**SECTION 25**

**SEDIMENT CONTROL**

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**LIST OF REVISIONS DURING PERMIT TERM**

| REV. NUMBER | REVISION DESCRIPTION | DATE APPROVED |
|---|---|---|

**SECTION 25 SEDIMENT CONTROL PLAN**

The primary control measure applied to comply with the applicable effluent standards will be retaining the effluent or surface runoff from the disturbed areas in sedimentation ponds for evaporation. The evaporation rate of this area is high, at 55 in as discussed in Section 12 Climate, and would be the primary method of treatment to comply with the effluent limitations. Sedimentation ponds are designed to retain the surface runoff and sediment from either the 100yr-6hr or 10yr-24hr storm event. In many areas NTEC will utilize ponds as BMP structures to contain precipitation events up to 100yr-6hr event.

## 25.1 Mining and Reclamation Practices and Methods to Control Erosion and Sediment

The sediment control methods described in Section 25.4 are applied to the mining and reclamation operations to prevent to the extent possible additional contribution of sediment to stream flow and to comply with applicable regulations. Refer to Section 18 Water resources for the applicable water quality standards and regulations. The control of sediment and erosion from regraded spoils and reclaimed surfaces is discussed in Section 38 Post-Reclamation Surface Stabilization and Sediment Control. Below is the description of the practices and methods applied to the affected areas to control drainage, erosion, and sediment.

### *25.1.1 Areas Subject to Effluent Limitations*

#### 25.1.1.1 Active Mining and Reclamation Areas

The active mining and reclamation areas consist of the following operational activities or areas: topdressing removal; overburden drilling, storage, and stripping; spoil rows or piles; pits; regraded spoils; and primary/final regrading of the last spoil row. Berms are utilized to convey surface flows from the active mining and reclamation areas to a ramp or the mining pit, a depression in ungraded spoils, a depression or dugout sump along the berm, or a sediment pond. The retained water can be evaporated, used to suppress dust on haulroads. In many areas, NTEC will utilize ponds as BMP structures to contain precipitation events up to 100yr-6hr event.

Mining will progress from west to east, with the pit oriented north and south. The mining strips will begin on the western side of the permit area where the topography slopes away from the pit or highwall. The surface runoff and sediment from the disturbed areas will be retained in sediment ponds constructed downstream of the disturbance area or highwall. A diversion berm will be constructed along the edge of topdressing removal disturbance to convey flows to topographic lows or existing drainages. At the low points or existing drainages, the berm will be left open to allow flows to continue to the sediment ponds downstream. Typical layout of the diversion berm is presented on Exhibit 25.4-1. The sediment ponds are presented in the drainage control plan (Section 26) on Exhibit 26.1-1.

As part of reclamation, NTEC will remove temporary post-reclamation structures as described in its reclamation plans detailed in Section 35 Hydrologic Reclamation Plan and Section 38 Post-Reclamation Surface Stabilization and Sediment Control. After erosion control measures sufficient to minimizing the erosion rate to less than or equal to pre-mine levels have been installed, the reclamation areas will be reconnected to the fluvial geomorphic-appropriate drainages that surround the mine permit area. If the surface runoff from an active mining area has a potential to leave the permit area or enter a reclaimed area downstream, a sediment pond will be constructed to retain the surface runoff and sediment. The pond will be located in either an existing drainage adjacent to the disturbed area or a reestablished drainage in the reclamation area. As reclamation progresses, watershed sizes can increase and it may be necessary to place additional ponds in series to retain the runoff until the area can be completely reclaimed. Berms can be used to prevent sediment and flows from leaving the disturbed area and to convey flows to sedimentation ponds.

The sequence in which reclamation area sediment controls are put into place is important to the functioning of the controls. The sequence is as follows:

1. Berms, ditches, and other drainage control structures are constructed to prevent surface runoff from the spoils from entering reclaimed areas, undisturbed lands, or leaving the permit area.
2. Spoils are regraded to the approximate original contours (AOC) topography with dozers and motor graders (see Section 34 Post-Reclamation Topography for a complete description of the backfilling and grading operation). During this phase additional berms and ditches can be constructed as required.
3. Topdressing is placed and spread onto the regraded spoils.
4. Berms and ditches that are no longer needed are removed.
5. The seedbed is prepared and the area is seeded.
6. Mulch is applied to the seeded area and crimped, and the remaining steps of the revegetation plan are carried out to establish a diverse, effective vegetation cover Section 37 Post-Reclamation Vegetation.

As mining progresses, disturbed areas are reclaimed as described above. To prevent possible degradation of the downstream reclaimed or topdressed and seeded areas, berms and ditches will remain in place as long as practically possible during topdressing placement. Generally, berms are removed by blending the material into the adjacent regraded spoils. In the process of removing the berms, positive drainage must be maintained in the drainage ways and on sloping surfaces. To achieve this there must be sufficient area or distance adjacent to the berm to spread and blend in the material. Therefore, as topdressing placement approaches onto a berm, the berm must be removed while there is still sufficient distance remaining to spread and blend in the material.

If a large storm event occurs, excess water accumulated in the pit will be pumped to one or more sediment ponds. The design volume of the ponds will be maintained; the pumping will be only to ponds with sufficient capacity without jeopardizing the design volume.

25.1.1.2 Topdressing Stockpile Areas

Topdressing material will be removed in the advance of mining and from the disturbed areas associated with the construction of mine support facilities. The topdressing will either be placed in stockpiles or direct hauled and spread onto available regraded areas.

Topdressing stockpiles are managed in a manner to minimize wind and water erosion, and to avoid sources of contamination. A perimeter berm and/or surface water-control structure will be constructed around the stockpiles to minimize loss and contamination from water erosion. To minimize loss from water and wind erosion, stockpile surfaces will be stabilized by mulching and seeding. Topdressing stockpiles that will remain undisturbed for longer than six months will be mulched and those that will be undisturbed for one year or longer will be seeded and mulched during the next appropriate seeding period. After a stockpile is depleted, and if appropriate, the stockpile area will be left with adequate topdressing so that it can also be reclaimed. All stockpiles are clearly marked so that other mining activities do not inadvertently disturb or contaminate them. The berms and ditches are inspected on a routine basis and repaired as needed. Refer to Section 22 Support Facilities for more information on topdressing stockpiles.

The typical berm and ditch shown on Figure 22.9-1 will be used on stockpiles that have other surface drainage controls downstream, such as sediment ponds, impoundments, or the mining pit. They will not be used on the stockpiles where there would be potential for a discharge to occur onto an undisturbed area, reclaimed area, or off the permit area. If such is the case, a site-specific design certified by a professional engineer will be submitted for approval.

*25.1.2 Areas Subject to Storm-water Permit Requirements*

The affected areas subject to storm-water permit requirements as stated in the MSGP Sector H for coal mines and coal mining-related facilities are areas and activities such as primary roads, ancillary roads, and temporary diversions (including material and topdressing stockpiles associated with the diversions). The methods applied to control drainage, erosion, and sediment from disturbed areas associated with primary and ancillary roads are discussed in Section 23 Roads. Two temporary diversions, the Pinabete Diversion and the East Diversion, will be constructed to facilitate mining in the permit area. The drainage and sediment control plans for the diversions are presented in Appendix 26.A.

*25.1.3 Minimizing the Disturbed Area*

Mine support facilities and infrastructure will be constructed per approved design plans. To minimize surface disturbance, excavation and placement of fill material will be limited to the catch lines and grades indicated on the approved plans.

In advance of mining, the maximum extent of allowable disturbance for topdressing removal will be 1,800 ft beyond the highwall. For a more detailed description of topdressing removal refer to Section 36 Post-Reclamation Soil. Information regarding the mining sequence and area mined by years is presented in Section 20 Mining Operations.

In the reclamation areas, backfilling and regrading to the final surface configuration (FSC) or AOC surface will be done contemporaneously to the extent practicable. For more details about the backfill and grading plan refer to Section 34 Post-Reclamation Topography.

*25.1.4 Diverting Runoff from Undisturbed Lands*

The Pinabete Diversion and East Diversion will divert flows away from the permit mining area. Pinabete Arroyo will be diverted into No Name Arroyo to facilitate the mining in the permit area. The tributary flows to Pinabete Arroyo crossing the eastern lease boundary will also be diverted to No Name Arroyo. The East Diversion will collect the flows along the eastern lease boundary and convey them to the Pinabete Diversion. Refer to Appendix 26.A for description and design of the diversions.

The grading or drainage plans for the mine support facilities minimize, to the extent practicable, the co-mingling of flows from undisturbed and disturbed areas. If the topography is favorable, the flows from the undisturbed areas are diverted either around or away from the area to be disturbed using berms, ditches, or channels.

Flows from undisturbed areas into a disturbed area will generally occur when the surface of an undisturbed area slopes toward an active reclamation or mining area. On the reclamation side, the flows from the undisturbed area and disturbed area (i.e., ungraded spoils, regraded spoils, and reclaimed areas) will co-mingle. Berms or ditches will be utilized to convey the flows to a depression in ungraded spoils, a ramp or the mining pit, or a sediment pond. On the highwall side or in the immediate mining area (IMA) (i.e., area of topsoil removal, truck/loader operation, blasting, and mining operations), the flows are usually retained in the mining pit, up against a safety berm at the crest of the highwall, or impounded. If the watershed of the undisturbed area is small, the flows can enter the pit or be retained against the safety berm at the crest of the highwall. However, if the watershed upstream of the IMA is large, it may be necessary to construct highwall impoundments to minimize inflows into the pit and IMA. The impoundments will be located upstream of the IMA on the highwall side of the pit. The primary intent is to retain all or a portion of the

smaller intensity but more frequently occurring precipitation events, thereby enhancing the safety of the work areas in the IMA. Refer to Section 26 Drainage Control Plan for more information on highwall impoundments.

*25.1.5 Stabilizing Exposed Surfaces and Backfilled Areas*

To minimize loss from water and wind erosion, topdressing stockpile surfaces will be stabilized by mulching and seeding. Topdressing stockpiles that will remain undisturbed for longer than six months will be mulched and hose that will be undisturbed for one year or longer will be seeded and mulched during the next appropriate seeding period, using the procedures outlined in Section 37 Post-Reclamation Vegetation.

The backfilling and grading of spoil material to FSC topography will be done using fluvial geomorphic principles. This method of regrading will effectively stabilize graded spoil material and reclaimed surfaces to minimize erosion. Refer to Section 38 Post-Reclamation Surface Stabilization and Sediment Control for detailed discussion on using fluvial geomorphic principles to stabilize and control erosion from regraded spoils and reclaimed surfaces. The sequencing, timing, and schedule to regrade spoil material to FSC topography are provided in the backfill and grading plan provided in Section 34 Post-Reclamation Topography. The permanent vegetation to be established on reclaimed lands is discussed in Section 37 Post-Reclamation Vegetation.

*25.1.6 Retaining Sediment in the Disturbed Area*

In the active mining and reclamation areas, storm-water flows containing sediment are retained within the disturbed area by using berms to convey surface flows to a ramp or the mining pit, a depression in ungraded spoils, a depression or dugout sump along the berm, or a sediment pond. Refer to Exhibit 25.4-1 for a typical drainage plan in active mining and reclamation areas.

The drainage or grading plan developed for each mine support facility was developed in a manner to retain surface flows and sediment from within the disturbed area. Berms, ditches, or channels are utilized to divert or convey flows.

**25.2 Sediment Control Practices, Methods, Structures, and Facilities**

The primary control measure used to comply with the applicable effluent standards is retaining the effluent or surface runoff from the disturbed areas in sedimentation ponds for evaporation. Sedimentation ponds are designed to retain the surface runoff and sediment from either the 100yr-6hr. There will be no discharge onto undisturbed areas or off the permit area from precipitation events.. Refer to Section 26 Drainage Control Plan for description of design and operation of sedimentation ponds. Table 26.2-1 provides the references for locating supporting design data and design drawings.

*25.2.1 Sediment Control Watersheds*

The sediment control structure watersheds were delineated using aerial mapping on 10-ft contours. The watershed areas and sediment control structures are presented in Section 26 (Drainage Control Plan).

*25.2.2 Reclaimed Area Watershed*

Currently there are no reclaimed areas (areas where Phase II Bond Release has been granted, Section 51 Reclamation Schedule) within the No Name Project (NNP). As mining and reclamation progresses and reclaimed areas become available the required information will be incorporated into this section.

*25.2.3 Small Area Exemption Watershed*

Currently there are no small area exemptions, but if the need for them should arise in the future this section will be revised accordingly.

*25.2.4 Alternate Sediment Control Measures*

Fluvial geomorphic concepts will be utilized to regrade spoil material to FSC topography. This method of regrading will effectively stabilize the graded spoil material and reclaimed surfaces. Refer to Section 38 Post-Reclamation Surface Stabilization and Sediment Control for detailed discussion on using geomorphic concepts to stabilize and control erosion from regraded spoils and reclaimed surfaces.

**25.3 Chemical Treatment**

There is no need to chemically treat effluent to comply with effluent standards.

**25.4 Use of Best Technology Currently Available**

The best technology currently available will be utilized to control sediment from the disturbed areas. Structures will be designed, constructed, and maintained in a manner to prevent additional contributions of sediment to stream flow or to runoff outside the permit area to the extent possible. The following subsections detail sediment control structures to be used in the mining and reclamation operations.

*25.4.1 Sedimentation Ponds*

Sedimentation ponds or impoundments are used to retain and/or treat surface runoff or effluent from the disturbed areas (i.e., active mining areas, coal stockpile areas, truck dump/hopper area, reclamation areas, and support facility areas). Ponds will be designed to retain the runoff from 100yr-6hr precipitation event. Retained water will be evaporated or used for dust suppression purposes. Refer to Section 26 (Drainage Control Plan) for more details on sedimentation ponds.

*25.4.2 Diversion Berms*

V-ditches and berms are used to: 1) convey flows from disturbed areas to sediment ponds; 2) divert flows from undisturbed areas away from disturbed areas; 3) divert flows from disturbed areas into ramps, pits, depressions or dugout sumps, etc., thereby retaining the runoff within the disturbed areas; and 4) retain surface runoff from topdressing stockpiles, thus retaining the runoff within the disturbed area and preventing loss or contamination of topdressing material.

Diversion berms will be used to prevent runoff from active mining or regraded areas from leaving the permit area or entering reclamation and reclaimed areas. The berms function as a diversion structure to convey flows to a retaining structure (i.e., sediment pond, mining pit/ramp, depression or dugout sumps). There are three situations where the berms are required:

1. In advance of topdressing removal where the general slope of the land will allow water to flow away from the advancing highwall and away from existing drainage control structures;
2. Following mining where the final grading is occurring and the general slope of the land allows water to flow toward reclaimed or off the permit area;
3. Areas at the end of the pits where drainage from topdressing-stripped areas, spoils, or regraded areas have potential to leave the permit area or enter reclaimed lands.

Berms are also utilized around mine support facility areas to prevent sediment and flows from leaving the disturbed area and to convey flows to sedimentation ponds.

Several factors are considered in the design criteria for diversion berms; the most important dimension of the immediate mining area diversion berm is the height. Two drainage conditions determine the height: water flowing along a berm, (thus, the berm effectively functions as a diversion), and water contained by the berm in areas of relatively small depression. The maximum height of the diversion berm will be 4 ft, except in areas where the berm crosses topographical lows, in which case the berm can be 7.5 ft high. A diversion berm can impound water in low areas. The maximum depth of water behind a diversion berm will be 6.5 ft (3.3 ft of running water and 3.2 ft of standing water). See Exhibit 25.4-1 for a typical design of a diversion berm.

The assumptions and design criteria used for diversion berms are as follows:

- A minimum of 1 ft of freeboard will be maintained at all times
- The 10yr-24hr design storm event (1.7 in of rainfall) will be used
- Type II-70 storm type
- Maximum delta Z is 125 ft to calculate time of concentration (Tc)
- Areas have a Curve Number of 89
- Maximum area of concern is 300 ac

- Minimum area of concern is 25 ac
- Areas are approximated as squares (conservative for calculating Tc)
- Areas have a flow length equal to the square root of the area times 1.5
- Berm serves as an erodible channel
- Manning's number (n) assumed at 0.03
- Berm side grade = 2:1
- Regraded slope of 1% - 15% adjacent
- Flowline grade 1% - 15%
- Berm height can be calculated from the following reformatted Manning's equation:

$$b = \left( \frac{Qn\left(C_2^{2/3}\right)}{1.486\left(\frac{FS}{100}\right)^{1/2}\left(C_1^{5/3}\right)} \right)^{3/8}$$

where;

| | | |
|---|---|---|
| b | = | berm height |
| $Q$ | = | peak flow (cfs) from drainage area |
| $n$ | = | Manning's number |
| $FS$ | = | flowline grade in percent |
| $C_1$ | = | $1 + 50/IS$ |
| $IS$ | = | internal embankment grade |
| $C_2$ | = | $(5)^{1/2} + ([IS^2 + 100^2]^{1/2}\ IS)$ |

From the above, the minimum calculated height for the berm is 1.3 ft and the maximum is 3.3 ft. From this equation it was also noted that some flows will exceed the erosive velocity of the soil; however, because the channels are generally in spoil, they will self-armor over time. Sediment will be retained within the disturbed areas not yet reclaimed and will not leave the permit area. For supporting data see Appendix 25.A.

*25.4.3 Alternate Sediment Control Measures*

If hydraulic analysis indicates that a protective lining is required to minimize erosion, riprap material will be used as a liner. Riprap will be utilized in channels or ditches with steep gradients, such as inlets into sediment ponds and some relief ditches along roads. The requirement for riprap will be dictated by the magnitude of the flow and channel gradient.

During surveys of baseline surface water resources presented in Section 18, a head-cut feature was identified along the lower reach of No Name Arroyo at the western edge of the NNP permit boundary. A mitigation structure for this feature has been developed to address this head cut and prevent the significant

migration of the head-cut feature due to increased flow frequency in this lower reach of No Name Arroyo due to the temporary diversion of the Pinabete Arroyo during mining operations in the permit area. The head-cut mitigation structure will be left in place for the long-term benefit of protecting No Name Arroyo water quality, as discussed in Section 35 Hydrologic Reclamation Plan. The designs for this head-cut mitigation structure are presented Section 35 Hydrologic Reclamation Plan.

# Appendix 25.A

Diversion Berm

Hydrology Analysis

Worst Case Scenarios – 25 to 300 Acre Watersheds

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 25 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

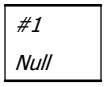
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 25.000 | 25.000 | 24.96 | 1.33 |

# *Subwatershed Hydrology Detail:*

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 25.000 | 0.154 | 0.000 | 0.000 | 89.000 | M | 24.96 | 1.329 |
| | Σ | **25.000** | | | | | | **24.96** | **1.329** |

# *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 7.99 | 125.00 | 1,565.00 | 2.820 | 0.154 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.154** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 50 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

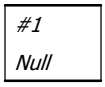
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 50.000 | 50.000 | 43.82 | 2.62 |

# *Subwatershed Hydrology Detail:*

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 50.000 | 0.259 | 0.000 | 0.000 | 89.000 | M | 43.82 | 2.620 |
| | Σ | **50.000** | | | | | | **43.82** | **2.620** |

# *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 5.65 | 125.00 | 2,214.03 | 2.370 | 0.259 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.259** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 75 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

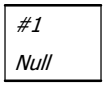
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 75.000 | 75.000 | 58.48 | 3.92 |

# *Subwatershed Hydrology Detail:*

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 75.000 | 0.351 | 0.000 | 0.000 | 89.000 | M | 58.48 | 3.925 |
| | Σ | **75.000** | | | | | | **58.48** | **3.925** |

# *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 4.61 | 125.00 | 2,711.08 | 2.140 | 0.351 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.351** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 100 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

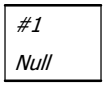
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 100.000 | 100.000 | 70.06 | 5.22 |

# *Subwatershed Hydrology Detail:*

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 100.000 | 0.437 | 0.000 | 0.000 | 89.000 | M | 70.06 | 5.219 |
| | Σ | **100.000** | | | | | | **70.06** | **5.219** |

# *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 3.99 | 125.00 | 3,131.02 | 1.990 | 0.437 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.437** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 150 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

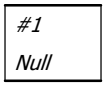
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 150.000 | 150.000 | 87.70 | 7.83 |

# Subwatershed Hydrology Detail:

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 150.000 | 0.591 | 0.000 | 0.000 | 89.000 | M | 87.70 | 7.826 |
| | Σ | **150.000** | | | | | | **87.70** | **7.826** |

# Subwatershed Time of Concentration Details:

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 3.26 | 125.00 | 3,834.00 | 1.800 | 0.591 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.591** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 200 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

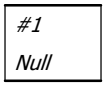
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 200.000 | 200.000 | 101.12 | 10.42 |

# *Subwatershed Hydrology Detail:*

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 200.000 | 0.731 | 0.000 | 0.000 | 89.000 | M | 101.12 | 10.423 |
| | Σ | **200.000** | | | | | | **101.12** | **10.423** |

# *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 2.82 | 125.00 | 4,427.12 | 1.680 | 0.731 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.731** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 250 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

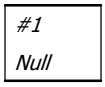
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 250.000 | 250.000 | 111.32 | 13.02 |

# Subwatershed Hydrology Detail:

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 250.000 | 0.870 | 0.000 | 0.000 | 89.000 | M | 111.32 | 13.017 |
| | Σ | **250.000** | | | | | | **111.32** | **13.017** |

# Subwatershed Time of Concentration Details:

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 2.53 | 125.00 | 4,950.29 | 1.580 | 0.870 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.870** |

# NO NAME PERMIT

# DIVERSION BERM

***Worst case scenario for 300 acre watershed.***

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

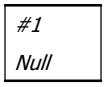
# *General Information*

## *Storm Information:*

| | |
|---|---|
| Storm Type: | Type II-70 |
| Design Storm: | 10 yr - 24 hr |
| Rainfall Depth: | 1.700 inches |

# *Structure Networking:*

| Type | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description |
|---|---|---|---|---|---|---|
| Null | #1 | ==> | End | 0.000 | 0.000 | |



# *Structure Summary:*

| | Immediate Contributing Area (ac) | Total Contributing Area (ac) | Peak Discharge (cfs) | Total Runoff Volume (ac-ft) |
|---|---|---|---|---|
| #1 | 300.000 | 300.000 | 120.50 | 15.63 |

# *Subwatershed Hydrology Detail:*

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| #1 | 1 | 300.000 | 0.997 | 0.000 | 0.000 | 89.000 | M | 120.50 | 15.628 |
| | Σ | **300.000** | | | | | | **120.50** | **15.628** |

# *Subwatershed Time of Concentration Details:*

| Stru # | SWS # | Land Flow Condition | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs) |
|---|---|---|---|---|---|---|---|
| #1 | 1 | 5. Nearly bare and untilled, and alluvial valley fans | 2.31 | 125.00 | 5,422.28 | 1.510 | 0.997 |
| **#1** | **1** | **Time of Concentration:** | | | | | **0.997** |

# DIVERSION BERM

Berm Height Calculations

| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 1 | 6 | 25 | 24.96 | 8.37 | 17.93 | 0.03 | 0.95 | 1.95 | 2.98 |
| 1 | 9 | 25 | 24.96 | 7.69 | 14.51 | 0.03 | 1.08 | 2.08 | 3.24 |
| 1 | 12 | 25 | 24.96 | 7.27 | 12.61 | 0.03 | 1.19 | 2.19 | 3.43 |
| 1 | 15 | 25 | 24.96 | 6.98 | 11.40 | 0.03 | 1.27 | 2.27 | 3.57 |
| 1 | 1 | 50 | 43.82 | 19.41 | 63.07 | 0.03 | 0.62 | 1.62 | 2.26 |
| 1 | 3 | 50 | 43.82 | 14.93 | 32.71 | 0.03 | 0.92 | 1.92 | 2.94 |
| 1 | 6 | 50 | 43.82 | 12.77 | 22.15 | 0.03 | 1.17 | 2.17 | 3.43 |
| 1 | 9 | 50 | 43.82 | 11.73 | 17.92 | 0.03 | 1.34 | 2.34 | 3.74 |
| 1 | 12 | 50 | 43.82 | 11.09 | 15.57 | 0.03 | 1.47 | 2.47 | 3.95 |
| 1 | 15 | 50 | 43.82 | 10.65 | 14.08 | 0.03 | 1.57 | 2.57 | 4.11 |
| 1 | 1 | 75 | 58.48 | 24.10 | 70.28 | 0.03 | 0.69 | 1.69 | 2.43 |
| 1 | 3 | 75 | 58.48 | 18.53 | 36.45 | 0.03 | 1.02 | 2.02 | 3.16 |
| 1 | 6 | 75 | 58.48 | 15.86 | 24.68 | 0.03 | 1.30 | 2.30 | 3.69 |
| 1 | 9 | 75 | 58.48 | 14.57 | 19.96 | 0.03 | 1.49 | 2.49 | 4.01 |
| 1 | 12 | 75 | 58.48 | 13.77 | 17.35 | 0.03 | 1.63 | 2.63 | 4.25 |
| 1 | 15 | 75 | 58.48 | 13.23 | 15.68 | 0.03 | 1.75 | 2.75 | 4.42 |
| 1 | 1 | 100 | 70.06 | 27.60 | 75.21 | 0.03 | 0.74 | 1.74 | 2.54 |
| 1 | 3 | 100 | 70.06 | 21.22 | 39.00 | 0.03 | 1.10 | 2.10 | 3.30 |
| 1 | 6 | 100 | 70.06 | 18.16 | 26.41 | 0.03 | 1.39 | 2.39 | 3.86 |
| 1 | 9 | 100 | 70.06 | 16.68 | 21.36 | 0.03 | 1.60 | 2.60 | 4.20 |
| 1 | 12 | 100 | 70.06 | 15.77 | 18.57 | 0.03 | 1.75 | 2.75 | 4.44 |
| 1 | 15 | 100 | 70.06 | 15.15 | 16.78 | 0.03 | 1.87 | 2.87 | 4.63 |
| 1 | 1 | 150 | 87.7 | 32.66 | 81.82 | 0.03 | 0.80 | 1.80 | 2.69 |
| 1 | 3 | 150 | 87.7 | 25.11 | 42.43 | 0.03 | 1.19 | 2.19 | 3.49 |
| 1 | 6 | 150 | 87.7 | 21.49 | 28.73 | 0.03 | 1.52 | 2.52 | 4.08 |
| 1 | 9 | 150 | 87.7 | 19.74 | 23.24 | 0.03 | 1.74 | 2.74 | 4.44 |
| 1 | 12 | 150 | 87.7 | 18.66 | 20.20 | 0.03 | 1.90 | 2.90 | 4.70 |
| 1 | 15 | 150 | 87.7 | 17.92 | 18.26 | 0.03 | 2.03 | 3.03 | 4.89 |
| 1 | 1 | 200 | 101.12 | 36.34 | 86.30 | 0.03 | 0.84 | 1.84 | 2.78 |
| 1 | 3 | 200 | 101.12 | 27.94 | 44.75 | 0.03 | 1.26 | 2.26 | 3.62 |
| 1 | 6 | 200 | 101.12 | 23.91 | 30.30 | 0.03 | 1.60 | 2.60 | 4.23 |
| 1 | 9 | 200 | 101.12 | 21.96 | 24.51 | 0.03 | 1.83 | 2.83 | 4.60 |
| 1 | 12 | 200 | 101.12 | 20.77 | 21.31 | 0.03 | 2.00 | 3.00 | 4.87 |
| 1 | 15 | 200 | 101.12 | 19.94 | 19.26 | 0.03 | 2.15 | 3.15 | 5.07 |
| 1 | 1 | 250 | 111.32 | 39.06 | 89.47 | 0.03 | 0.88 | 1.88 | 2.85 |
| 1 | 3 | 250 | 111.32 | 30.03 | 46.40 | 0.03 | 1.30 | 2.30 | 3.71 |
| 1 | 6 | 250 | 111.32 | 25.70 | 31.41 | 0.03 | 1.66 | 2.66 | 4.33 |
| 1 | 9 | 250 | 111.32 | 23.61 | 25.41 | 0.03 | 1.90 | 2.90 | 4.72 |
| 1 | 12 | 250 | 111.32 | 22.32 | 22.09 | 0.03 | 2.08 | 3.08 | 4.99 |
| 1 | 15 | 250 | 111.32 | 21.44 | 19.97 | 0.03 | 2.22 | 3.22 | 5.19 |
| 1 | 1 | 300 | 120.5 | 41.45 | 92.17 | 0.03 | 0.90 | 1.90 | 2.91 |
| 1 | 3 | 300 | 120.5 | 31.87 | 47.80 | 0.03 | 1.34 | 2.34 | 3.78 |
| 1 | 6 | 300 | 120.5 | 27.27 | 32.36 | 0.03 | 1.71 | 2.71 | 4.42 |
| 1 | 9 | 300 | 120.5 | 25.05 | 26.18 | 0.03 | 1.95 | 2.95 | 4.81 |
| 1 | 12 | 300 | 120.5 | 23.69 | 22.76 | 0.03 | 2.14 | 3.14 | 5.09 |
| 1 | 15 | 300 | 120.5 | 22.75 | 20.57 | 0.03 | 2.29 | 3.29 | 5.30 |
| 3 | 1 | 25 | 24.96 | 8.43 | 41.56 | 0.03 | 0.41 | 1.41 | 2.96 |
| 3 | 3 | 25 | 24.96 | 6.48 | 21.55 | 0.03 | 0.61 | 1.61 | 3.85 |

| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 3 | 6 | 25 | 24.96 | 5.55 | 14.59 | 0.03 | 0.77 | 1.77 | 4.50 |
| 3 | 9 | 25 | 24.96 | 5.09 | 11.81 | 0.03 | 0.88 | 1.88 | 4.90 |
| 3 | 12 | 25 | 24.96 | 4.82 | 10.26 | 0.03 | 0.97 | 1.97 | 5.18 |
| 3 | 15 | 25 | 24.96 | 4.63 | 9.28 | 0.03 | 1.03 | 2.03 | 5.40 |
| 3 | 1 | 50 | 43.82 | 12.86 | 51.33 | 0.03 | 0.50 | 1.50 | 3.41 |
| 3 | 3 | 50 | 43.82 | 9.89 | 26.62 | 0.03 | 0.75 | 1.75 | 4.43 |
| 3 | 6 | 50 | 43.82 | 8.46 | 18.02 | 0.03 | 0.95 | 1.95 | 5.18 |
| 3 | 9 | 50 | 43.82 | 7.77 | 14.58 | 0.03 | 1.09 | 2.09 | 5.64 |
| 3 | 12 | 50 | 43.82 | 7.35 | 12.68 | 0.03 | 1.19 | 2.19 | 5.96 |
| 3 | 15 | 50 | 43.82 | 7.06 | 11.46 | 0.03 | 1.28 | 2.28 | 6.21 |
| 3 | 1 | 75 | 58.48 | 15.96 | 57.20 | 0.03 | 0.56 | 1.56 | 3.66 |
| 3 | 3 | 75 | 58.48 | 12.27 | 29.66 | 0.03 | 0.83 | 1.83 | 4.76 |
| 3 | 6 | 75 | 58.48 | 10.50 | 20.08 | 0.03 | 1.06 | 2.06 | 5.57 |
| 3 | 9 | 75 | 58.48 | 9.65 | 16.25 | 0.03 | 1.21 | 2.21 | 6.06 |
| 3 | 12 | 75 | 58.48 | 9.12 | 14.12 | 0.03 | 1.33 | 2.33 | 6.41 |
| 3 | 15 | 75 | 58.48 | 8.76 | 12.76 | 0.03 | 1.42 | 2.42 | 6.68 |
| 3 | 1 | 100 | 70.06 | 18.28 | 61.21 | 0.03 | 0.60 | 1.60 | 3.83 |
| 3 | 3 | 100 | 70.06 | 14.06 | 31.74 | 0.03 | 0.89 | 1.89 | 4.98 |
| 3 | 6 | 100 | 70.06 | 12.03 | 21.49 | 0.03 | 1.14 | 2.14 | 5.83 |
| 3 | 9 | 100 | 70.06 | 11.05 | 17.39 | 0.03 | 1.30 | 2.30 | 6.34 |
| 3 | 12 | 100 | 70.06 | 10.45 | 15.11 | 0.03 | 1.42 | 2.42 | 6.71 |
| 3 | 15 | 100 | 70.06 | 10.03 | 13.66 | 0.03 | 1.52 | 2.52 | 6.98 |
| 3 | 1 | 150 | 87.7 | 21.63 | 66.59 | 0.03 | 0.65 | 1.65 | 4.05 |
| 3 | 3 | 150 | 87.7 | 16.63 | 34.53 | 0.03 | 0.97 | 1.97 | 5.27 |
| 3 | 6 | 150 | 87.7 | 14.23 | 23.38 | 0.03 | 1.23 | 2.23 | 6.16 |
| 3 | 9 | 150 | 87.7 | 13.07 | 18.91 | 0.03 | 1.41 | 2.41 | 6.71 |
| 3 | 12 | 150 | 87.7 | 12.36 | 16.44 | 0.03 | 1.55 | 2.55 | 7.09 |
| 3 | 15 | 150 | 87.7 | 11.87 | 14.86 | 0.03 | 1.66 | 2.66 | 7.39 |
| 3 | 1 | 200 | 101.12 | 24.07 | 70.24 | 0.03 | 0.69 | 1.69 | 4.20 |
| 3 | 3 | 200 | 101.12 | 18.51 | 36.42 | 0.03 | 1.02 | 2.02 | 5.46 |
| 3 | 6 | 200 | 101.12 | 15.84 | 24.66 | 0.03 | 1.30 | 2.30 | 6.39 |
| 3 | 9 | 200 | 101.12 | 14.55 | 19.95 | 0.03 | 1.49 | 2.49 | 6.95 |
| 3 | 12 | 200 | 101.12 | 13.76 | 17.34 | 0.03 | 1.63 | 2.63 | 7.35 |
| 3 | 15 | 200 | 101.12 | 13.21 | 15.67 | 0.03 | 1.75 | 2.75 | 7.65 |
| 3 | 1 | 250 | 111.32 | 25.87 | 72.81 | 0.03 | 0.71 | 1.71 | 4.30 |
| 3 | 3 | 250 | 111.32 | 19.89 | 37.76 | 0.03 | 1.06 | 2.06 | 5.60 |
| 3 | 6 | 250 | 111.32 | 17.02 | 25.57 | 0.03 | 1.35 | 2.35 | 6.54 |
| 3 | 9 | 250 | 111.32 | 15.64 | 20.68 | 0.03 | 1.54 | 2.54 | 7.12 |
| 3 | 12 | 250 | 111.32 | 14.78 | 17.98 | 0.03 | 1.69 | 2.69 | 7.53 |
| 3 | 15 | 250 | 111.32 | 14.20 | 16.25 | 0.03 | 1.81 | 2.81 | 7.84 |
| 3 | 1 | 300 | 120.5 | 27.45 | 75.01 | 0.03 | 0.73 | 1.73 | 4.39 |
| 3 | 3 | 300 | 120.5 | 21.11 | 38.90 | 0.03 | 1.09 | 2.09 | 5.71 |
| 3 | 6 | 300 | 120.5 | 18.06 | 26.34 | 0.03 | 1.39 | 2.39 | 6.67 |
| 3 | 9 | 300 | 120.5 | 16.59 | 21.31 | 0.03 | 1.59 | 2.59 | 7.26 |
| 3 | 12 | 300 | 120.5 | 15.69 | 18.52 | 0.03 | 1.74 | 2.74 | 7.68 |
| 3 | 15 | 300 | 120.5 | 15.07 | 16.74 | 0.03 | 1.86 | 2.86 | 8.00 |
| 5 | 1 | 25 | 24.96 | 6.96 | 37.77 | 0.03 | 0.37 | 1.37 | 3.59 |
| 5 | 3 | 25 | 24.96 | 5.35 | 19.59 | 0.03 | 0.55 | 1.55 | 4.66 |

| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 5 | 6 | 25 | 24.96 | 4.58 | 13.26 | 0.03 | 0.70 | 1.70 | 5.45 |
| 5 | 9 | 25 | 24.96 | 4.21 | 10.73 | 0.03 | 0.80 | 1.80 | 5.93 |
| 5 | 12 | 25 | 24.96 | 3.98 | 9.33 | 0.03 | 0.88 | 1.88 | 6.28 |
| 5 | 15 | 25 | 24.96 | 3.82 | 8.43 | 0.03 | 0.94 | 1.94 | 6.53 |
| 5 | 1 | 50 | 43.82 | 10.61 | 46.64 | 0.03 | 0.46 | 1.46 | 4.13 |
| 5 | 3 | 50 | 43.82 | 8.16 | 24.19 | 0.03 | 0.68 | 1.68 | 5.37 |
| 5 | 6 | 50 | 43.82 | 6.98 | 16.38 | 0.03 | 0.86 | 1.86 | 6.27 |
| 5 | 9 | 50 | 43.82 | 6.42 | 13.25 | 0.03 | 0.99 | 1.99 | 6.83 |
| 5 | 12 | 50 | 43.82 | 6.07 | 11.52 | 0.03 | 1.08 | 2.08 | 7.22 |
| 5 | 15 | 50 | 43.82 | 5.83 | 10.41 | 0.03 | 1.16 | 2.16 | 7.52 |
| 5 | 1 | 75 | 58.48 | 13.18 | 51.97 | 0.03 | 0.51 | 1.51 | 4.44 |
| 5 | 3 | 75 | 58.48 | 10.13 | 26.95 | 0.03 | 0.76 | 1.76 | 5.77 |
| 5 | 6 | 75 | 58.48 | 8.67 | 18.25 | 0.03 | 0.96 | 1.96 | 6.74 |
| 5 | 9 | 75 | 58.48 | 7.97 | 14.76 | 0.03 | 1.10 | 2.10 | 7.34 |
| 5 | 12 | 75 | 58.48 | 7.53 | 12.83 | 0.03 | 1.21 | 2.21 | 7.76 |
| 5 | 15 | 75 | 58.48 | 7.23 | 11.60 | 0.03 | 1.29 | 2.29 | 8.08 |
| 5 | 1 | 100 | 70.06 | 15.09 | 55.62 | 0.03 | 0.54 | 1.54 | 4.64 |
| 5 | 3 | 100 | 70.06 | 11.61 | 28.84 | 0.03 | 0.81 | 1.81 | 6.04 |
| 5 | 6 | 100 | 70.06 | 9.93 | 19.53 | 0.03 | 1.03 | 2.03 | 7.06 |
| 5 | 9 | 100 | 70.06 | 9.12 | 15.80 | 0.03 | 1.18 | 2.18 | 7.68 |
| 5 | 12 | 100 | 70.06 | 8.63 | 13.73 | 0.03 | 1.29 | 2.29 | 8.12 |
| 5 | 15 | 100 | 70.06 | 8.28 | 12.41 | 0.03 | 1.38 | 2.38 | 8.46 |
| 5 | 1 | 150 | 87.7 | 17.86 | 60.50 | 0.03 | 0.59 | 1.59 | 4.91 |
| 5 | 3 | 150 | 87.7 | 13.73 | 31.38 | 0.03 | 0.88 | 1.88 | 6.39 |
| 5 | 6 | 150 | 87.7 | 11.75 | 21.24 | 0.03 | 1.12 | 2.12 | 7.46 |
| 5 | 9 | 150 | 87.7 | 10.80 | 17.19 | 0.03 | 1.28 | 2.28 | 8.12 |
| 5 | 12 | 150 | 87.7 | 10.21 | 14.94 | 0.03 | 1.41 | 2.41 | 8.59 |
| 5 | 15 | 150 | 87.7 | 9.80 | 13.50 | 0.03 | 1.50 | 2.50 | 8.95 |
| 5 | 1 | 200 | 101.12 | 19.87 | 63.82 | 0.03 | 0.62 | 1.62 | 5.09 |
| 5 | 3 | 200 | 101.12 | 15.28 | 33.10 | 0.03 | 0.93 | 1.93 | 6.62 |
| 5 | 6 | 200 | 101.12 | 13.07 | 22.41 | 0.03 | 1.18 | 2.18 | 7.73 |
| 5 | 9 | 200 | 101.12 | 12.01 | 18.13 | 0.03 | 1.35 | 2.35 | 8.42 |
| 5 | 12 | 200 | 101.12 | 11.36 | 15.76 | 0.03 | 1.48 | 2.48 | 8.90 |
| 5 | 15 | 200 | 101.12 | 10.91 | 14.24 | 0.03 | 1.59 | 2.59 | 9.27 |
| 5 | 1 | 250 | 111.32 | 21.36 | 66.16 | 0.03 | 0.65 | 1.65 | 5.21 |
| 5 | 3 | 250 | 111.32 | 16.42 | 34.31 | 0.03 | 0.96 | 1.96 | 6.78 |
| 5 | 6 | 250 | 111.32 | 14.05 | 23.23 | 0.03 | 1.23 | 2.23 | 7.92 |
| 5 | 9 | 250 | 111.32 | 12.91 | 18.79 | 0.03 | 1.40 | 2.40 | 8.62 |
| 5 | 12 | 250 | 111.32 | 12.21 | 16.34 | 0.03 | 1.54 | 2.54 | 9.12 |
| 5 | 15 | 250 | 111.32 | 11.72 | 14.77 | 0.03 | 1.64 | 2.64 | 9.50 |
| 5 | 1 | 300 | 120.5 | 22.67 | 68.16 | 0.03 | 0.67 | 1.67 | 5.32 |
| 5 | 3 | 300 | 120.5 | 17.43 | 35.35 | 0.03 | 0.99 | 1.99 | 6.91 |
| 5 | 6 | 300 | 120.5 | 14.91 | 23.93 | 0.03 | 1.26 | 2.26 | 8.08 |
| 5 | 9 | 300 | 120.5 | 13.70 | 19.36 | 0.03 | 1.45 | 2.45 | 8.80 |
| 5 | 12 | 300 | 120.5 | 12.95 | 16.83 | 0.03 | 1.58 | 2.58 | 9.30 |
| 5 | 15 | 300 | 120.5 | 12.44 | 15.21 | 0.03 | 1.69 | 2.69 | 9.69 |
| 7 | 1 | 25 | 24.96 | 6.13 | 35.46 | 0.03 | 0.35 | 1.35 | 4.07 |
| 7 | 3 | 25 | 24.96 | 4.72 | 18.39 | 0.03 | 0.52 | 1.52 | 5.29 |

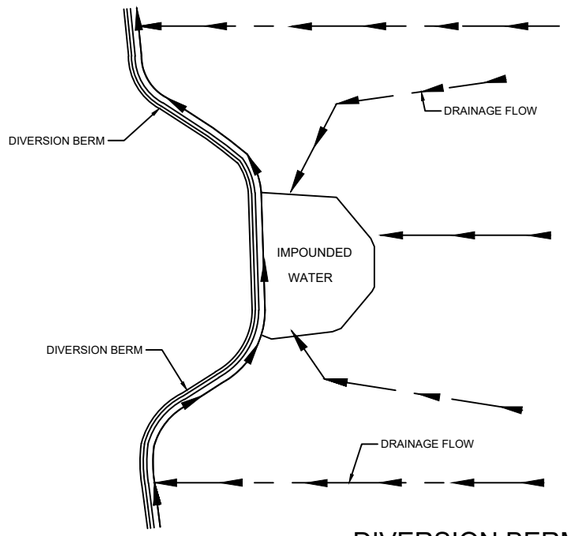
| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 7 | 6 | 25 | 24.96 | 4.04 | 12.45 | 0.03 | 0.66 | 1.66 | 6.18 |
| 7 | 9 | 25 | 24.96 | 3.71 | 10.07 | 0.03 | 0.75 | 1.75 | 6.73 |
| 7 | 12 | 25 | 24.96 | 3.51 | 8.76 | 0.03 | 0.82 | 1.82 | 7.12 |
| 7 | 15 | 25 | 24.96 | 3.37 | 7.91 | 0.03 | 0.88 | 1.88 | 7.41 |
| 7 | 1 | 50 | 43.82 | 9.36 | 43.79 | 0.03 | 0.43 | 1.43 | 4.68 |
| 7 | 3 | 50 | 43.82 | 7.19 | 22.71 | 0.03 | 0.64 | 1.64 | 6.09 |
| 7 | 6 | 50 | 43.82 | 6.16 | 15.38 | 0.03 | 0.81 | 1.81 | 7.12 |
| 7 | 9 | 50 | 43.82 | 5.66 | 12.44 | 0.03 | 0.93 | 1.93 | 7.75 |
| 7 | 12 | 50 | 43.82 | 5.35 | 10.81 | 0.03 | 1.02 | 2.02 | 8.20 |
| 7 | 15 | 50 | 43.82 | 5.13 | 9.77 | 0.03 | 1.09 | 2.09 | 8.53 |
| 7 | 1 | 75 | 58.48 | 11.62 | 48.80 | 0.03 | 0.48 | 1.48 | 5.03 |
| 7 | 3 | 75 | 58.48 | 8.93 | 25.30 | 0.03 | 0.71 | 1.71 | 6.55 |
| 7 | 6 | 75 | 58.48 | 7.64 | 17.13 | 0.03 | 0.90 | 1.90 | 7.65 |
| 7 | 9 | 75 | 58.48 | 7.02 | 13.86 | 0.03 | 1.03 | 2.03 | 8.33 |
| 7 | 12 | 75 | 58.48 | 6.64 | 12.05 | 0.03 | 1.13 | 2.13 | 8.81 |
| 7 | 15 | 75 | 58.48 | 6.38 | 10.89 | 0.03 | 1.21 | 2.21 | 9.17 |
| 7 | 1 | 100 | 70.06 | 13.30 | 52.22 | 0.03 | 0.51 | 1.51 | 5.27 |
| 7 | 3 | 100 | 70.06 | 10.23 | 27.08 | 0.03 | 0.76 | 1.76 | 6.85 |
| 7 | 6 | 100 | 70.06 | 8.75 | 18.33 | 0.03 | 0.97 | 1.97 | 8.00 |
| 7 | 9 | 100 | 70.06 | 8.04 | 14.83 | 0.03 | 1.11 | 2.11 | 8.71 |
| 7 | 12 | 100 | 70.06 | 7.60 | 12.89 | 0.03 | 1.21 | 2.21 | 9.22 |
| 7 | 15 | 100 | 70.06 | 7.30 | 11.65 | 0.03 | 1.30 | 2.30 | 9.60 |
| 7 | 1 | 150 | 87.7 | 15.74 | 56.80 | 0.03 | 0.56 | 1.56 | 5.57 |
| 7 | 3 | 150 | 87.7 | 12.11 | 29.46 | 0.03 | 0.83 | 1.83 | 7.24 |
| 7 | 6 | 150 | 87.7 | 10.36 | 19.94 | 0.03 | 1.05 | 2.05 | 8.47 |
| 7 | 9 | 150 | 87.7 | 9.52 | 16.13 | 0.03 | 1.20 | 2.20 | 9.22 |
| 7 | 12 | 150 | 87.7 | 9.00 | 14.03 | 0.03 | 1.32 | 2.32 | 9.75 |
| 7 | 15 | 150 | 87.7 | 8.64 | 12.68 | 0.03 | 1.41 | 2.41 | 10.15 |
| 7 | 1 | 200 | 101.12 | 17.52 | 59.92 | 0.03 | 0.59 | 1.59 | 5.77 |
| 7 | 3 | 200 | 101.12 | 13.47 | 31.07 | 0.03 | 0.87 | 1.87 | 7.51 |
| 7 | 6 | 200 | 101.12 | 11.52 | 21.04 | 0.03 | 1.11 | 2.11 | 8.77 |
| 7 | 9 | 200 | 101.12 | 10.59 | 17.02 | 0.03 | 1.27 | 2.27 | 9.55 |
| 7 | 12 | 200 | 101.12 | 10.01 | 14.80 | 0.03 | 1.39 | 2.39 | 10.10 |
| 7 | 15 | 200 | 101.12 | 9.61 | 13.37 | 0.03 | 1.49 | 2.49 | 10.52 |
| 7 | 1 | 250 | 111.32 | 18.83 | 62.12 | 0.03 | 0.61 | 1.61 | 5.91 |
| 7 | 3 | 250 | 111.32 | 14.48 | 32.21 | 0.03 | 0.91 | 1.91 | 7.69 |
| 7 | 6 | 250 | 111.32 | 12.39 | 21.81 | 0.03 | 1.15 | 2.15 | 8.99 |
| 7 | 9 | 250 | 111.32 | 11.38 | 17.64 | 0.03 | 1.32 | 2.32 | 9.78 |
| 7 | 12 | 250 | 111.32 | 10.76 | 15.34 | 0.03 | 1.44 | 2.44 | 10.35 |
| 7 | 15 | 250 | 111.32 | 10.33 | 13.86 | 0.03 | 1.54 | 2.54 | 10.77 |
| 7 | 1 | 300 | 120.5 | 19.98 | 63.99 | 0.03 | 0.63 | 1.63 | 6.03 |
| 7 | 3 | 300 | 120.5 | 15.36 | 33.18 | 0.03 | 0.93 | 1.93 | 7.84 |
| 7 | 6 | 300 | 120.5 | 13.14 | 22.47 | 0.03 | 1.19 | 2.19 | 9.17 |
| 7 | 9 | 300 | 120.5 | 12.08 | 18.18 | 0.03 | 1.36 | 2.36 | 9.98 |
| 7 | 12 | 300 | 120.5 | 11.42 | 15.80 | 0.03 | 1.49 | 2.49 | 10.55 |
| 7 | 15 | 300 | 120.5 | 10.97 | 14.28 | 0.03 | 1.59 | 2.59 | 10.99 |
| 9 | 1 | 25 | 24.96 | 5.58 | 33.83 | 0.03 | 0.33 | 1.33 | 4.47 |
| 9 | 3 | 25 | 24.96 | 4.29 | 17.54 | 0.03 | 0.49 | 1.49 | 5.81 |

| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 9 | 6 | 25 | 24.96 | 3.67 | 11.88 | 0.03 | 0.63 | 1.63 | 6.80 |
| 9 | 9 | 25 | 24.96 | 3.37 | 9.61 | 0.03 | 0.72 | 1.72 | 7.40 |
| 9 | 12 | 25 | 24.96 | 3.19 | 8.35 | 0.03 | 0.79 | 1.79 | 7.82 |
| 9 | 15 | 25 | 24.96 | 3.06 | 7.55 | 0.03 | 0.84 | 1.84 | 8.15 |
| 9 | 1 | 50 | 43.82 | 8.51 | 41.78 | 0.03 | 0.41 | 1.41 | 5.15 |
| 9 | 3 | 50 | 43.82 | 6.55 | 21.66 | 0.03 | 0.61 | 1.61 | 6.69 |
| 9 | 6 | 50 | 43.82 | 5.60 | 14.67 | 0.03 | 0.77 | 1.77 | 7.82 |
| 9 | 9 | 50 | 43.82 | 5.15 | 11.87 | 0.03 | 0.89 | 1.89 | 8.51 |
| 9 | 12 | 50 | 43.82 | 4.87 | 10.32 | 0.03 | 0.97 | 1.97 | 9.01 |
| 9 | 15 | 50 | 43.82 | 4.67 | 9.32 | 0.03 | 1.04 | 2.04 | 9.38 |
| 9 | 1 | 75 | 58.48 | 10.57 | 46.55 | 0.03 | 0.46 | 1.46 | 5.53 |
| 9 | 3 | 75 | 58.48 | 8.13 | 24.14 | 0.03 | 0.68 | 1.68 | 7.19 |
| 9 | 6 | 75 | 58.48 | 6.96 | 16.34 | 0.03 | 0.86 | 1.86 | 8.41 |
| 9 | 9 | 75 | 58.48 | 6.39 | 13.22 | 0.03 | 0.99 | 1.99 | 9.15 |
| 9 | 12 | 75 | 58.48 | 6.04 | 11.49 | 0.03 | 1.08 | 2.08 | 9.68 |
| 9 | 15 | 75 | 58.48 | 5.80 | 10.39 | 0.03 | 1.16 | 2.16 | 10.08 |
| 9 | 1 | 100 | 70.06 | 12.11 | 49.81 | 0.03 | 0.49 | 1.49 | 5.79 |
| 9 | 3 | 100 | 70.06 | 9.31 | 25.83 | 0.03 | 0.73 | 1.73 | 7.53 |
| 9 | 6 | 100 | 70.06 | 7.96 | 17.49 | 0.03 | 0.92 | 1.92 | 8.80 |
| 9 | 9 | 100 | 70.06 | 7.32 | 14.15 | 0.03 | 1.06 | 2.06 | 9.57 |
| 9 | 12 | 100 | 70.06 | 6.92 | 12.30 | 0.03 | 1.16 | 2.16 | 10.13 |
| 9 | 15 | 100 | 70.06 | 6.64 | 11.12 | 0.03 | 1.24 | 2.24 | 10.54 |
| 9 | 1 | 150 | 87.7 | 14.33 | 54.19 | 0.03 | 0.53 | 1.53 | 6.12 |
| 9 | 3 | 150 | 87.7 | 11.02 | 28.10 | 0.03 | 0.79 | 1.79 | 7.96 |
| 9 | 6 | 150 | 87.7 | 9.43 | 19.03 | 0.03 | 1.00 | 2.00 | 9.30 |
| 9 | 9 | 150 | 87.7 | 8.66 | 15.39 | 0.03 | 1.15 | 2.15 | 10.13 |
| 9 | 12 | 150 | 87.7 | 8.19 | 13.38 | 0.03 | 1.26 | 2.26 | 10.71 |
| 9 | 15 | 150 | 87.7 | 7.86 | 12.09 | 0.03 | 1.35 | 2.35 | 11.15 |
| 9 | 1 | 200 | 101.12 | 15.94 | 57.16 | 0.03 | 0.56 | 1.56 | 6.34 |
| 9 | 3 | 200 | 101.12 | 12.26 | 29.64 | 0.03 | 0.83 | 1.83 | 8.25 |
| 9 | 6 | 200 | 101.12 | 10.49 | 20.07 | 0.03 | 1.06 | 2.06 | 9.64 |
| 9 | 9 | 200 | 101.12 | 9.64 | 16.24 | 0.03 | 1.21 | 2.21 | 10.49 |
| 9 | 12 | 200 | 101.12 | 9.11 | 14.11 | 0.03 | 1.33 | 2.33 | 11.10 |
| 9 | 15 | 200 | 101.12 | 8.75 | 12.76 | 0.03 | 1.42 | 2.42 | 11.56 |
| 9 | 1 | 250 | 111.32 | 17.13 | 59.26 | 0.03 | 0.58 | 1.58 | 6.50 |
| 9 | 3 | 250 | 111.32 | 13.18 | 30.73 | 0.03 | 0.86 | 1.86 | 8.45 |
| 9 | 6 | 250 | 111.32 | 11.27 | 20.81 | 0.03 | 1.10 | 2.10 | 9.88 |
| 9 | 9 | 250 | 111.32 | 10.36 | 16.83 | 0.03 | 1.26 | 2.26 | 10.75 |
| 9 | 12 | 250 | 111.32 | 9.79 | 14.63 | 0.03 | 1.38 | 2.38 | 11.37 |
| 9 | 15 | 250 | 111.32 | 9.40 | 13.22 | 0.03 | 1.47 | 2.47 | 11.84 |
| 9 | 1 | 300 | 120.5 | 18.18 | 61.05 | 0.03 | 0.60 | 1.60 | 6.63 |
| 9 | 3 | 300 | 120.5 | 13.98 | 31.66 | 0.03 | 0.89 | 1.89 | 8.62 |
| 9 | 6 | 300 | 120.5 | 11.96 | 21.43 | 0.03 | 1.13 | 2.13 | 10.07 |
| 9 | 9 | 300 | 120.5 | 10.99 | 17.34 | 0.03 | 1.29 | 2.29 | 10.96 |
| 9 | 12 | 300 | 120.5 | 10.39 | 15.07 | 0.03 | 1.42 | 2.42 | 11.60 |
| 9 | 15 | 300 | 120.5 | 9.98 | 13.62 | 0.03 | 1.52 | 2.52 | 12.08 |
| 11 | 1 | 25 | 24.96 | 5.18 | 32.58 | 0.03 | 0.32 | 1.32 | 4.82 |
| 11 | 3 | 25 | 24.96 | 3.98 | 16.89 | 0.03 | 0.47 | 1.47 | 6.27 |

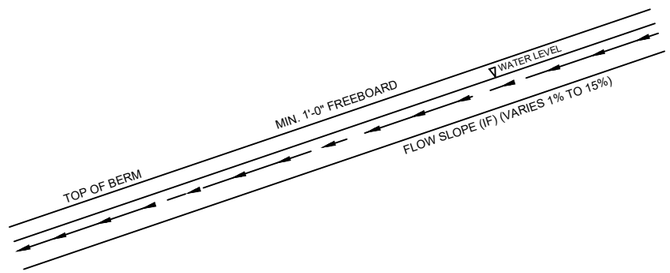
| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 11 | 6 | 25 | 24.96 | 3.41 | 11.44 | 0.03 | 0.60 | 1.60 | 7.33 |
| 11 | 9 | 25 | 24.96 | 3.13 | 9.25 | 0.03 | 0.69 | 1.69 | 7.98 |
| 11 | 12 | 25 | 24.96 | 2.96 | 8.04 | 0.03 | 0.76 | 1.76 | 8.43 |
| 11 | 15 | 25 | 24.96 | 2.84 | 7.27 | 0.03 | 0.81 | 1.81 | 8.78 |
| 11 | 1 | 50 | 43.82 | 7.90 | 40.23 | 0.03 | 0.39 | 1.39 | 5.55 |
| 11 | 3 | 50 | 43.82 | 6.07 | 20.86 | 0.03 | 0.59 | 1.59 | 7.22 |
| 11 | 6 | 50 | 43.82 | 5.20 | 14.13 | 0.03 | 0.75 | 1.75 | 8.43 |
| 11 | 9 | 50 | 43.82 | 4.77 | 11.43 | 0.03 | 0.85 | 1.85 | 9.18 |
| 11 | 12 | 50 | 43.82 | 4.51 | 9.93 | 0.03 | 0.93 | 1.93 | 9.71 |
| 11 | 15 | 50 | 43.82 | 4.33 | 8.98 | 0.03 | 1.00 | 2.00 | 10.11 |
| 11 | 1 | 75 | 58.48 | 9.81 | 44.83 | 0.03 | 0.44 | 1.44 | 5.96 |
| 11 | 3 | 75 | 58.48 | 7.54 | 23.25 | 0.03 | 0.65 | 1.65 | 7.76 |
| 11 | 6 | 75 | 58.48 | 6.45 | 15.74 | 0.03 | 0.83 | 1.83 | 9.06 |
| 11 | 9 | 75 | 58.48 | 5.93 | 12.73 | 0.03 | 0.95 | 1.95 | 9.87 |
| 11 | 12 | 75 | 58.48 | 5.60 | 11.07 | 0.03 | 1.04 | 2.04 | 10.44 |
| 11 | 15 | 75 | 58.48 | 5.38 | 10.00 | 0.03 | 1.11 | 2.11 | 10.87 |
| 11 | 1 | 100 | 70.06 | 11.23 | 47.97 | 0.03 | 0.47 | 1.47 | 6.24 |
| 11 | 3 | 100 | 70.06 | 8.63 | 24.88 | 0.03 | 0.70 | 1.70 | 8.11 |
| 11 | 6 | 100 | 70.06 | 7.39 | 16.84 | 0.03 | 0.89 | 1.89 | 9.48 |
| 11 | 9 | 100 | 70.06 | 6.79 | 13.63 | 0.03 | 1.02 | 2.02 | 10.32 |
| 11 | 12 | 100 | 70.06 | 6.42 | 11.85 | 0.03 | 1.11 | 2.11 | 10.92 |
| 11 | 15 | 100 | 70.06 | 6.16 | 10.71 | 0.03 | 1.19 | 2.19 | 11.37 |
| 11 | 1 | 150 | 87.7 | 13.29 | 52.19 | 0.03 | 0.51 | 1.51 | 6.60 |
| 11 | 3 | 150 | 87.7 | 10.22 | 27.06 | 0.03 | 0.76 | 1.76 | 8.58 |
| 11 | 6 | 150 | 87.7 | 8.74 | 18.32 | 0.03 | 0.97 | 1.97 | 10.03 |
| 11 | 9 | 150 | 87.7 | 8.03 | 14.82 | 0.03 | 1.11 | 2.11 | 10.92 |
| 11 | 12 | 150 | 87.7 | 7.59 | 12.89 | 0.03 | 1.21 | 2.21 | 11.55 |
| 11 | 15 | 150 | 87.7 | 7.29 | 11.65 | 0.03 | 1.30 | 2.30 | 12.02 |
| 11 | 1 | 200 | 101.12 | 14.79 | 55.05 | 0.03 | 0.54 | 1.54 | 6.84 |
| 11 | 3 | 200 | 101.12 | 11.37 | 28.55 | 0.03 | 0.80 | 1.80 | 8.89 |
| 11 | 6 | 200 | 101.12 | 9.73 | 19.33 | 0.03 | 1.02 | 2.02 | 10.39 |
| 11 | 9 | 200 | 101.12 | 8.94 | 15.64 | 0.03 | 1.17 | 2.17 | 11.31 |
| 11 | 12 | 200 | 101.12 | 8.45 | 13.59 | 0.03 | 1.28 | 2.28 | 11.97 |
| 11 | 15 | 200 | 101.12 | 8.12 | 12.29 | 0.03 | 1.37 | 2.37 | 12.46 |
| 11 | 1 | 250 | 111.32 | 15.89 | 57.07 | 0.03 | 0.56 | 1.56 | 7.01 |
| 11 | 3 | 250 | 111.32 | 12.22 | 29.60 | 0.03 | 0.83 | 1.83 | 9.11 |
| 11 | 6 | 250 | 111.32 | 10.46 | 20.04 | 0.03 | 1.06 | 2.06 | 10.65 |
| 11 | 9 | 250 | 111.32 | 9.61 | 16.21 | 0.03 | 1.21 | 2.21 | 11.59 |
| 11 | 12 | 250 | 111.32 | 9.08 | 14.09 | 0.03 | 1.33 | 2.33 | 12.26 |
| 11 | 15 | 250 | 111.32 | 8.72 | 12.74 | 0.03 | 1.42 | 2.42 | 12.76 |
| 11 | 1 | 300 | 120.5 | 16.86 | 58.79 | 0.03 | 0.58 | 1.58 | 7.15 |
| 11 | 3 | 300 | 120.5 | 12.97 | 30.49 | 0.03 | 0.86 | 1.86 | 9.29 |
| 11 | 6 | 300 | 120.5 | 11.10 | 20.64 | 0.03 | 1.09 | 2.09 | 10.86 |
| 11 | 9 | 300 | 120.5 | 10.19 | 16.70 | 0.03 | 1.25 | 2.25 | 11.82 |
| 11 | 12 | 300 | 120.5 | 9.64 | 14.52 | 0.03 | 1.37 | 2.37 | 12.50 |
| 11 | 15 | 300 | 120.5 | 9.26 | 13.12 | 0.03 | 1.46 | 2.46 | 13.02 |
| 13 | 1 | 25 | 24.96 | 4.86 | 31.57 | 0.03 | 0.31 | 1.31 | 5.13 |
| 13 | 3 | 25 | 24.96 | 3.74 | 16.37 | 0.03 | 0.46 | 1.46 | 6.67 |

| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 13 | 6 | 25 | 24.96 | 3.20 | 11.09 | 0.03 | 0.59 | 1.59 | 7.80 |
| 13 | 9 | 25 | 24.96 | 2.94 | 8.97 | 0.03 | 0.67 | 1.67 | 8.49 |
| 13 | 12 | 25 | 24.96 | 2.78 | 7.80 | 0.03 | 0.73 | 1.73 | 8.98 |
| 13 | 15 | 25 | 24.96 | 2.67 | 7.05 | 0.03 | 0.78 | 1.78 | 9.35 |
| 13 | 1 | 50 | 43.82 | 7.42 | 38.99 | 0.03 | 0.38 | 1.38 | 5.91 |
| 13 | 3 | 50 | 43.82 | 5.70 | 20.22 | 0.03 | 0.57 | 1.57 | 7.68 |
| 13 | 6 | 50 | 43.82 | 4.88 | 13.69 | 0.03 | 0.72 | 1.72 | 8.98 |
| 13 | 9 | 50 | 43.82 | 4.48 | 11.08 | 0.03 | 0.83 | 1.83 | 9.77 |
| 13 | 12 | 50 | 43.82 | 4.24 | 9.63 | 0.03 | 0.91 | 1.91 | 10.34 |
| 13 | 15 | 50 | 43.82 | 4.07 | 8.70 | 0.03 | 0.97 | 1.97 | 10.76 |
| 13 | 1 | 75 | 58.48 | 9.21 | 43.45 | 0.03 | 0.42 | 1.42 | 6.35 |
| 13 | 3 | 75 | 58.48 | 7.08 | 22.53 | 0.03 | 0.63 | 1.63 | 8.26 |
| 13 | 6 | 75 | 58.48 | 6.06 | 15.26 | 0.03 | 0.81 | 1.81 | 9.65 |
| 13 | 9 | 75 | 58.48 | 5.57 | 12.34 | 0.03 | 0.92 | 1.92 | 10.50 |
| 13 | 12 | 75 | 58.48 | 5.26 | 10.73 | 0.03 | 1.01 | 2.01 | 11.11 |
| 13 | 15 | 75 | 58.48 | 5.06 | 9.70 | 0.03 | 1.08 | 2.08 | 11.57 |
| 13 | 1 | 100 | 70.06 | 10.55 | 46.49 | 0.03 | 0.45 | 1.45 | 6.64 |
| 13 | 3 | 100 | 70.06 | 8.11 | 24.11 | 0.03 | 0.68 | 1.68 | 8.64 |
| 13 | 6 | 100 | 70.06 | 6.94 | 16.32 | 0.03 | 0.86 | 1.86 | 10.10 |
| 13 | 9 | 100 | 70.06 | 6.37 | 13.21 | 0.03 | 0.99 | 1.99 | 10.99 |
| 13 | 12 | 100 | 70.06 | 6.03 | 11.48 | 0.03 | 1.08 | 2.08 | 11.62 |
| 13 | 15 | 100 | 70.06 | 5.79 | 10.38 | 0.03 | 1.16 | 2.16 | 12.10 |
| 13 | 1 | 150 | 87.7 | 12.48 | 50.58 | 0.03 | 0.49 | 1.49 | 7.03 |
| 13 | 3 | 150 | 87.7 | 9.60 | 26.23 | 0.03 | 0.74 | 1.74 | 9.14 |
| 13 | 6 | 150 | 87.7 | 8.21 | 17.76 | 0.03 | 0.94 | 1.94 | 10.68 |
| 13 | 9 | 150 | 87.7 | 7.54 | 14.37 | 0.03 | 1.07 | 2.07 | 11.62 |
| 13 | 12 | 150 | 87.7 | 7.13 | 12.49 | 0.03 | 1.18 | 2.18 | 12.29 |
| 13 | 15 | 150 | 87.7 | 6.85 | 11.29 | 0.03 | 1.26 | 2.26 | 12.80 |
| 13 | 1 | 200 | 101.12 | 13.89 | 53.35 | 0.03 | 0.52 | 1.52 | 7.28 |
| 13 | 3 | 200 | 101.12 | 10.68 | 27.67 | 0.03 | 0.78 | 1.78 | 9.47 |
| 13 | 6 | 200 | 101.12 | 9.14 | 18.73 | 0.03 | 0.99 | 1.99 | 11.07 |
| 13 | 9 | 200 | 101.12 | 8.39 | 15.15 | 0.03 | 1.13 | 2.13 | 12.05 |
| 13 | 12 | 200 | 101.12 | 7.94 | 13.17 | 0.03 | 1.24 | 2.24 | 12.74 |
| 13 | 15 | 200 | 101.12 | 7.62 | 11.91 | 0.03 | 1.33 | 2.33 | 13.27 |
| 13 | 1 | 250 | 111.32 | 14.93 | 55.31 | 0.03 | 0.54 | 1.54 | 7.46 |
| 13 | 3 | 250 | 111.32 | 11.48 | 28.68 | 0.03 | 0.81 | 1.81 | 9.70 |
| 13 | 6 | 250 | 111.32 | 9.82 | 19.42 | 0.03 | 1.03 | 2.03 | 11.34 |
| 13 | 9 | 250 | 111.32 | 9.02 | 15.71 | 0.03 | 1.17 | 2.17 | 12.34 |
| 13 | 12 | 250 | 111.32 | 8.53 | 13.66 | 0.03 | 1.28 | 2.28 | 13.05 |
| 13 | 15 | 250 | 111.32 | 8.19 | 12.34 | 0.03 | 1.37 | 2.37 | 13.59 |
| 13 | 1 | 300 | 120.5 | 15.84 | 56.98 | 0.03 | 0.56 | 1.56 | 7.61 |
| 13 | 3 | 300 | 120.5 | 12.18 | 29.55 | 0.03 | 0.83 | 1.83 | 9.89 |
| 13 | 6 | 300 | 120.5 | 10.42 | 20.01 | 0.03 | 1.06 | 2.06 | 11.56 |
| 13 | 9 | 300 | 120.5 | 9.57 | 16.18 | 0.03 | 1.21 | 2.21 | 12.59 |
| 13 | 12 | 300 | 120.5 | 9.05 | 14.07 | 0.03 | 1.32 | 2.32 | 13.31 |
| 13 | 15 | 300 | 120.5 | 8.69 | 12.72 | 0.03 | 1.42 | 2.42 | 13.86 |
| 15 | 1 | 25 | 24.96 | 4.61 | 30.74 | 0.03 | 0.30 | 1.30 | 5.41 |
| 15 | 3 | 25 | 24.96 | 3.54 | 15.94 | 0.03 | 0.45 | 1.45 | 7.04 |

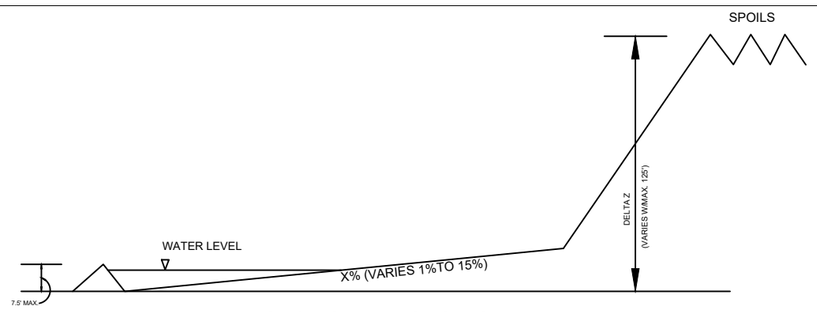
| DIVERSION BERM HEIGHT CALCULATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Slope (FS) (%) | Internal Slope (IS) (%) | Watershed Area (acres) | Peak Discharge ($Q_{10}$) (cfs) | Flow Area ($ft^2$) | Wetted Perimeter (ft) | Mannings Coefficient | Berm Height (B) (ft) | Berm + 1 Foot of Freeboard | Velocity (fps) |
| 1 | 1 | 25 | 24.96 | 12.73 | 51.07 | 0.03 | 0.50 | 1.50 | 1.96 |
| 1 | 3 | 25 | 24.96 | 9.79 | 26.48 | 0.03 | 0.74 | 1.74 | 2.55 |
| 15 | 6 | 25 | 24.96 | 3.03 | 10.79 | 0.03 | 0.57 | 1.57 | 8.23 |
| 15 | 9 | 25 | 24.96 | 2.79 | 8.73 | 0.03 | 0.65 | 1.65 | 8.96 |
| 15 | 12 | 25 | 24.96 | 2.63 | 7.59 | 0.03 | 0.71 | 1.71 | 9.47 |
| 15 | 15 | 25 | 24.96 | 2.53 | 6.86 | 0.03 | 0.76 | 1.76 | 9.87 |
| 15 | 1 | 50 | 43.82 | 7.03 | 37.96 | 0.03 | 0.37 | 1.37 | 6.23 |
| 15 | 3 | 50 | 43.82 | 5.41 | 19.68 | 0.03 | 0.55 | 1.55 | 8.11 |
| 15 | 6 | 50 | 43.82 | 4.63 | 13.33 | 0.03 | 0.70 | 1.70 | 9.47 |
| 15 | 9 | 50 | 43.82 | 4.25 | 10.78 | 0.03 | 0.81 | 1.81 | 10.31 |
| 15 | 12 | 50 | 43.82 | 4.02 | 9.37 | 0.03 | 0.88 | 1.88 | 10.91 |
| 15 | 15 | 50 | 43.82 | 3.86 | 8.47 | 0.03 | 0.94 | 1.94 | 11.36 |
| 15 | 1 | 75 | 58.48 | 8.73 | 42.30 | 0.03 | 0.41 | 1.41 | 6.70 |
| 15 | 3 | 75 | 58.48 | 6.71 | 21.93 | 0.03 | 0.62 | 1.62 | 8.71 |
| 15 | 6 | 75 | 58.48 | 5.74 | 14.85 | 0.03 | 0.78 | 1.78 | 10.18 |
| 15 | 9 | 75 | 58.48 | 5.28 | 12.01 | 0.03 | 0.90 | 1.90 | 11.08 |
| 15 | 12 | 75 | 58.48 | 4.99 | 10.44 | 0.03 | 0.98 | 1.98 | 11.72 |
| 15 | 15 | 75 | 58.48 | 4.79 | 9.44 | 0.03 | 1.05 | 2.05 | 12.21 |
| 15 | 1 | 100 | 70.06 | 10.00 | 45.26 | 0.03 | 0.44 | 1.44 | 7.01 |
| 15 | 3 | 100 | 70.06 | 7.69 | 23.47 | 0.03 | 0.66 | 1.66 | 9.11 |
| 15 | 6 | 100 | 70.06 | 6.58 | 15.89 | 0.03 | 0.84 | 1.84 | 10.65 |
| 15 | 9 | 100 | 70.06 | 6.04 | 12.86 | 0.03 | 0.96 | 1.96 | 11.60 |
| 15 | 12 | 100 | 70.06 | 5.71 | 11.18 | 0.03 | 1.05 | 2.05 | 12.26 |
| 15 | 15 | 100 | 70.06 | 5.49 | 10.10 | 0.03 | 1.13 | 2.13 | 12.77 |
| 15 | 1 | 150 | 87.7 | 11.83 | 49.24 | 0.03 | 0.48 | 1.48 | 7.41 |
| 15 | 3 | 150 | 87.7 | 9.10 | 25.53 | 0.03 | 0.72 | 1.72 | 9.64 |
| 15 | 6 | 150 | 87.7 | 7.78 | 17.29 | 0.03 | 0.91 | 1.91 | 11.27 |
| 15 | 9 | 150 | 87.7 | 7.15 | 13.99 | 0.03 | 1.04 | 2.04 | 12.27 |
| 15 | 12 | 150 | 87.7 | 6.76 | 12.16 | 0.03 | 1.14 | 2.14 | 12.97 |
| 15 | 15 | 150 | 87.7 | 6.49 | 10.99 | 0.03 | 1.22 | 2.22 | 13.51 |
| 15 | 1 | 200 | 101.12 | 13.16 | 51.94 | 0.03 | 0.51 | 1.51 | 7.68 |
| 15 | 3 | 200 | 101.12 | 10.12 | 26.93 | 0.03 | 0.76 | 1.76 | 9.99 |
| 15 | 6 | 200 | 101.12 | 8.66 | 18.24 | 0.03 | 0.96 | 1.96 | 11.68 |
| 15 | 9 | 200 | 101.12 | 7.96 | 14.75 | 0.03 | 1.10 | 2.10 | 12.71 |
| 15 | 12 | 200 | 101.12 | 7.52 | 12.83 | 0.03 | 1.21 | 2.21 | 13.44 |
| 15 | 15 | 200 | 101.12 | 7.22 | 11.59 | 0.03 | 1.29 | 2.29 | 14.00 |
| 15 | 1 | 250 | 111.32 | 14.15 | 53.85 | 0.03 | 0.53 | 1.53 | 7.87 |
| 15 | 3 | 250 | 111.32 | 10.88 | 27.92 | 0.03 | 0.78 | 1.78 | 10.23 |
| 15 | 6 | 250 | 111.32 | 9.31 | 18.91 | 0.03 | 1.00 | 2.00 | 11.96 |
| 15 | 9 | 250 | 111.32 | 8.55 | 15.29 | 0.03 | 1.14 | 2.14 | 13.02 |
| 15 | 12 | 250 | 111.32 | 8.08 | 13.30 | 0.03 | 1.25 | 2.25 | 13.77 |
| 15 | 15 | 250 | 111.32 | 7.76 | 12.02 | 0.03 | 1.34 | 2.34 | 14.34 |
| 15 | 1 | 300 | 120.5 | 15.01 | 55.47 | 0.03 | 0.54 | 1.54 | 8.03 |
| 15 | 3 | 300 | 120.5 | 11.54 | 28.77 | 0.03 | 0.81 | 1.81 | 10.44 |
| 15 | 6 | 300 | 120.5 | 9.88 | 19.48 | 0.03 | 1.03 | 2.03 | 12.20 |
| 15 | 9 | 300 | 120.5 | 9.07 | 15.76 | 0.03 | 1.18 | 2.18 | 13.28 |
| 15 | 12 | 300 | 120.5 | 8.58 | 13.70 | 0.03 | 1.29 | 2.29 | 14.04 |
| 15 | 15 | 300 | 120.5 | 8.24 | 12.38 | 0.03 | 1.38 | 2.38 | 14.62 |



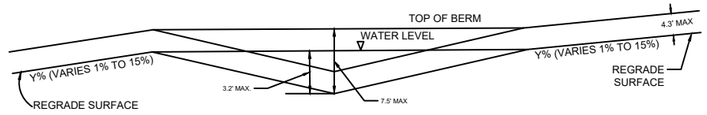

DIVERSION BERM
PARTIAL PLAN-SPOIL SIDE
N.T.S



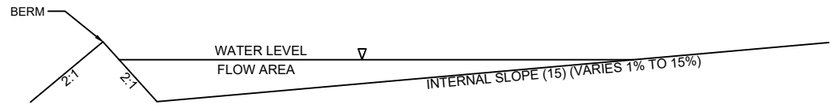

TYPICAL PROFILE
N.T.S




SECTION A-A' SPOIL SIDE
N.T.S




SECTION B-B' SPOIL SIDE
N.T.S




SIMILAR TO SECTION A-A'
N.T.S

NOTE:

1. THE SUPPORTING DESIGN DATA IS PRESENTED IN SECTION 25.4 AND APPENDIX 25.A

Navajo Transitional Energy Company

***Exhibit 25.4-1 (Sheet 1 of 2)***

| Date | Description | Drafted By: |
|---|---|---|
| 8-13-25 | Exhibit 25.4-1 (Sheet 1 of 2) | AE |
| | | |
| | | |
| | | |

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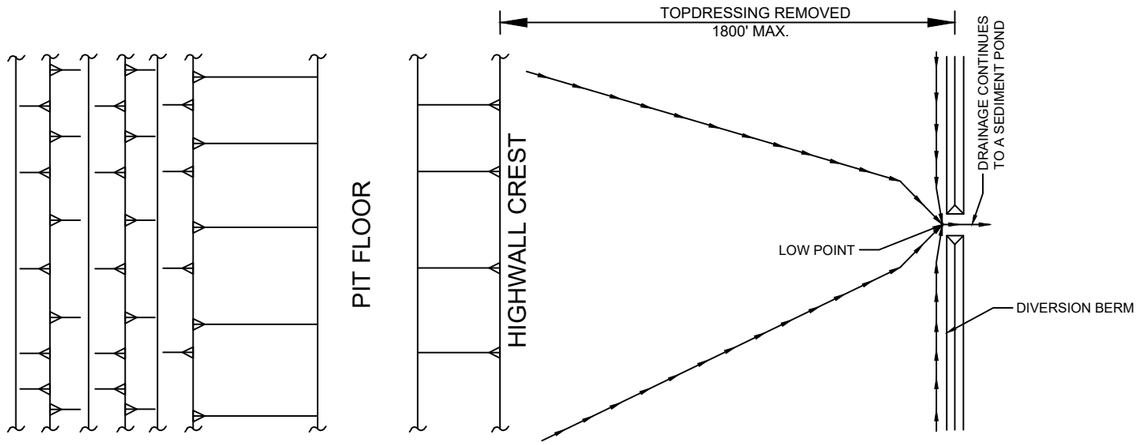
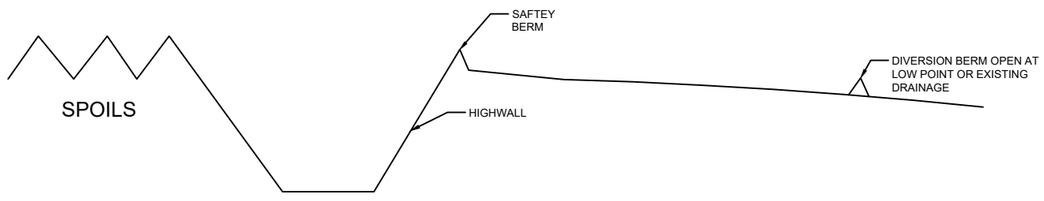
Layout: Layout1
Plot Date: Wednesday, August 13, 2025 4:17:40 PM

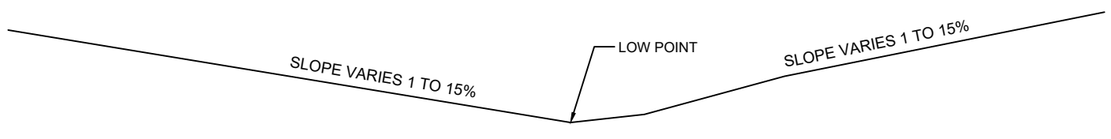
Revision




PARTIAL PLAN
HIGHWALL SIDE
N.T.S




SECTION A-A'
N.T.S




SECTION B-B'
N.T.S

NOTE:

1. THE SUPPORTING DESIGN DATA IS PRESENTED IN SECTION 25.4 AND APPENDIX 25.A.

Navajo Transitional Energy Company

***Exhibit 25.4-1 (Sheet 2 of 2)***

| Date | Description | Drafted By: |
|---|---|---|
| 8-13-25 | Exhibit 25.4-1 (Sheet 2 of2) | AE |
| | | |
| | | |
| | | |

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Revision