |

| Maximum Rainfall of > 20" and for Site Winterization | | | |
|---|-------|-------|-------|
| SLOPE | ≤5:1 | 4:1 | ≥3:1 |
| Soil Stabilizer (gals/acre) | 6 | 8 | 10 |
| Fiber (lb/acre) | 2,000 | 2,500 | 3,000 |

Unlike rolled blankets, there is no need to smooth the slope prior to application of hydraulically applied blankets. In fact some roughening of the surface, either natural or mechanically induced, is preferable. However, large rocks, those ≥ 9 inches, and existing rills should be removed prior to application. Tracking or grooving of slopes should be considered to slow water flows during a storm event. Slope interruption devices such as stair step grading or benching should be applied prior to the application. Mixing and application rates should follow manufacturer's recommendations.

Hydraulically applied blankets are typically applied in two stages. Unless specifically recommended to be applied first, if the seed is applied at the same time as the hydraulically applied blanket, the bonded fibers may keep the seed from making sufficient contact with the soil to germinate. After the seed mixture is applied, the BFM, FGM, or PSFM should be sprayed over the area at the required application rate.



PENNEAST PIPELINE PROJECT HYDRAULICALLY APPLIED BLANKETS

FIGURE 15



CLIENT APPROVAL

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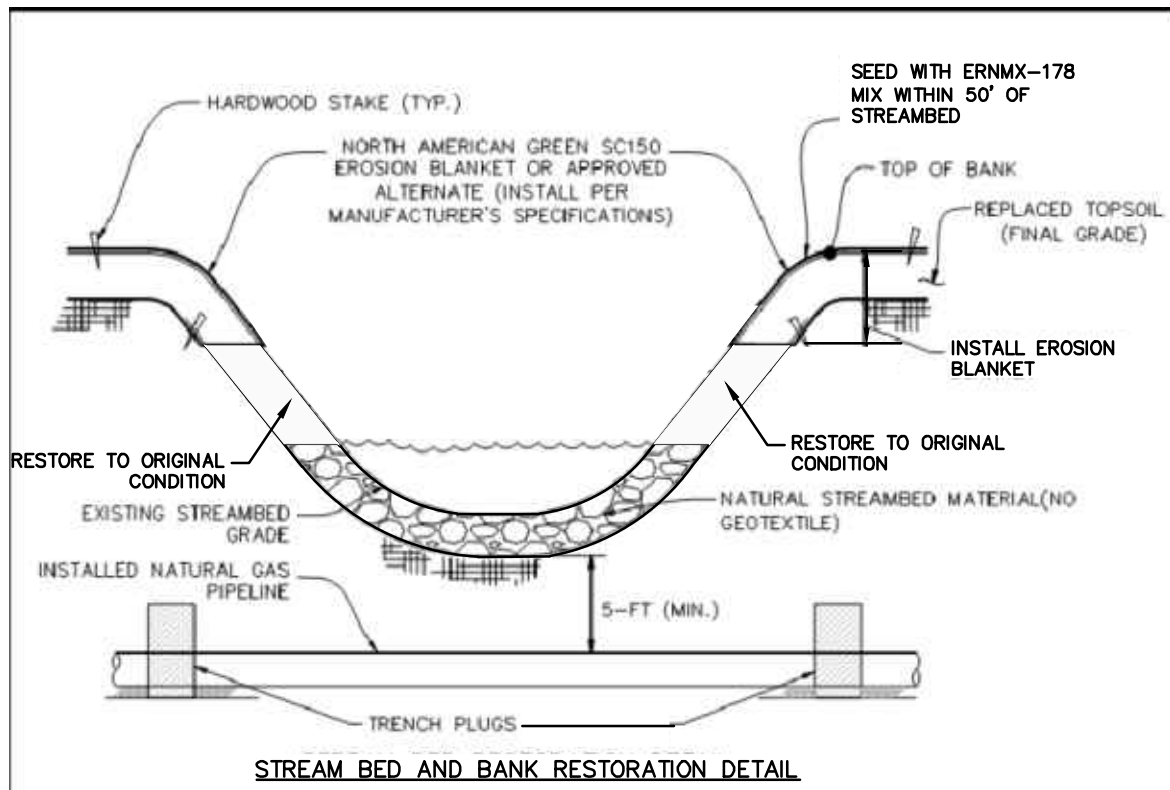
| REVISIONS | | | | | APPROVALS | |
|-----------|-------------------|---------|----------|----------|-----------|---------------|
| NO. | DESCRIPTION | DATE | DRAWN | CK | APPR | DATE |
| A | ISSUED FOR PADEP | 10/2018 | AJD (MM) | MWF (MM) | MJD (MM) | AJD (MM) |
| B | REVISED FOR PADEP | 10/2019 | AJD (MM) | MWF (MM) | MJD (MM) | CHECKED BY |
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PENNEAST PIPELINE PROJECT

SITE RESTORATION PLAN TYPICAL E&S DETAILS

| SCALE | DRAWING NO. | REVISION |
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| AS SHOWN | 000-03-09-001 | B |



- NOTES:
1. REMOVE EXISTING STREAMBED MATERIAL AND STOCKPILE SEPARATELY.
 2. ONCE PIPELINE IS INSTALLED, REPLACE SUBSTRATE BACK IN STREAMBED AND RESTORE TO EXISTING CONDITION.
 3. SEE RECOMMENDED SEED MIXTURES TABLES FOR SEED MIXES.
 4. ON STREAMBANKS WITH SLOPES 2:1 OR LESS, EROSION CONTROL BLANKET NAG SC150 OR APPROVED EQUAL SHALL BE USED. FOR ALL OTHER SLOPES, EROSION CONTROL BLANKET NAG C125 OR APPROVED EQUAL SHALL BE UTILIZED.
 5. THE USE OF EROSION CONTROL BLANKET IS NOT ALLOWED ON STATE GAME LANDS. HYDRAULICALLY APPLIED SLOPE STABILIZATION MUST BE USED.
 6. REFER TO TRENCH PLUG INSTALLATION DETAIL (TP) FOR MORE INFORMATION.



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| PENNEAST PIPELINE PROJECT | |
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| STREAM BED AND BANK STABILIZATION WITH REINFORCEMENT BLANKET | |
| FIGURE 21 | |

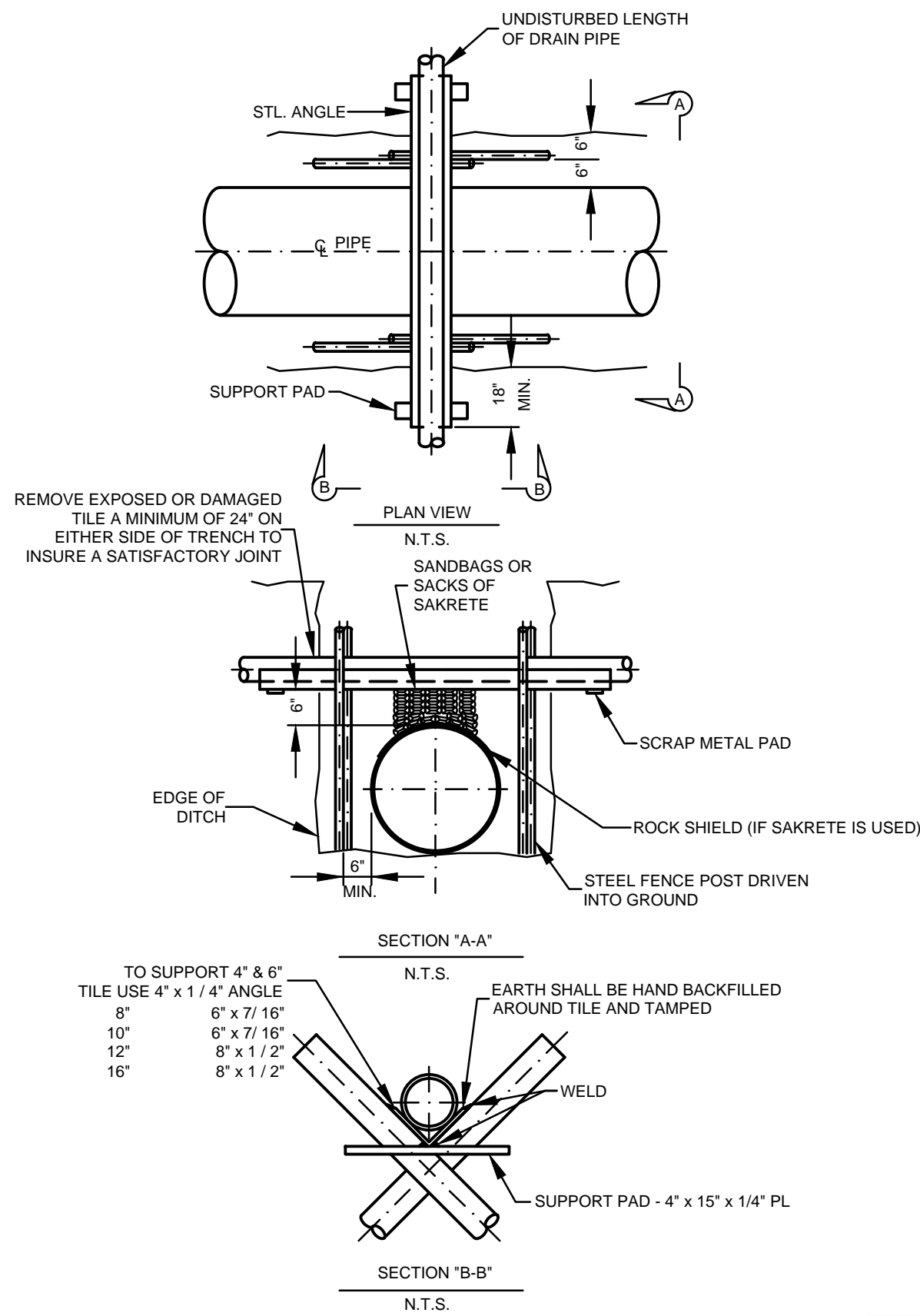
- Cleanup and Restoration**
1. Revegetate the ROW with annual ryegrass at 45 lbs / acre Pure Live Seed or with the recommended wetland seed mix, unless standing water is present.
 2. Do not use lime or fertilizer in wetland areas.
 3. Mulch the disturbed ROW. No mulch may be applied in wetlands.
 4. In the event that final seeding and mulching 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 equipment mats upon completion of construction.
 6. Develop specific procedures in coordination with the appropriate land management or state agency, where necessary, to prevent the invasion or spread of undesirable exotic vegetation (such as purple loose strife and phragmites). Additionally, install matting at exceptional value wetland crossing.
 7. Ensure that all disturbed areas permanently revegetate.
 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.



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| PENNEAST PIPELINE PROJECT | |
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| WETLAND PIPELINE CONSTRUCTION REQUIREMENTS | |
| FIGURE 26B | |



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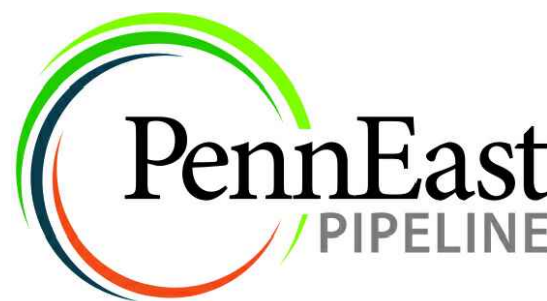
| PENNEAST PIPELINE PROJECT | |
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| DRAIN TILE REPAIR PROCEDURE | |
| FIGURE 32 | |



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| CLIENT APPROVAL |
| DATE |

| REVISIONS | | | | | APPROVALS | |
|-----------|-------------------|---------|----------|----------|-----------|---------------------|
| NO. | DESCRIPTION | DATE | DRAWN | CK | APPR | |
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| B | REVISED FOR PADEP | 10/2019 | AJD (MM) | MWF (MM) | MJD(MM) | CHECKED BY DATE |
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| | | | | | | P.M. APPROVAL DATE |

PREPARED FOR



PENNEAST PIPELINE PROJECT

SITE RESTORATION PLAN
TYPICAL E&S DETAILS

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