


**TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.**
**HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111**

November 23, 2020

Mr. Zach Trujillo  
 Environmental Protection Specialist  
 Colorado Division of Reclamation, Mining & Safety  
 Department of Natural Resources  
 1313 Sherman Street, Room 215  
 Denver, CO 80203

**RE: Colowyo Coal Company L.P.**  
**Permit No. C-1981-019**  
**Technical Revision No. 145**  
**South Taylor & West Pit Postmine Topography Revision**

Dear Mr. Trujillo,

Tri-State Generation and Transmission Association Inc. (Tri-State), is the parent company to Axial Basin Coal Company, which is the general partner to Colowyo Coal Company L.P. (Colowyo). Therefore, Tri-State on behalf of Colowyo is submitting technical revision 145 (TR-145) to Permit No. C-1981-019.

TR-145 proposes a revised post mine topography (PMT) for the South Taylor and West Pits. The revised PMT surface takes advantage of geomorphic reclamation techniques (Natural Regrade software) to design the PMT, which breaks up long continuous slopes with smaller watersheds, and adds sinuosity to the post mine permanent channels. Part of the final configuration of the PMT surface also targets topography to harvest wind and snow for future reestablishment of tall shrubs and aspens, which are required for the revegetation success of the South Taylor Pit.

The revised PMT presented under this TR-145 application, was presented on July 7, 2020 to the Division and impacted surface landowners including the BLM-Little Snake Field Office and Colorado State Land Board. The PMT presented to the group during that meeting is reflected within the maps included in TR-145. Any feedback that was provided by all agencies during the meeting has been included in the final materials submitted.

Also included in this technical revision are a proposed public notice, and a change of index sheet to ease incorporation of this technical revision into the permit document. If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 824-1232 at your convenience.

Sincerely,

DocuSigned by:

*Daniel Casiraro*

B70D69F114324DE...

Daniel J. Casiraro  
 Senior Manager  
 Environmental Services



November 23, 2020

Page 2

DJC:TT:der

Enclosure

cc: Jennifer Maiolo (BLM-LSFO)  
Chris Gilbreath (via email)  
Tony Tennyson (via email)  
Angela Aalbers (via email)  
File: C. F. 1.1.2.127 - G471-11.3(21)d

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## CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Date: **November 16, 2020**

Permit Number: **C-1981-019**

Revision Description: **TR-145 West Pit and South Taylor PMT Revision**

| Volume Number | Page, Map or other Permit Entry to be REMOVED                         | Page, Map or other Permit Entry to be ADDED                                                                               | Description of Change                                                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1             | List of Maps Page x (1 page)                                          | List of Maps Page x (1 page)                                                                                              | List of Maps has been updated.                                                                                                                                                                                        |
| 2A            |                                                                       |                                                                                                                           | No Change                                                                                                                                                                                                             |
| 2B            | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                     | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                                                                         | Exhibit 7 TOC has been updated.                                                                                                                                                                                       |
| 2C            | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                     | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                                                                         | Exhibit 7 TOC has been updated.                                                                                                                                                                                       |
| 2C            | Pages Exh. 7-14-6 and 7-14-7 (2 pages)                                | Page Exh. 7-14-6 (1 page)                                                                                                 | Exhibit 7 Item 14 Table 1 has been updated.                                                                                                                                                                           |
| 2C            | Appendix Exh. 7-14B Page Exh. 7-14B-2 (1 page)                        | Appendix Exh. 7-14B Page Exh. 7-14B-2 (1 page)                                                                            | Exhibit 7-14B table has been updated.                                                                                                                                                                                 |
| 2C            | Appendix Exh. 7-14C-1 through Exh. 7-14C-16 (16 pages)                |                                                                                                                           | Exhibit 7-14C has been consolidated into Appendix Exh. 7-14ET.                                                                                                                                                        |
| 2C            | Appendix Exh. 7-14D All Pages                                         |                                                                                                                           | Section 16 Fill Ditch has been consolidated in Appendix Exh. 7-14S.                                                                                                                                                   |
| 2C            | Appendix Exh. 7-14I All Pages                                         |                                                                                                                           | Appendix Exh. 7-14I has been consolidated into Appendix Exh. 7-14C.                                                                                                                                                   |
| 2C            | Appendix Exh. 7-14L Pages Exh. 7-14L-1 through Exh. 7-14L-8 (8 pages) |                                                                                                                           | Appendix Exh. 7-14L has been consolidated into Appendix Exh. 7-14C.                                                                                                                                                   |
| 2D            | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                     | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                                                                         | Exhibit 7 TOC has been updated.                                                                                                                                                                                       |
| 2D            | Exhibit 7 Pages 1 through 16 (16 pages)                               | Exhibit 7 Pages 1 through 14 (14 pages)                                                                                   | Exhibit 7 Intro has been updated. Exhibit 7 Table 6 is being removed from the permit as all information conveyed on the table is provided in each permit section for each pond or through annual impoundment reports. |
| 2D            | Streeter Pond All pages                                               | Pages Exh. 7-14SP-1 through Exh. 7-14SP-3 (3 pages), Figures Exh. 7-14SP-1 and 2 (2 pages), and SEDCAD outputs (72 pages) | Appendix Exh. 7-14SP has been updated.                                                                                                                                                                                |
| 2E            | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                     | Pages Exh. 7-14TOC-1 and Exh. 7-14TOC-2 (2 pages)                                                                         | Exhibit 7 TOC has been updated.                                                                                                                                                                                       |

## CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Permit Number: **C-1981-019**

Date: **November 16, 2020**

Revision Description: **TR-145 West Pit and South Taylor PMT Revision**

| Volume Number | Page, Map or other Permit Entry to be REMOVED     | Page, Map or other Permit Entry to be ADDED                                                                                       | Description of Change                                                                                                                 |
|---------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 2E            | East Taylor Pond (All Pages)                      | Appendix Exh. 7-14ET, Pages Exh. 7-ET-1 through 5 (5 pages), Figures Exh. 7-14ET-1 through 3 (3 pages), SEDCAD Outputs (72 Pages) | East Taylor Pond and channel models has been updated.                                                                                 |
| 2E            | Figures Exh. 7-14PP-1 and Exh. 7-14PP-2 (2 pages) | Figures Exh. 7-14PP-1 and Exh. 7-14PP-2 (2 pages)                                                                                 | Proposed Pond Subwatershed S has been revised. The acreage from the subwatershed did not change, therefore the model was not revised. |
| 2E            | Section 16 Pond (All Pages)                       | Appendix Exh. 7-14S, Pages Exh. 7-14S-1 through 4 (4 pages), Figures Exh. 7-14S-1 and 2 (2 pages), SEDCAD Outputs (34 Pages)      | Section 16 Pond and channel models have been updated.                                                                                 |
| 3             |                                                   |                                                                                                                                   | No Change                                                                                                                             |
| 4             |                                                   |                                                                                                                                   | No Change                                                                                                                             |
| 4             |                                                   |                                                                                                                                   | No Change                                                                                                                             |
| 5A            |                                                   |                                                                                                                                   | No Change                                                                                                                             |
| 5B            |                                                   |                                                                                                                                   | No Change                                                                                                                             |
| 6             | List of Maps Page 2 (1 page)                      | List of Maps Page 2 (1 page)                                                                                                      | List of Maps has been updated.                                                                                                        |
| 7             | List of Maps Page 2 (1 page)                      | List of Maps Page 2 (1 page)                                                                                                      | List of Maps has been updated.                                                                                                        |
| 7             | Map 19                                            | Map 19                                                                                                                            | Map 19 has been updated                                                                                                               |
| 7             | Map 12                                            | Map 12                                                                                                                            | Map 12 has been updated.                                                                                                              |
| 8             | List of Maps Page 2 (1 page)                      | List of Maps Page 2 (1 page)                                                                                                      | List of Maps has been updated.                                                                                                        |
| 8             | Map 29                                            | Map 29                                                                                                                            | Map 29 has been updated.                                                                                                              |
| 9             | List of Maps Page 2 (1 page)                      | List of Maps Page 2 (1 page)                                                                                                      | List of Maps has been updated.                                                                                                        |
| 9             | Map 33A                                           | Map 33A                                                                                                                           | Map 33A has been updated.                                                                                                             |
| 10            | List of Maps Page 2 (1 page)                      | List of Maps Page 2 (1 page)                                                                                                      | List of Maps has been updated.                                                                                                        |
| 12            | List of Maps page ix (1 page)                     | List of Maps page ix (1 page)                                                                                                     | List of Maps has been updated.                                                                                                        |

## CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Permit Number: **C-1981-019**

Date: **November 16, 2020**

Revision Description: **TR-145 West Pit and South Taylor PMT Revision**

| Volume Number | Page, Map or other Permit Entry to be REMOVED       | Page, Map or other Permit Entry to be ADDED                                                                                                         | Description of Change                                                                                                                                            |
|---------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12            | South Taylor/Lower Wilson page ix (1 page)          | South Taylor/Lower Wilson page ix (1 page)                                                                                                          | List of Maps has been updated.                                                                                                                                   |
| 12            | Rule 4, Pages 7 and 8 (2 pages)                     | Rule 4, Pages 7 and 8 (2 pages)                                                                                                                     | Section 4.09 has been updated. Citation has been updated.                                                                                                        |
| 13            | Page Exh. 7-20-ii (1 page)                          | Page Exh. 7-20-i (1 page)                                                                                                                           | Exhibit 7 Table of Contents has been updated.                                                                                                                    |
| 13            | Page Exh. 7-20-1 and 7-20-2 (2 pages)               |                                                                                                                                                     | Exhibit 7 Item 20 Intro and Table 4 are being removed from the permit as all information is presented in Volume 2D or in the narrative for each individual pond. |
| 13            | Exhibit 7 Item 20 Figures 1A-3 and 1C-3A (2 pages)  |                                                                                                                                                     | West Taylor and Section 28 Pond as-builts have been renumbered and moved into the appropriate part of Exhibit 7 Item 20.                                         |
| 13            | Exhibit 7 Item 20 Part A All pages (26 total pages) | Exhibit 7 Item 20 Pages Exh. 7-20A-1 an Exh. 7-20A-2 (2 pages), Figures 7-20A-1 and 7-20A-2 (2 pages), and SEDCAD Outputs 24 pages (28 total pages) | Exhibit 7 Item 20 Part A Section 28 Pond model has been updated.                                                                                                 |
| 13            | Exhibit 7 Item 20 Part C                            | Exhibit 7 Item 20 Page Exh. 7-20B-1 through Exh. 7-20B-4 (4 pages), Figures 7-20B-1 though 7-20B-3 (3 pages), and SEDCAD Outputs (103 total pages)  | Exhibit 7 Item 20 Part C West Taylor Pond model has been updated and moved into Exhibit 7 Item 20 Part B.                                                        |
| 13            | Exhibit 7 Item 20 Part D all pages                  |                                                                                                                                                     | Exhibit 7 Item 20 Part D has been moved to Exhibit 7 Item 20 Part A.                                                                                             |
| 13            | Exhibit 7 Item 20 Part E all pages (25 pages)       |                                                                                                                                                     | All information on the post mine channels has been moved to be within the applicable sediment pond watershed they will be constructed in post mine.              |
| 13            | Exhibit 7 Item 20 Part G all pages (8 pages)        |                                                                                                                                                     | All information on the terrace ditches has been moved to be within the applicable sediment pond watershed they will be constructed in post mine.                 |
| 14            | List of Maps Page 2 (1 page)                        | List of Maps Page 2 (1 page)                                                                                                                        | List of Maps has been updated.                                                                                                                                   |
| 14            | Map 20B                                             | Map 20B                                                                                                                                             | Map 20B has been updated.                                                                                                                                        |

## CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Permit Number: **C-1981-019**

Date: **November 16, 2020**

Revision Description: **TR-145 West Pit and South  
Taylor PMT Revision**

| Volume<br>Number | Page, Map or other Permit<br>Entry to be<br>REMOVED | Page, Map or other Permit<br>Entry to be<br>ADDED | Description of Change          |
|------------------|-----------------------------------------------------|---------------------------------------------------|--------------------------------|
| 14               | Map 33B                                             | Map 33B                                           | Map 33B has been updated.      |
| 14               | Map 44                                              | Map 44                                            | Map 44 has been updated.       |
| 14               | Map 45                                              | Map 45                                            | Map 45 has been updated.       |
| 15               | List of Maps Page xii (1 page)                      | List of Maps Page xii (1 page)                    | List of Maps has been updated. |
| 16               |                                                     |                                                   | No Change                      |
| 17               |                                                     |                                                   | No Change                      |
| 18A              |                                                     |                                                   | No Change                      |
| 18B              |                                                     |                                                   | No Change                      |
| 18C              |                                                     |                                                   | No Change                      |
| 18D              |                                                     |                                                   | No Change                      |
| 19               |                                                     |                                                   | No Change                      |
| 20               |                                                     |                                                   | No Change                      |
| 21               | List of Maps Page 2 (1 page)                        | List of Maps Page 2 (1 page)                      | List of Maps has been updated. |
| 22               | List of Maps Page 2 (1 page)                        | List of Maps Page 2 (1 page)                      | List of Maps has been updated. |

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**Exhibit 7**  
**Hydrology Information**

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- 1) Ground Water Quality Colowyo Coal Mine, Leonard Rice Consulting Water Engineers, Inc., 1979
- 6) Hydrologic and Erosional Characteristics of Regraded Surface Coal Mined Land in Colorado, Striffler and Rhodes, 1981
- 7) Modification of both Surface Water Monitoring and Alluvial Groundwater Monitoring Locations, 1991
- 8) Geotechnical Assessment East Taylor Pond, CTL/Thompson, Inc. 1995
- 9) Haulroad Culvert Redesign, 1997
- 10) Stoker Crusher Ditch, 1997
- 12) Section 16 Taylor Ditch, 1997
- 14) Lower Administration Building Small Area Exemption
- 15) Haul Road A Upper and Lower Ditches

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Summary Text  
Appendix Exh. 7-14A Emergency Spillway Outslope Channel Designs  
Appendix Exh. 7-14B Side Channel Designs (Temporary)  
Appendix Exh. 7-14E Streeter Gulch and Buckskin Draw Ditches (Permanent)  
Appendix Exh. 7-14F Coal Road Ditch  
Appendix Exh. 7-14P Small Area Exemption  
Appendix Exh. 7-14R East Pit Reclamation Area, Prospect Ditch, North Trib East Pit  
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- 15) Stability Evaluation, Existing Sedimentation Pond Embankments, CTL/Thompson Inc.  
1998
- 16) Adjudicated and permitted surface and groundwater locations within 1 mile of the Permit  
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- 18) Gulch A Small Area Exemption

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Introductory Text - Methodologies and Assumptions for Sediment Pond Design  
Appendix Exh. 7-14SP Streeter Pond  
Work Area Pond  
Gossard Pond  
Stoker Siding Pond  
Rail Loop Pond

**Volume 2E**

Prospect Pond  
West Pit Pond  
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Appendix Exh. 7-14ET East Taylor Pond  
Taylor Pump Pond

**(Note: For hydrology information in the South Taylor Area, See Volume 13, Exhibit 7 Item 20 and for the Collom Area, See Volumes 18B through 18D.)**

**Exhibit 7**  
**Hydrology Information**

**Volume 2B**

- 1) Ground Water Quality Colowyo Coal Mine, Leonard Rice Consulting Water Engineers, Inc., 1979
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**Volume 2C**

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Appendix Exh. 7-14F Coal Road Ditch  
Appendix Exh. 7-14P Small Area Exemption  
Appendix Exh. 7-14R East Pit Reclamation Area, Prospect Ditch, North Trib East Pit  
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- 16) Adjudicated and permitted surface and groundwater locations within 1 mile of the Permit  
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- 18) Gulch A Small Area Exemption

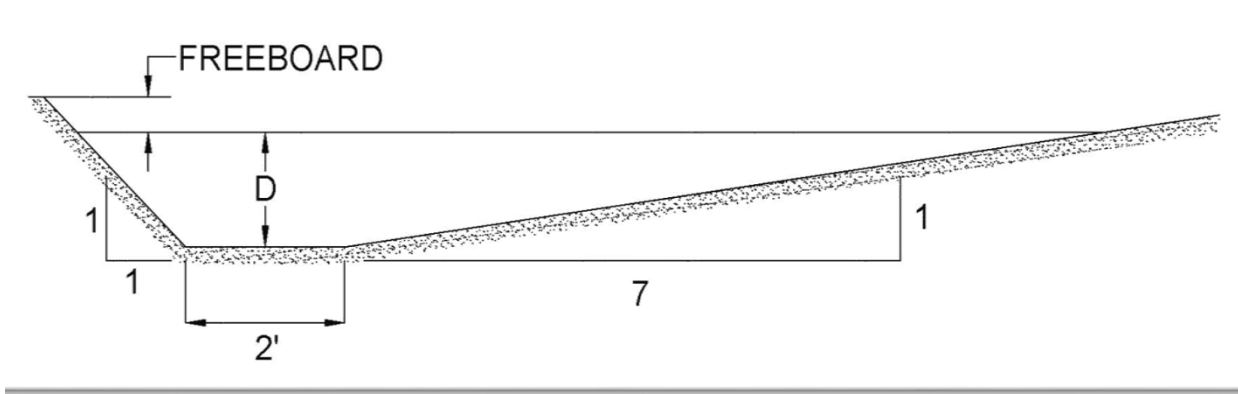
**Volume 2D**

Introductory Text - Methodologies and Assumptions for Sediment Pond Design  
Appendix Exh. 7-14SP Streeter Pond  
Work Area Pond  
Gossard Pond  
Stoker Siding Pond  
Rail Loop Pond

**Volume 2E**

Prospect Pond  
West Pit Pond  
Appendix Exh. 7-14S Section 16 Pond  
Appendix Exh. 7-14ET East Taylor Pond  
Taylor Pump Pond

**(Note: For hydrology information in the South Taylor Area, See Volume 13, Exhibit 7 Item 20 and for the Collom Area, See Volumes 18B through 18D.)**



**Typical Temporary Side Channel<sup>1</sup>**

| Channel                        | Channel Section |       | Slope (%) | Flow (cfs)       | Depth of Flow (D) (ft) | Freeboard (ft) | Total Depth (ft) | Velocity (fps) |
|--------------------------------|-----------------|-------|-----------|------------------|------------------------|----------------|------------------|----------------|
|                                | From            | To    |           |                  |                        |                |                  |                |
| South Collection Ditch         | 100+00          | 90+00 | 3.0%      | 0.0              | 0.2                    | 0.3            | 0.5              | 3.0            |
|                                | 90+00           | 50+00 | 3.0%      | 0.0              | 0.2                    | 0.3            | 0.5              | 3.0            |
|                                | 50+00           | 30+00 | 5.0%      | 0.0              | 0.2                    | 0.3            | 0.5              | 3.0            |
|                                | 30+00           | 0+00  | 5.0%      | 46.4             | 0.9                    | 0.3            | 1.2              | 8.9            |
| Prospect East Collection Ditch | 16+50           | 0+00  | 3.0%      | 0.0 <sup>2</sup> | 0.2                    | 0.3            | 0.5              | 3.0            |
| Stoker Ditch                   |                 |       | 3.0%      | 0.0 <sup>2</sup> | 0.2                    | 0.3            | 0.5              | 3.0            |
| Streeter Side Ditch            | 33+00           | 0+00  | 3.0%      | 0.0 <sup>2</sup> | 0.2                    | 0.3            | 0.5              | 3.0            |

<sup>1</sup> This table presents historical information only. Ditches previously listed on this table, but never constructed have been removed to match as-built conditions at the Colowyo mine site.

<sup>2</sup> Minimum Flow of 1 cfs used to size temporary side channels where no flow is predicted for the post-mine drainage conditions.

**Exhibit 7, Item 14, Table 1**  
**Summary of Ditch and Channel Design Parameters**

|          |                                                                                                           |                |                 |                     |                         |                         |
|----------|-----------------------------------------------------------------------------------------------------------|----------------|-----------------|---------------------|-------------------------|-------------------------|
| Exh7-14A | <b>Emergency Spillway Designs</b>                                                                         | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Streeter Pond Spillway                                                                                    | 29.7           | 8               | 20.0                | 1.5                     | 9                       |
|          | Work Area Pond Spillway                                                                                   | 0.0            | 8               | 15.0                | 1.5                     | NA                      |
|          | Stoker Siding Pond Spillway                                                                               | 0.0            | 50              | 5.0                 | 2.0                     | NA                      |
|          | Rail Loop Pond Spillway                                                                                   | 0.0            | 50              | 7.0                 | 2.0                     | NA                      |
|          | Prospect Pond Spillway                                                                                    | 3.0            | 33              | 12.0                | 1.5                     | 9                       |
|          | West Pit Pond Spillway                                                                                    | 0.0            | 33              | 20.0                | 1.5                     | NA                      |
|          | Section 16 Pond Spillway                                                                                  | 2.4            | 33              | 19.0                | 2.0                     | 9                       |
|          | East Taylor Pond Spillway                                                                                 | 3.7            | 40              | 20.0                | 2.0                     | 9                       |
|          | <b>Side Channel Designs (Temporary)</b>                                                                   | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Please see Appendix Exh. 7-14B in Volume 2C                                                               |                |                 |                     |                         |                         |
|          | <b>Taylor, East Taylor, and Taylor Trib Ditches</b>                                                       | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Please see Appendix Exh. 7-14ET in Volume 2E                                                              |                |                 |                     |                         |                         |
|          | <b>Section 16 Fill Ditch</b>                                                                              | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Please see Appendix Exh. 7-14S in Volume 2E                                                               |                |                 |                     |                         |                         |
|          | <b>Streeter Gulch Ditch &amp; Buckskin Draw Ditch</b>                                                     | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Please see Appendix Exh. 7-14SP in Volume 2D                                                              |                |                 |                     |                         |                         |
|          | <b>West Pit Fill Ditch &amp; East Taylor Pond Ditch</b>                                                   | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
| Exh7-14F | (All segments ex. Coal Road Ditch designed for 100 yr storm; WP Coal Rd Ditch designed for 10 year storm) |                |                 |                     |                         |                         |
|          | West Pit Fill Ditch, Sta 0 to 2                                                                           | 169.9          | 17.0            | 10.0                | 3.0                     | 21                      |
|          | West Pit Fill Ditch, Sta 2 to 10                                                                          | 158.2          | 25.0            | 10.0                | 3.0                     | 24                      |
|          | West Pit Fill Ditch, Sta 10 to 31                                                                         | 108.0          | 10.0            | 10.0                | 3.0                     | 12                      |
|          | West Pit Coal Road Ditch, Sta 0 to 21                                                                     | 19.2           | 10.0            | 10.0                | 3.0                     | Veg.                    |
|          | East Taylor Pond Ditch, Sta 0 to 30                                                                       | 50.2           | 3.5             | 0.0                 | 3.0                     | Veg.                    |
|          |                                                                                                           |                |                 |                     |                         |                         |
|          | <b>Section 16 Pond Ditch Extension</b>                                                                    | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Please see Appendix Exh. 7-14S in Volume 2E                                                               |                |                 |                     |                         |                         |
| Exh7-14R | <b>East Pit Reclamation Areas</b>                                                                         | <b>Flow, Q</b> | <b>Slope, %</b> | <b>Bottom Width</b> | <b>Side Slope, H:1V</b> | <b>Rip Rap, D50, in</b> |
|          | Prospect Ditch Reach 1 to Sta 1+50                                                                        | 10.0           | 10.7            | 12                  | 2                       | n/a; veg.               |
|          | Prospect Ditch, Sta 1+50 to PD-1                                                                          | 4.4            | 28.2            | 12                  | 2                       | n/a; veg.               |
|          | Prospect Ditch, above Pond PD-1                                                                           | 4.1            | 12-15           | 12                  | 2                       | n/a; veg.               |
|          | N. Trib. East Pit Ditch Reach 1                                                                           | 10.2           | 21              | 12                  | 2                       | n/a; veg.               |
|          | N. Trib. East Pit Ditch Reach 2                                                                           | 11.9           | 10 - 13         | 12                  | 2                       | 6                       |
|          | Final East Pit Ditch all 3 Reaches                                                                        | 5.9-27.2       | 4-16.8          | 12                  | 2                       | 6                       |
|          |                                                                                                           |                |                 |                     |                         |                         |
|          | Combined NTEP/Final E Pit Ditch                                                                           | 35.4           | 24              | 12                  | 2                       | 9                       |

**Note: For permanent and secondary channels in the South Taylor area please see the West Taylor and Section 28 Pond models.**

Revision Date: 11/16/20  
Revision No. TR-145

**Exhibit 7**  
**Hydrology Information**

**Volume 2B**

- 1) Ground Water Quality Colowyo Coal Mine, Leonard Rice Consulting Water Engineers, Inc., 1979
- 6) Hydrologic and Erosional Characteristics of Regraded Surface Coal Mined Land in Colorado, Striffler and Rhodes, 1981
- 7) Modification of both Surface Water Monitoring and Alluvial Groundwater Monitoring Locations, 1991
- 8) Geotechnical Assessment East Taylor Pond, CTL/Thompson, Inc. 1995
- 9) Haulroad Culvert Redesign, 1997
- 10) Stoker Crusher Ditch, 1997
- 12) Section 16 Taylor Ditch, 1997
- 14) Lower Administration Building Small Area Exemption
- 15) Haul Road A Upper and Lower Ditches

**Volume 2C**

- 14) Emergency Spillway, Temporary and Permanent Channel Designs, Existing Structures  
Summary Text  
Appendix Exh. 7-14A Emergency Spillway Outslope Channel Designs  
Appendix Exh. 7-14B Side Channel Designs (Temporary)  
Appendix Exh. 7-14E Streeter Gulch and Buckskin Draw Ditches (Permanent)  
Appendix Exh. 7-14F Coal Road Ditch  
Appendix Exh. 7-14P Small Area Exemption  
Appendix Exh. 7-14R East Pit Reclamation Area, Prospect Ditch, North Trib East Pit  
Ditch, Final East Pit Ditch
- 15) Stability Evaluation, Existing Sedimentation Pond Embankments, CTL/Thompson Inc.  
1998
- 16) Adjudicated and permitted surface and groundwater locations within 1 mile of the Permit  
boundary
- 18) Gulch A Small Area Exemption

**Volume 2D**

Introductory Text - Methodologies and Assumptions for Sediment Pond Design  
Appendix Exh. 7-14SP Streeter Pond  
Work Area Pond  
Gossard Pond  
Stoker Siding Pond  
Rail Loop Pond

**Volume 2E**

Prospect Pond  
West Pit Pond  
Appendix Exh. 7-14S Section 16 Pond  
Appendix Exh. 7-14ET East Taylor Pond  
Taylor Pump Pond

**(Note: For hydrology information in the South Taylor Area, See Volume 13, Exhibit 7 Item 20 and for the Collom Area, See Volumes 18B through 18D.)**

## **METHODOLOGIES AND ASSUMPTIONS FOR SEDIMENTATION POND EVALUATIONS**

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The hydrologic calculations used to model all of the Colowyo's sedimentation ponds and the Taylor Pump Holding Pond, were performed using the SEDCAD4 computer modeling program developed by Civil Software Design. The results of the SEDCAD4 analyses are presented as attachments in each of the individual pond design sections.

The general procedures described herein will be used for all future hydrologic designs for ponds, ditches, and other facilities to be constructed at the Colowyo Mine.

### **1.0 HYDROLOGIC AND HYDRAULIC CALCULATIONS**

SEDCAD4 is a comprehensive, computer-based model used to evaluate storm water, erosion, and sediment control management techniques. The SEDCAD4 model calculates run-off and peak flow via a numerical modeling technique based on user inputs of a design storm event (i.e., rainfall amount and duration, selection of rainfall distribution, and convolution increment). Hydrographs are developed on a sub-watershed basis with the input of area, time of concentration, SCS Curve Number, and the selection of 1 of 3 dimensionless double triangle unit hydrograph shapes. Routing of hydrographs is accomplished by Muskingum's Method.

Inputs to the hydrology component of the SEDCAD4 computer model include:

- Precipitation Distribution
- Storm Duration
- Return Period/Precipitation
- Hydrograph Response Shape
- Drainage Basin Area
- Time of Concentration
- Muskingum Routing Parameters
- Curve Number
- Base Flow

Input values are shown on the SEDCAD4 printouts included as attachments in each of the individual pond sections, and are explained in more detail below.

#### **1.1 PRECIPITATION DISTRIBUTION**

A precipitation distribution is input to model the run-off hydrograph. SEDCAD4 allows the user to choose between the SCS Type I, Type IA, Type II, Type III, and user-defined storm unit mass curves. The Type II distribution is input as the most accurate reflection of area storm patterns.

#### **1.2 STORM DURATION**

A storm duration of 24 hours is used for the design and evaluation of the Colowyo ponds.

### **1.3 RETURN PERIOD/PRECIPITATION**

A precipitation amount is required for the appropriate return period. The following return periods and precipitation events are used for the Colowyo Mine:

|                               |        |
|-------------------------------|--------|
| 10-year, 24-hour storm event  | 1.8 in |
| 25-year, 24-hour storm event  | 2.3 in |
| 100-year, 24-hour storm event | 2.7 in |

### **1.4 HYDROGRAPH RESPONSE SHAPE**

A unit hydrograph is chosen for each drainage area or sub-area modeled to predict the run-off response. The hydrograph responses available in the SEDCAD4 model are slow, medium, and fast. A slow response corresponds to a forested area or an area with a number of obstructions. A fast response corresponds to an un-vegetated or poorly protected area. Medium and fast hydrograph responses are considered as most representative for mine areas.

The internal convolution increment is 0.05 hours, and values are saved at the user-specified interval of 0.1 hours or greater. A convolution increment of 0.1 is specified. It should be noted that a time of concentration less than 0.125 hours bypasses the unit hydrograph technique and instantaneous run-off is assumed. As explained in the SEDCAD4 User's Manual (Schwab and Warner, 1998), the time of concentration restriction of 0.125 hours is dictated by a combination of array size restrictions, minimum internal convolution interval, and the user-specified time increment for saving convolution values.

### **1.5 DRAINAGE BASIN AREA**

Drainage basin areas are determined for each pond from scaled topographic drawings. In many cases determination of the “worst case” condition with respect to volume of runoff has to be determined by examining several stages of the mining operation. The final post-mining topography would usually be expected to produce the largest volume or runoff as the entire watershed is contributing to the runoff by this stage, and is always evaluated but may not control the design. Watershed (or sub-watershed) areas are delineated consistent with four general categories representing various stages of reclamation and disturbance. The watershed or sub-watershed delineations reflect anticipated disturbance/reclamation status based on Colowyo’s current mining and reclamation plans.

### **1.6 TIME OF CONCENTRATION, $T_c$**

The time of concentration is calculated using the SCS upland method (Soil Conservation Service, 1986) as incorporated into the SEDCAD software. The hydraulic lengths, drainage heights and associated slopes are determined from topographic drawings. The values calculated for each structure are shown on a sub-watershed basis in the SEDCAD4 printouts.

### **1.7 MUSKINGUM ROUTING PARAMETERS, K, X**

The Muskingum Routing Parameters are also calculated using the SCS upland method. The hydraulic lengths, drainage heights and associated slopes are determined from topographic drawings. The values calculated between each structure and/or sub-watershed are shown in the SEDCAD4 printouts.

### **1.8 CURVE NUMBER, CN**

The runoff curve number is a factor relating the amount of rainfall to the amount of runoff for a given area. Curve numbers were jointly developed and agreed upon by the Division and Colowyo.

The curve number for the undisturbed lands is selected as Hydrologic Soil Group (HSG) “C” based on the pre-mining mapped soils in the county SCS soil maps.

For disturbed lands the use of mapped SCS soil groups is not appropriate. Instead, Section 630.0702 “Disturbed Soils” in Chapter 7 of Part 630 of the NRCS National Engineering Handbook (NEH) recommends that onsite investigations should be made to determine the HSG, including on-site infiltration tests, grain size characteristics and lab permeability tests. A program meeting these requirements was carried out and reported in Striffler and Rhodes (1981), and it included tests performed at the Colowyo mine, as well as ten other Colorado coal mines.

All of the infiltration tests performed at the Colowyo Mine reported in Table C-5 of that study indicated infiltration rates well in excess of a “C” soil, and in all cases except one reflected rates that would be associated with a HSG “A” soil. That exceptional case indicated infiltration rate between HSG “A” and HSG B” soils. The selection of HSG”B” for the disturbed lands is therefore a conservative assumption, more likely to overestimate than to underestimate runoff rates.

With the HSG determined as described above for undisturbed and disturbed land, the CN is then determined based on the land cover condition as described in numerous hydrologic references, all ultimately based on NEH cover and condition tables.

The resulting hydrologic curve numbers (CN) for use in SEDCAD for the various categories of land at the mine are presented below in Table 1. Table 7 provides a scanned image of published curve numbers typical for disturbed areas; these values will not be used directly but are only provided to support to Table 1. Table 8 provides a similar listing from the National Engineering Handbook (NEH-4) (USDA-SCS, 1985); these values are included within the drop down menus of the SEDCAD model. Of the several tables included here as Table 8, the last table presented here in Table 8 is applies to Range lands in arid and semi-arid areas, and is the most appropriate set of Curve Numbers for the Colowyo Mine applications. Values in Table 8 will not be used directly but are provided to support the values presented below in Table 1.

| <b>TABLE 1 – SCS CURVE NUMBERS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                        |                                 |                                   |                                |                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------|-----------------------------------|--------------------------------|-------------------------|
| <b>COVER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>COVER TYPE</b>                      | <b>HYDROLOGIC<br/>CONDITION</b> | <b>PERCENT<br/>VEG.<br/>COVER</b> | <b>HYD.<br/>SOIL<br/>GROUP</b> | <b>CURVE<br/>NUMBER</b> |
| Undisturbed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Mountain Shrub                         | Good                            | 85                                | C                              | <b>61</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Oak-Aspen                              | Good to Fair                    | 50-85                             | C                              | <b>57</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Sagebrush                              | Good                            | 50                                | C                              | <b>47</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Sagebrush                              | Fair                            | 50                                | C                              | <b>63</b>               |
| Disturbed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Topsoil Stripped Roads                 | Bare                            | N/A                               | B                              | <b>85</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Spoil Piles & Active Pits <sup>1</sup> | Bare                            | N/A                               | B                              | <b>74</b>               |
| Reclaimed<br>(Excluding<br>Prospect Basin)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Topsoil & Seeded <sup>2</sup>          | Bare                            | N/A                               | B                              | <b>80</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 to 2 Year Growth <sup>3</sup>        | Fair to Good                    | 25-45                             | B                              | <b>74</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3+ Year Growth <sup>4</sup>            | Fair to Good                    | 70+                               | B                              | <b>62</b>               |
| Prospect Basin<br>Reclaimed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Topsoil & Seeded                       | Bare                            | N/A                               | B                              | <b>83</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 to 2 Year Growth                     | Fair to Good                    | 25-45                             | B                              | <b>77</b>               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3+ Year Growth                         | Fair to Good                    | 70+                               | B                              | <b>74</b>               |
| Phase III<br>Released                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10+ Year Growth                        | Fair to Good                    | 50                                | B                              | <b>47</b>               |
| <p>Sources: Table 8, attached, derived from National Engineering Handbook (NEH-4) (USDA-SCS, 1985)</p> <p>- Undisturbed lands are assumed HSG C, based on SCS county mapping units; except for Prospect drainage disturbed lands are HSG B based on measured infiltration rates reported in Striffler and Rhodes, 1981 in conjunction with Part 630 NEH, Chapter 7, <u>Hydrologic Soil Groups</u>. For Prospect Drainage, all CNs, disturbed and undisturbed, are generally assume HSG C.</p> <p>Notes: 1) This CN applies only to tributary portions of active pit area, which are significantly roughened and contain numerous large equipment induced local depressions. Active pit areas where all runoff is captured within the pit are not included in modeled runoff calculations. CNs for tributary active pit and spoil pile areas are considered as “Cultivated land, without conservation treatment” with HSG B, in Table 7</p> <p>2) CN based on an average of "Fallow, with Crop Residue, Poor Condition", Table 8, with 50% HSG A and 50% HSG B</p> <p>3) CN based on an average of “Pasture or Range, Fair Condition”, Table 7, with 50% HSG A and 50% HSG B</p> <p>4) CN based on an average of “Pasture or Range, Good Condition”, Table 7, with 50% HSG A and 50% HSG B, conservatively revised upward.</p> |                                        |                                 |                                   |                                |                         |

## 1.9 BASE FLOW

In some cases a fixed base flow is include in the flow reporting to a sediment pond. A description of the base flow for each pond is contained in the section narrative for each individual pond.

## 2.0 SEDIMENTATION CALCULATIONS

The sedimentation calculations for each pond on the Colowyo Mine are performed using the SEDCAD4 Computer Modeling Program developed by Civil Software Design. The SEDCAD4 Computer model is based on the Revised Universal Soil Loss Equation (RUSLE). The input parameters used in the sedimentation analyses are presented in the following sections.

### 2.1 RAINFALL FACTOR, R

A rainfall factor of 19 is used for the Colowyo mine site. This factor is consistent with other recent erosion analyses performed for the Colowyo Coal Company.

### 2.2 SOIL ERODIBILITY FACTOR, K

The soil erodibility factors for the Colowyo Mine are estimated based on soil survey information presented in the Colowyo Permit Application. Note that for historic models, an average of 0.28 was used for K. All current models will be based on a K value of 0.30.

| TABLE 2<br>SOIL ERODIBILITY FACTOR |              |                             |
|------------------------------------|--------------|-----------------------------|
| DOMINANT SOIL TYPE                 | SOIL TEXTURE | SOIL ERODIBILITY FACTOR (K) |
| Burnette Series                    | Loam         | 0.28                        |
| Work Series                        | Loam         | 0.31                        |
| Average                            |              | 0.30                        |

### 2.3 LENGTH-SLOPE FACTOR, LS

Input parameters to determine the LS factor were obtained from scaled maps of the watershed areas. Values measured from the scaled maps are shown in the SEDCAD4 printouts. Within disturbed subwatersheds, the representative length was capped at 400 feet. Lengths of drainage paths needed for the “LS” factor determination in the RUSLE option in SEDCAD are determined by tracing the flow path back to the subwatershed headwaters. In most cases this distance exceeds the nominal limit of 400 feet described in accepted references such as “Applied Hydrology and Sedimentology for Disturbed Areas”, 1985, by Barfield, Warner and Haan, making reference to the original 1965 Wischmeier and Smith USDA publication. In such cases the length of the watershed has been capped at 400 feet. This practice has been recommended based on personal conversations with Dr. Richard Warner, one of the developers of the SEDCAD program.

### 2.4 CONTROL FACTOR, C

The control factor is used to account for vegetative or mulch cover. The following values are utilized in the pond design evaluations (Renard *et al*, 1996) (Schwab and Warner, 1987):

| TABLE 3<br>CONTROL FACTOR |                      |                                                              |                |
|---------------------------|----------------------|--------------------------------------------------------------|----------------|
| COVER                     | COVER TYPE           | VEGETATION                                                   | CONTROL FACTOR |
| Undisturbed               | Mountain Shrub       | 75% canopy (0.5 m fall height),<br>40% ground cover          | 0.080          |
|                           | Oak-Aspen            | 50% canopy (2.0 m fall height),<br>40% ground cover          | 0.085          |
|                           | Sagebrush (good)     | 75% canopy (0.5 m fall height),<br>60% ground cover          | 0.031          |
|                           | Sagebrush (fair)     | 50% canopy (0.5 m fall height),<br>40% ground cover          | 0.070          |
| Disturbed                 | Topsoil Stripped     | No appreciable canopy or cover                               | 1.000          |
| Reclaimed                 | Topsoiled and Seeded | No appreciable canopy or cover                               | 0.800          |
|                           | 1 to 2 Year Growth   | Rangeland/Continuous Grass, no appreciable canopy, 70% cover | 0.070          |
|                           | 3+ Year Growth       | Rangeland/Continuous Grass, no appreciable canopy, 80% cover | 0.010          |

## 2.5 PRACTICE FACTOR, P

The practice factor is used to account for conservation practices for the watershed. The following values are utilized in the pond design evaluations (Renard *et al*, 1996) (Schwab and Warner, 1987):

| TABLE 4<br>PRACTICE FACTOR |                      |                  |                |
|----------------------------|----------------------|------------------|----------------|
| SURFACE                    | SURFACE TYPE         | PRACTICE         | CONTROL FACTOR |
| Undisturbed                | Mountain Shrub       | None             | 0.90           |
|                            | Oak-Aspen            | None             | 0.90           |
|                            | Sagebrush (good)     | None             | 0.90           |
|                            | Sagebrush (fair)     | None             | 0.90           |
| Disturbed                  | Topsoil Stripped     | None             | 0.90           |
| Reclaimed                  | Topsoiled and Seeded | Contour Furrowed | 0.38           |
|                            | 1 to 2 Year Growth   | Contour Furrowed | 0.38           |
|                            | 3+ Year Growth       | Contour Furrowed | 0.38           |

## 2.6 SEDIMENT PARTICLE DISTRIBUTION

A general sediment size consist was developed based on the weighted average of physical analysis data results for mine areas. The following grain size components were agreed upon between the DRMS and Colowyo:

|      |            |
|------|------------|
| Sand | 27 percent |
| Silt | 40 percent |
| Clay | 33 percent |

As input into the SEDCAD Model, the grains size curve is as follows:

|            |          |      |
|------------|----------|------|
| Finer than | 4.75 mm  | 100% |
|            | 0.075 mm | 73%  |
|            | 0.040 mm | 33%  |
|            | 0.001 mm | 20%  |

A sediment distribution was generated from the general size consist, as noted above, and input to the SEDCAD4 program. The resulting sediment distribution is shown on the SEDCAD4 printouts.

## 3.0 POND GEOMETRY INPUT PARAMETERS

Pond dimensions and input parameters are obtained from scaled drawings generated from pond as-built surveys. The input parameters are shown on the SEDCAD4 printouts.

## 4.0 POND CLASSIFICATIONS AND SPILLWAY EVALUATIONS

In order to address compliance with applicable provisions of Rules 4.05.9(2)(d), 4.05.9(2)(e), and 4.05.9(10), WWC completed an impoundment hazard analysis for all ponds to determine the hazard classification for each pond in accordance with the guidance provided by USDA- Soil Conservation Service Technical Release TR-60, "Earth Dams and Reservoirs". As part of the pond hazard analysis, the

adequacies of emergency spillway structures to meet applicable TR-60 discharge criteria and to maintain adequate freeboard to prevent overtopping were also evaluated. The TR-60 discharge criteria used in the emergency spillway capacity and freeboard evaluations are as follows:

- Discharge flow basis for emergency spillway capacity evaluation (for a Class B pond):
- 100-yr, 6-hr peak flow + 0.12 (PMP, 6-hr peak flow - 100-yr, 6-hr peak flow)
- Discharge flow basis for impoundment freeboard evaluation (for a Class B pond):
- 100-yr, 6-hr peak flow + 0.4 (PMP, 6-hr peak flow - 100-yr, 6-hr peak flow)

| <b>TABLE 5</b><br><b>IMPOUNDMENT HAZARD ANALYSIS SUMMARY</b>                                                                              |                                 |                                                         |                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------|-----------------------------------------------------------|
| IMPOUNDMENT                                                                                                                               | HAZARD CLASSIFICATION/BASIS     | SPILLWAY CAPACITY EVALUATION BASIS <sup>1</sup> /RESULT | FREEBOARD EVALUATION BASIS <sup>1</sup> /RESULT/FREEBOARD |
| Streeter Pond                                                                                                                             | B/Proximity to State Highway 13 | Class B/Ok                                              | Class B/Ok/0.25'                                          |
| Work Area Pond                                                                                                                            | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/1.55'                                          |
| Gossard Pond                                                                                                                              | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/6.46'                                          |
| Stoker Siding Pond                                                                                                                        | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/3.64'                                          |
| Rail Loop Pond                                                                                                                            | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/1.82'                                          |
| Prospect Pond                                                                                                                             | B/Proximity to State Highway 13 | Class B/Ok                                              | Class B/Ok/0.61'                                          |
| West Pit Pond                                                                                                                             | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/2.47'                                          |
| Section 16 Pond                                                                                                                           | B/Proximity to State Highway 13 | Class B/Ok                                              | Class B/Ok/0.96'                                          |
| East Taylor Pond                                                                                                                          | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/0.76'                                          |
| Taylor Pump Holding Pond                                                                                                                  | A/Agricultural Land             | Class B/Ok                                              | Class B/Ok/0.91'                                          |
| Notes: <sup>1</sup> Spillway capacity and freeboard for all ponds were evaluated for a uniform worst-case hazard classification (Class B) |                                 |                                                         |                                                           |

The results of the WWC impoundment hazard analysis indicate that emergency spillway capacities and available freeboard for all existing ponds are adequate to affect full compliance with applicable requirements under the guidelines of TR-60, based on the applicable hazard classifications. Given this confirmation of compliance, no modifications to the existing emergency spillway structures are required.

## 5.0 POND DESIGN EVALUATION RESULTS

The supporting SEDCAD4 analyses and watershed maps are presented as attachments in each of the individual pond design sections

## 6.0 REFERENCES

- Barfield, Warner, & Haan (1981). *“Applied Hydrology and Sedimentology for Disturbed Areas”*. Oklahoma Technical Press, Stillwater, OK.
- Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder (1996). “Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE)”. *Agricultural Handbook No. 703*. U.S. Department of Agriculture. Washington, DC.
- Schwab and Warner (1998). *“SEDCAD4 Users Manual”*. Civil Software Design. Lexington, KY.
- Soil Conservation Service (1986). *“Urban Hydrology for Small Watersheds (TR-55)”*. Soil Conservation Service. Washington, DC.
- Striffler and Rhodes (1981). “Hydrologic and Erosional Characteristics of Regraded Surface Coal Mined Lands in Colorado”, Dept. of Earth resources, Colorado State University, Ft. Collins, CO. (included in Vol 2B, Item 6 of the Colowyo Permit application)
- USDA (January 2009), National Resources Conservation Service, National Engineering Handbook (NEH), Chapter 7, “Hydrologic Soil Groups”

The curve number (CN) of an area indicates the runoff potential of the area. Table 2.20 gives the CN's for various land use and

Table 2.20 Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Land Use. (Antecedent Moisture Condition II).

| LAND USE DESCRIPTION                                           | HYDROLOGIC SOIL GROUP |    |    |    |
|----------------------------------------------------------------|-----------------------|----|----|----|
|                                                                | A                     | B  | C  | D  |
| Cultivated land <sup>1/</sup> : without conservation treatment | 72                    | 81 | 88 | 91 |
| : with conservation treatment                                  | 62                    | 71 | 78 | 81 |
| Pasture or range land: poor condition                          | 68                    | 79 | 86 | 89 |
| good condition                                                 | 39                    | 61 | 74 | 80 |
| Meadow: good condition                                         | 30                    | 58 | 71 | 78 |
| Wood or Forest land: thin stand, poor cover, no mulch          | 45                    | 66 | 77 | 83 |
| good cover <sup>2/</sup>                                       | 25                    | 55 | 70 | 77 |
| Open Spaces, lawns, parks, golf courses, cemeteries, etc.      |                       |    |    |    |
| good condition: grass cover on 75% or more of the area         | 39                    | 61 | 74 | 80 |
| fair condition: grass cover on 50% to 75% of the area          | 49                    | 69 | 79 | 84 |
| Commercial and business areas (85% impervious)                 | 89                    | 92 | 94 | 95 |
| Industrial districts (72% impervious).                         | 81                    | 88 | 91 | 93 |
| Residential: <sup>3/</sup>                                     |                       |    |    |    |
| Average lot size      Average % Impervious <sup>2/</sup>       |                       |    |    |    |
| 1/8 acre or less      65                                       | 77                    | 85 | 90 | 92 |
| 1/4 acre      38                                               | 61                    | 75 | 83 | 87 |
| 1/3 acre      30                                               | 57                    | 72 | 81 | 86 |
| 1/2 acre      25                                               | 54                    | 70 | 80 | 85 |
| 1 acre      20                                                 | 51                    | 68 | 79 | 84 |
| Paved parking lots, roofs, driveways, etc. <sup>3/</sup>       | 98                    | 98 | 98 | 98 |
| Streets and roads:                                             |                       |    |    |    |
| paved with curbs and storm sewers <sup>2/</sup>                | 98                    | 98 | 98 | 98 |
| gravel                                                         | 76                    | 85 | 89 | 91 |
| dirt                                                           | 72                    | 82 | 87 | 89 |

<sup>1/</sup> For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

<sup>2/</sup> Good cover is protected from grazing and litter and brush cover soil.

<sup>3/</sup> Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

<sup>2/</sup> The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

<sup>3/</sup> In some warmer climates of the country a curve number of 95 may be used.

Table 7 Scanned image of Table 2.20 from "Applied Hydrology and Sedimentology for Disturbed Areas", Barfield, B.J., Warner, R. C., and Haan, C. T., Oklahoma Technical Press, Fourth Printing, 1987.

**Table 8                      Curve Numbers Provided in the SEDCAD model (from National Engineering Handbook (NEH-4) (USDA-SCS, 1985))**

| Runoff Curve Numbers for Urban Areas                                                                                                                                                                                                                                                                                                                                                 |                                 |    |    |    |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----|----|----|----|
| Cover Type and Hydrologic Condition                                                                                                                                                                                                                                                                                                                                                  | Average Percent Impervious Area | A  | B  | C  | D  |
| Open space (lawns, parks, golf courses, cemeteries, etc.)                                                                                                                                                                                                                                                                                                                            |                                 |    |    |    |    |
| ◆ Poor condition (grass cover < 50%)                                                                                                                                                                                                                                                                                                                                                 |                                 | 68 | 79 | 86 | 89 |
| ◆ Fair condition (grass cover 50% to 75%)                                                                                                                                                                                                                                                                                                                                            |                                 | 49 | 69 | 79 | 84 |
| ◆ Good condition (grass cover > 75%)                                                                                                                                                                                                                                                                                                                                                 |                                 | 39 | 61 | 74 | 80 |
| Paved parking lots, roofs, driveways, etc. (excluding right-of-way)                                                                                                                                                                                                                                                                                                                  |                                 | 98 | 98 | 98 | 98 |
| Streets and roads:                                                                                                                                                                                                                                                                                                                                                                   |                                 |    |    |    |    |
| ◆ Paved; curbs and storm drains (excluding right-of-way)                                                                                                                                                                                                                                                                                                                             |                                 | 98 | 98 | 98 | 98 |
| ◆ Paved; open ditches (including right-of-way)                                                                                                                                                                                                                                                                                                                                       |                                 | 83 | 89 | 92 | 93 |
| ◆ Gravel (including right-of-way)                                                                                                                                                                                                                                                                                                                                                    |                                 | 76 | 85 | 89 | 91 |
| ◆ Dirt (including right-of-way)                                                                                                                                                                                                                                                                                                                                                      |                                 | 72 | 82 | 87 | 89 |
| Western desert urban areas:                                                                                                                                                                                                                                                                                                                                                          |                                 |    |    |    |    |
| ◆ Natural desert landscaping (pervious areas only)                                                                                                                                                                                                                                                                                                                                   |                                 | 63 | 77 | 85 | 88 |
| ◆ Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)                                                                                                                                                                                                                                                     |                                 | 96 | 96 | 96 | 96 |
| Urban districts:                                                                                                                                                                                                                                                                                                                                                                     |                                 |    |    |    |    |
| ◆ Commercial and business                                                                                                                                                                                                                                                                                                                                                            | 85                              | 89 | 92 | 94 | 95 |
| ◆ Industrial                                                                                                                                                                                                                                                                                                                                                                         | 72                              | 81 | 88 | 91 | 93 |
| Residential districts by average lot size:                                                                                                                                                                                                                                                                                                                                           |                                 |    |    |    |    |
| ◆ 1/8 acre or less (town houses)                                                                                                                                                                                                                                                                                                                                                     | 65                              | 77 | 85 | 90 | 92 |
| ◆ 1/4 acre                                                                                                                                                                                                                                                                                                                                                                           | 38                              | 61 | 75 | 83 | 87 |
| ◆ 1/3 acre                                                                                                                                                                                                                                                                                                                                                                           | 30                              | 57 | 72 | 81 | 86 |
| ◆ 1/2 acre                                                                                                                                                                                                                                                                                                                                                                           | 25                              | 54 | 70 | 80 | 85 |
| ◆ 1 acre                                                                                                                                                                                                                                                                                                                                                                             | 20                              | 51 | 68 | 79 | 84 |
| ◆ 2 acres                                                                                                                                                                                                                                                                                                                                                                            | 12                              | 46 | 65 | 77 | 82 |
| Developing urban areas:                                                                                                                                                                                                                                                                                                                                                              |                                 |    |    |    |    |
| Newly graded areas (pervious areas only, no vegetation)                                                                                                                                                                                                                                                                                                                              |                                 | 77 | 86 | 91 | 94 |
| <b>Notes:</b> Values are for average runoff condition, and $I_a = 0.2S$ .<br>The average percent impervious area shown was used to develop the composite RCNs.<br>Other assumptions are: impervious areas are directly connected to the drainage system, impervious areas have a RCN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. |                                 |    |    |    |    |

**Table 8      Curve Numbers Provided in the SEDCAD model (from National Engineering Handbook (NEH-4) (USDA-SCS, 1985), Continued**

| Runoff Curve Numbers for Cultivated Agricultural Land <sup>1</sup> |                            |                                   |    |    |    |    |
|--------------------------------------------------------------------|----------------------------|-----------------------------------|----|----|----|----|
| Cover Type                                                         | Treatment <sup>2</sup>     | Hydrologic Condition <sup>3</sup> | A  | B  | C  | D  |
| Fallow                                                             | Bare soil                  |                                   | 77 | 86 | 91 | 94 |
|                                                                    | Crop residue               | Poor                              | 76 | 85 | 90 | 93 |
|                                                                    | cover (CR)                 | Good                              | 74 | 83 | 88 | 90 |
| Row Crops                                                          | Straight row (SR)          | Poor                              | 72 | 81 | 88 | 91 |
|                                                                    |                            | Good                              | 67 | 78 | 85 | 89 |
|                                                                    | SR + CR                    | Poor                              | 71 | 80 | 87 | 90 |
|                                                                    |                            | Good                              | 64 | 75 | 82 | 85 |
|                                                                    | Contoured (C)              | Poor                              | 70 | 79 | 84 | 88 |
|                                                                    |                            | Good                              | 65 | 75 | 82 | 86 |
|                                                                    | C + CR                     | Poor                              | 69 | 78 | 83 | 87 |
|                                                                    |                            | Good                              | 64 | 74 | 81 | 85 |
|                                                                    | Contoured & terraced (C&T) | Poor                              | 66 | 74 | 80 | 82 |
|                                                                    |                            | Good                              | 62 | 71 | 78 | 81 |
|                                                                    | C&T + CR                   | Poor                              | 65 | 73 | 79 | 81 |
|                                                                    |                            | Good                              | 61 | 70 | 77 | 80 |
| Small grain                                                        | SR                         | Poor                              | 65 | 76 | 84 | 88 |
|                                                                    |                            | Good                              | 63 | 75 | 83 | 87 |
|                                                                    | SR + CR                    | Poor                              | 64 | 75 | 83 | 86 |
|                                                                    |                            | Good                              | 60 | 72 | 80 | 84 |
|                                                                    | C                          | Poor                              | 63 | 74 | 82 | 85 |
|                                                                    |                            | Good                              | 61 | 73 | 81 | 84 |
|                                                                    | C + CR                     | Poor                              | 62 | 73 | 81 | 84 |
|                                                                    |                            | Good                              | 60 | 72 | 80 | 83 |
|                                                                    | C&T                        | Poor                              | 61 | 72 | 79 | 82 |
|                                                                    |                            | Good                              | 59 | 70 | 78 | 81 |
|                                                                    | C&T + CR                   | Poor                              | 60 | 71 | 78 | 81 |
|                                                                    |                            | Good                              | 58 | 69 | 77 | 80 |
| Close-seeded or broadcast                                          | SR                         | Poor                              | 66 | 77 | 85 | 89 |
|                                                                    |                            | Good                              | 58 | 72 | 81 | 85 |
|                                                                    | Legumes or C               | Poor                              | 64 | 75 | 83 | 85 |
| Rotation                                                           |                            | Good                              | 55 | 69 | 78 | 83 |
| Meadow                                                             | C&T                        | Poor                              | 63 | 73 | 80 | 83 |
|                                                                    |                            | Good                              | 51 | 67 | 76 | 80 |

Notes: <sup>1</sup> Values are for average runoff condition, and  $I_a = 0.2S$ .

<sup>2</sup> Crop residue cover applies only if residue is on at least 5 percent of the surface throughout the year.

<sup>3</sup> Hydrologic condition is based on a combination of factors affecting infiltration and runoff: density and canopy of vegetative areas, amount of year-round cover, amount of grass or closed-seeded legumes in rotations, percent of residue cover on land surface (good > 20 percent), and degree of roughness.

*Poor*: Factors impair infiltration and tend to increase runoff.

*Good*: Factors encourage average and better infiltration and tend to decrease runoff.

**Table 8                      Curve Numbers Provided in the SEDCAD model (from National Engineering Handbook (NEH-4) (USDA-SCS, 1985), Continued**

Runoff Curve Numbers for Other Agricultural Lands

| Cover Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Hydrologic Condition | A  | B  | C  | D  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----|----|----|----|
| Pasture, grassland, or range-continuous forage for grazing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Poor                 | 68 | 79 | 86 | 89 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fair                 | 49 | 69 | 79 | 84 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Good                 | 39 | 61 | 74 | 80 |
| Meadow – continuous grass, protected from grazing and generally mowed for hay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                      | 30 | 58 | 71 | 78 |
| Brush – brush-weed-grass mixture, with brush the major element                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Poor                 | 48 | 67 | 77 | 83 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fair                 | 35 | 56 | 70 | 77 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Good                 | 30 | 48 | 65 | 73 |
| Woods – grass combination (orchard or tree farm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Poor                 | 57 | 73 | 82 | 86 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fair                 | 43 | 65 | 76 | 82 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Good                 | 32 | 58 | 72 | 79 |
| Woods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Poor                 | 45 | 66 | 77 | 83 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fair                 | 36 | 60 | 73 | 79 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Good                 | 30 | 55 | 70 | 77 |
| Farmsteads – buildings, lanes, driveways, and surrounding lots                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                      | 59 | 74 | 82 | 86 |
| <p><i>Notes:</i> Values are for average runoff condition, and <math>I_a = 0.2S</math>.</p> <p><i>Pasture:</i> Poor is &lt; 50% ground cover or heavily grazed with no mulch, Fair is 50% to 75% ground cover and not heavily grazed, and Good is &gt;75% ground cover and lightly or only occasionally grazed.</p> <p><i>Meadow:</i> Poor is &lt;50% ground cover, Fair is 50% to 75% ground cover, Good is &gt;75% ground cover.</p> <p><i>Woods/grass:</i> RCNs shown were computed for areas with 50 percent grass (pasture) cover. Other combinations of conditions may be computed from RCNs for woods and pasture.</p> <p><i>Woods:</i> Poor is forest litter, small trees, and brush destroyed by heavy grazing or regular burning. Fair is woods grazed but not burned and with some forest litter covering the soil. Good is woods protected from grazing and with litter and brush adequately covering soil.</p> |                      |    |    |    |    |

**Table 8                      Curve Numbers Provided in the SEDCAD model (from National Engineering Handbook (NEH-4) (USDA-SCS, 1985), Continued**

| Runoff Curve Numbers for Arid and Semi Arid Rangelands                                                                                                                                                                                                                                                                            |                      |    |    |    |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----|----|----|----|
| Cover Type                                                                                                                                                                                                                                                                                                                        | Hydrologic Condition | A  | B  | C  | D  |
| Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element                                                                                                                                                                                                                                           | Poor                 |    | 80 | 87 | 93 |
|                                                                                                                                                                                                                                                                                                                                   | Fair                 |    | 71 | 81 | 89 |
|                                                                                                                                                                                                                                                                                                                                   | Good                 |    | 62 | 74 | 85 |
| Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush                                                                                                                                                                                                                     | Poor                 |    | 66 | 74 | 79 |
|                                                                                                                                                                                                                                                                                                                                   | Fair                 |    | 48 | 57 | 63 |
|                                                                                                                                                                                                                                                                                                                                   | Good                 |    | 30 | 41 | 48 |
| Pinyon-juniper—pinyon, juniper, or both; grass understory                                                                                                                                                                                                                                                                         | Poor                 |    | 75 | 85 | 89 |
|                                                                                                                                                                                                                                                                                                                                   | Fair                 |    | 58 | 73 | 80 |
|                                                                                                                                                                                                                                                                                                                                   | Good                 |    | 41 | 61 | 71 |
| Sagebrush with grass understory                                                                                                                                                                                                                                                                                                   | Poor                 |    | 67 | 80 | 85 |
|                                                                                                                                                                                                                                                                                                                                   | Fair                 |    | 51 | 63 | 70 |
|                                                                                                                                                                                                                                                                                                                                   | Good                 |    | 35 | 47 | 55 |
| saltbush, greasewood, creosote-bush, blackbrush, bursage, palo verde, mesquite, and cactus                                                                                                                                                                                                                                        | Poor                 | 63 | 77 | 85 | 88 |
|                                                                                                                                                                                                                                                                                                                                   | Fair                 | 55 | 72 | 81 | 86 |
|                                                                                                                                                                                                                                                                                                                                   | Good                 | 49 | 68 | 79 | 84 |
| <p><i>Notes.</i> Values are for average runoff condition, and <math>I_a = 0.2S</math>.<br/> Hydrologic Condition: Poor is &lt;30% ground cover (litter, grass, and brush overstory), Fair is 30% to 70% ground cover, Good is &gt;70% ground cover.<br/> Curve numbers for Group A have been developed only for desert shrub.</p> |                      |    |    |    |    |

## **Appendix Exh. 7-14SP Streeter Pond and Permanent Channels**

The location of the Streeter Pond is presented on Map 12. The profiles of the associated permanent channels associated with the Streeter Pond watershed are presented on Map 33. These channels consist of the Streeter and Buckskin Ditches, and their design information is presented in this appendix. The as-built configuration for the Streeter Pond is presented on Figure Exh. 7-14SP-1, and Figure Exh. 7-14SP-2 provides the breakdown of drainage areas and hydrologic conditions for this sediment pond.

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used in sediment pond and post mine channel assumptions. Runoff curve numbers assigned to the undisturbed and reclaimed lands in various stages of reclamation have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD<sup>TM</sup>. For channels to be protected by a vegetative liner, the permissible velocities are also determined using SEDCAD<sup>TM</sup> routines.

### **Streeter Pond**

The following pages present the results of the SEDCAD<sup>TM</sup> models for the worst-case hydrologic conditions under the post mining condition. At this stage the oldest reclamation is on the northern extent of the reclaimed West Pit, and the younger (topsoil and seeded) reclamation is the southern reaches of the Streeter Pond watershed near the convergence of the West and South Taylor Pits.

The SEDCAD<sup>TM</sup> model herein provides the results of the 10 year 24 hour design storm and demonstrates the Streeter Pond will meet the applicable settleable solids standard under this modeled storm event. The second SEDCAD<sup>TM</sup> model demonstrates that the East Taylor Pond emergency spillway elevation is capable of containing the 25 year 24 hour storm.

The final post mining topographic surface and the final locations of the permanent drainage channels as presented on Map 12 were used to model the watershed for the post-mining condition. Three in-stream stock ponds (SD-1, SD-2, and SD-3) are included in the permanent channels to decrease peak flows from the modeled storm event, and to provide a water source to support the post-mining land use. A typical design for these stock ponds is presented on Figure 2.05-6 in Volume 1; however, each stock pond will ultimately be design and constructed to account for local ground conditions present in the post mine topography at the time of construction.

In summary, for the post mining case at the Streeter Pond, the 10 year 24 hour storm produces 3.15 acre feet of runoff, and the peak settleable solids concentration is 0.00 ml/l. The 25 year 24 hour storm event peaks at the 6,587.2 elevation, which is below the emergency spillway elevation of 6,588.0'

### **Streeter Permanent Post Mine Channels**

The Streeter Pond watershed is comprised of two post-mining channels. The main channel is the Streeter Ditch, which will convey post mining surface water flows to the Streeter Pond.

Buckskin Ditch is a tributary to the Streeter Ditch. The locations of both channels are presented on Map 12 and Figure Exh. 7-14SP-2, and the channel profiles are presented on Map 33.

The assumed hydrologic condition for both channels is the post mine condition when the entire Streeter watershed is reclaimed and reporting to the Streeter Pond.

The upper segments of the Streeter Ditch and the entirety of Buckskin Ditch have a contributing area of less than one square mile. They could be designed in accordance with Rule 4.05.3. However, for ease since the lower segments of Streeter Ditch meet the requirements of Rule 4.05.4, both ditches have been designed for the 100-year, 24-hour storm event.

A SEDCAD<sup>TM</sup> model has been included which evaluates the peak flow and total runoff volume for each of the channel segments for the 100 year, 24-hour storm event. The channel configurations for the 100 year, 24 hour storm for the Streeter and Buckskin Ditches are summarized below.

**Streeter Ditch**

| <u>Station</u>                 | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Erosion<br/>Protection</u> |
|--------------------------------|--------------------------------|------------------------------|---------------------------|------------------------|-------------------------------|
| Station 0+00<br>to 10+00       | 7.93                           | 28.3                         | Trapezoidal<br>6' bottom  | 2H:1V                  | Riprap,<br>D50 = 12"          |
| Station 10+00<br>to 25+00      | 61.01                          | 10.9                         | Trapezoidal<br>6' bottom  | 2H:1V                  | Riprap,<br>D50 = 12"          |
| Station 25+00<br>to 45+00      | 61.01                          | 2.0                          | Trapezoidal<br>12' bottom | 3H:1V                  | Riprap,<br>D50 = 6"           |
| Station 45+00<br>to 80+00      | 60.81                          | 1.9                          | Trapezoidal<br>12' bottom | 3H:1V                  | Vegetation                    |
| Station 80+00<br>to 91+00      | 78.04                          | 3.8                          | Trapezoidal<br>15' bottom | 3H:1V                  | Vegetation                    |
| Station 91+00<br>to 111+00     | 103.76                         | 2.8                          | Trapezoidal<br>15' bottom | 3H:1V                  | Vegetation                    |
| Station<br>111+00 to<br>125+00 | 127.95                         | 2.6                          | Trapezoidal<br>15' bottom | 3H:1V                  | Vegetation                    |
| Station<br>125+00 to<br>187+00 | 81.91                          | 5.0                          | Trapezoidal<br>12' bottom | 3H:1V                  | Vegetation                    |

**Buckskin Ditch**

| <u>Station</u>           | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Erosion<br/>Protection</u> |
|--------------------------|--------------------------------|------------------------------|---------------------------|------------------------|-------------------------------|
| Station 0+00<br>to 35+00 | 39.2                           | 25                           | Trapezoidal<br>12' bottom | 3H:1V                  | Vegetation                    |

# **Streeter Pond** **10 Year 24 Hour Storm Event**

***Effluent Demonstration***  
***Post-Mining Condition***

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.  
1100 West 116th Avenue  
Westminster, CO 80234

Phone: (970) 824-1232  
Email: [ttennyson@tristategt.org](mailto:ttennyson@tristategt.org)

## ***General Information***

### ***Storm Information:***

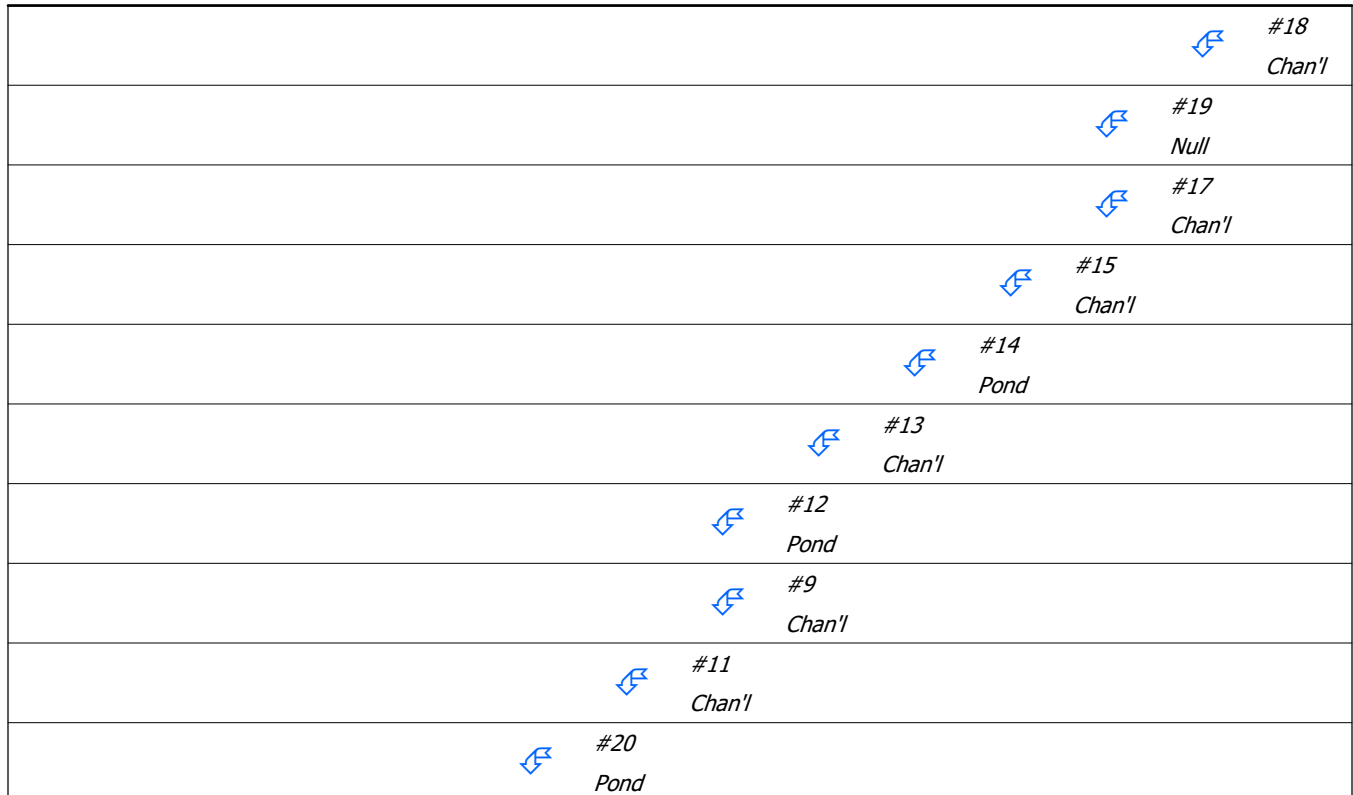
|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 10 yr - 24 hr |
| Rainfall Depth: | 1.800 inches  |

### ***Particle Size Distribution:***

| Size (mm) | Colowyo Particle Size |
|-----------|-----------------------|
| 4.7500    | 100.000%              |
| 0.0750    | 73.000%               |
| 0.0400    | 33.000%               |
| 0.0010    | 20.000%               |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                                    |
|---------|--------|--------------|--------|---------------|---------|----------------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below Streeter Pond                                       |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Streeter Pond                                                  |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above Streeter Pond                                       |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Streeter Ditch 0+00 to 10+00                                   |
| Channel | #5     | ==>          | #4     | 0.000         | 0.000   | Streeter South Side Ditch                                      |
| Channel | #6     | ==>          | #3     | 0.000         | 0.000   | Streeter Ditch 10+00 to 25+00                                  |
| Channel | #7     | ==>          | #6     | 0.000         | 0.000   | Streeter Ditch 25+00 to 45+00<br>Streeter Ditch 25+00 to 45+00 |
| Channel | #9     | ==>          | #11    | 0.000         | 0.000   | Stoker Ditch                                                   |
| Channel | #10    | ==>          | #7     | 0.000         | 0.000   | Streeter Ditch 45+00 to 80+00                                  |
| Channel | #11    | ==>          | #20    | 0.000         | 0.000   | Streeter Ditch 80+00 to 91+00                                  |
| Pond    | #12    | ==>          | #11    | 0.000         | 0.000   | SD-2 Stockpond                                                 |
| Channel | #13    | ==>          | #12    | 0.000         | 0.000   | Streeter Ditch 91+00 to 111+00                                 |
| Pond    | #14    | ==>          | #13    | 0.000         | 0.000   | SD-3 Stockpond                                                 |
| Channel | #15    | ==>          | #14    | 0.000         | 0.000   | Streeter Ditch 111+00 to 125+00                                |
| Channel | #17    | ==>          | #15    | 0.000         | 0.000   | Buckskin Ditch                                                 |
| Channel | #18    | ==>          | #19    | 0.000         | 0.000   | Streeter Ditch 125+00 to 187+00                                |
| Null    | #19    | ==>          | #15    | 0.011         | 0.370   | Null at Confluence Buckskin/Streeter                           |
| Pond    | #20    | ==>          | #10    | 0.000         | 0.000   | SD-1 Stockpond                                                 |



|                                                                                   |                                                                                   |               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |  | #7<br>Chan'l  |
|                                                                                   |  | #6<br>Chan'l  |
|                                                                                   |  | #5<br>Chan'l  |
|                                                                                   |  | #4<br>Chan'l  |
|                                                                                   |  | #3<br>Null    |
|  | #2<br>Pond                                                                        |               |
| #1<br>Null                                                                        |                                                                                   |               |

## Structure Routing Details:

| Stru #     | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #19        | 8. Large gullies, diversions, and low flowing streams | 2.60      | 5.20             | 200.00            | 4.83           | 0.011        |
| <b>#19</b> | <b>Muskingum K:</b>                                   |           |                  |                   |                | <b>0.011</b> |

### ***Structure Summary:***

|     | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) | Sediment<br>(tons) | Peak<br>Sediment<br>Conc.<br>(mg/l) | Peak<br>Settleable<br>Conc.<br>(ml/l) | 24VW<br>(ml/l) |
|-----|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|--------------------|-------------------------------------|---------------------------------------|----------------|
| #18 | 316.200                                   | 316.200                               | 21.73                      | 4.99                                 | 109.0              | 364,165                             | 205.23                                | 8.32           |
| #19 | 0.000                                     | 316.200                               | 21.73                      | 4.99                                 | 109.0              | 364,165                             | 205.23                                | 8.32           |
| #17 | 135.700                                   | 135.700                               | 16.85                      | 1.54                                 | 71.9               | 91,138                              | 51.94                                 | 19.06          |
| #15 | 143.100                                   | 595.000                               | 42.68                      | 7.96                                 | 391.3              | 186,389                             | 105.90                                | 19.61          |
| #14 | In<br>Out                                 | 0.000                                 | 595.000                    | 42.68                                | 7.96               | 391.3                               | 186,389                               | 105.90         |
|     |                                           |                                       |                            |                                      |                    |                                     |                                       |                |
| #13 | 99.000                                    | 694.000                               | 21.13                      | 5.47                                 | 230.4              | 220,429                             | 125.64                                | 17.24          |
| #12 | In<br>Out                                 | 0.000                                 | 694.000                    | 21.13                                | 5.47               | 230.4                               | 220,429                               | 125.64         |
|     |                                           |                                       |                            |                                      |                    |                                     |                                       |                |
| #9  | 19.600                                    | 19.600                                | 8.04                       | 0.59                                 | 30.6               | 81,675                              | 46.55                                 | 21.14          |
| #11 | 71.400                                    | 785.000                               | 24.37                      | 3.23                                 | 201.0              | 170,377                             | 97.11                                 | 27.30          |
| #20 | In<br>Out                                 | 0.000                                 | 785.000                    | 24.37                                | 3.23               | 201.0                               | 170,377                               | 97.11          |
|     |                                           |                                       |                            |                                      |                    |                                     |                                       |                |
| #10 | 160.900                                   | 945.900                               | 0.31                       | 0.02                                 | 201.1              | 6,414                               | 0.00                                  | 0.00           |
| #7  | 142.400                                   | 1,088.300                             | 0.31                       | 0.02                                 | 201.1              | 6,414                               | 0.00                                  | 0.00           |
| #6  | 58.100                                    | 1,146.400                             | 0.31                       | 0.02                                 | 201.1              | 6,414                               | 0.00                                  | 0.00           |
| #5  | 164.800                                   | 164.800                               | 0.04                       | 0.01                                 | 0.0                | 5,242                               | 2.54                                  | 1.99           |
| #4  | 9.500                                     | 174.300                               | 2.84                       | 0.22                                 | 217.0              | 1,075,732                           | 613.11                                | 301.85         |
| #3  | 0.000                                     | 1,320.700                             | 3.15                       | 0.24                                 | 418.0              | 1,013,139                           | 299.68                                | 145.66         |
| #2  | In<br>Out                                 | 21.200                                | 1,341.900                  | 3.15                                 | 0.24               | 418.0                               | 1,013,139                             | 299.68         |
|     |                                           |                                       |                            |                                      |                    |                                     |                                       |                |
| #1  | 0.000                                     | 1,341.900                             | 0.03                       | 0.09                                 | 0.8                | 8,630                               | 0.00                                  | 0.00           |

## ***Particle Size Distribution(s) at Each Structure***

### ***Structure #18 (Streeter Ditch 125+00 to 187+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.862%  |
| 0.0400    | 33.921%  |
| 0.0010    | 20.558%  |

### ***Structure #19 (Null at Confluence Buckskin/Streeter):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.862%  |
| 0.0400    | 33.921%  |
| 0.0010    | 20.558%  |

### ***Structure #17 (Buckskin Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.028%  |
| 0.0400    | 33.013%  |
| 0.0010    | 20.008%  |

### ***Structure #15 (Streeter Ditch 111+00 to 125+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.245%  |
| 0.0400    | 33.259%  |
| 0.0010    | 20.157%  |

### ***Structure #14 (SD-3 Stockpond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 73.245%  | 100.000% |
| 0.0400    | 33.259%  | 100.000% |
| 0.0010    | 20.157%  | 100.000% |

***Structure #13 (Streeter Ditch 91+00 to 111+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.001%  |

***Structure #12 (SD-2 Stockpond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 73.000%  | 100.000% |
| 0.0400    | 33.000%  | 100.000% |
| 0.0010    | 20.001%  | 100.000% |

***Structure #9 (Stoker Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #11 (Streeter Ditch 80+00 to 91+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #20 (SD-1 Stockpond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |

| Size (mm) | In      | Out      |
|-----------|---------|----------|
| 0.0750    | 73.000% | 100.000% |
| 0.0400    | 33.000% | 100.000% |
| 0.0010    | 20.000% | 100.000% |

***Structure #10 (Streeter Ditch 45+00 to 80+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 100.000% |
| 0.0400    | 100.000% |
| 0.0010    | 100.000% |

***Structure #7 (Streeter Ditch 25+00 to 45+00  
Streeter Ditch 25+00 to 45+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 100.000% |
| 0.0400    | 100.000% |
| 0.0010    | 100.000% |

***Structure #6 (Streeter Ditch 10+00 to 25+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 100.000% |
| 0.0400    | 100.000% |
| 0.0010    | 100.000% |

***Structure #5 (Streeter South Side Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 100.000% |
| 0.0400    | 45.190%  |
| 0.0010    | 27.388%  |

***Structure #4 (Streeter Ditch 0+00 to 10+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |

| Size (mm) | In/Out  |
|-----------|---------|
| 0.0750    | 73.006% |
| 0.0400    | 33.003% |
| 0.0010    | 20.002% |

***Structure #3 (Null Above Streeter Pond):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 85.990%  |
| 0.0400    | 65.229%  |
| 0.0010    | 58.481%  |

***Structure #2 (Streeter Pond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 85.990%  | 100.000% |
| 0.0400    | 65.229%  | 100.000% |
| 0.0010    | 58.481%  | 100.000% |

***Structure #1:***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 100.000% |
| 0.0400    | 100.000% |
| 0.0010    | 100.000% |

***Structure Detail:******Structure #18 (Vegetated Channel)****Streeter Ditch 125+00 to 187+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 2.6       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 21.73 cfs                             |                                      | 21.73 cfs                            |                                     |
| Depth:                 | 0.51 ft                               |                                      | 0.90 ft                              |                                     |
| Top Width:             | 18.05 ft                              |                                      | 20.39 ft                             |                                     |
| Velocity:              | 2.59 fps                              |                                      | 1.37 fps                             |                                     |
| X-Section Area:        | 8.39 sq ft                            |                                      | 15.89 sq ft                          |                                     |
| Hydraulic Radius:      | 0.461 ft                              |                                      | 0.768 ft                             |                                     |
| Froude Number:         | 0.67                                  |                                      | 0.27                                 |                                     |
| Roughness Coefficient: | 0.0552                                |                                      | 0.1473                               |                                     |

***Structure #19 (Null)****Null at Confluence Buckskin/Streeter****Structure #17 (Vegetated Channel)****Buckskin Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 4.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 16.85 cfs                             |                                      | 16.85 cfs                            |                                     |
| Depth:                    | 0.44 ft                               |                                      | 0.79 ft                              |                                     |
| Top Width:                | 14.65 ft                              |                                      | 16.72 ft                             |                                     |
| Velocity:                 | 2.87 fps                              |                                      | 1.49 fps                             |                                     |
| X-Section Area:           | 5.88 sq ft                            |                                      | 11.29 sq ft                          |                                     |
| Hydraulic Radius:         | 0.397 ft                              |                                      | 0.665 ft                             |                                     |
| Froude Number:            | 0.80                                  |                                      | 0.32                                 |                                     |
| Roughness<br>Coefficient: | 0.0560                                |                                      | 0.1517                               |                                     |

Structure #15 (Vegetated Channel)

*Streeter Ditch 111+00 to 125+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 15.00                | 3.0:1                      | 3.0:1                       | 2.6       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 42.68 cfs                             |                                      | 42.68 cfs                            |                                     |
| Depth:                    | 0.67 ft                               |                                      | 1.10 ft                              |                                     |
| Top Width:                | 19.05 ft                              |                                      | 21.59 ft                             |                                     |
| Velocity:                 | 3.71 fps                              |                                      | 2.12 fps                             |                                     |
| X-Section Area:           | 11.49 sq ft                           |                                      | 20.09 sq ft                          |                                     |
| Hydraulic Radius:         | 0.596 ft                              |                                      | 0.915 ft                             |                                     |
| Froude Number:            | 0.84                                  |                                      | 0.39                                 |                                     |
| Roughness<br>Coefficient: | 0.0457                                |                                      | 0.1065                               |                                     |

Structure #14 (Pond)

*SD-3 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

|                    |            |
|--------------------|------------|
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 103.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 103.16 ft |
| H'graph Detention Time: | 3.13 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.49 days |
| Trap Efficiency:        | 100.00 %  |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs)  |
|-----------|-----------|------------------|-----------------|---------------------|
| 90.00     | 0.050     | 0.000            | 0.000           | Top of Sed. Storage |
| 90.01     | 0.050     | 0.001            | 0.000           |                     |
| 91.00     | 0.072     | 0.061            | 0.000           |                     |
| 92.00     | 0.098     | 0.145            | 0.000           |                     |
| 93.00     | 0.128     | 0.258            | 0.000           |                     |
| 94.00     | 0.162     | 0.403            | 0.000           |                     |
| 95.00     | 0.200     | 0.583            | 0.000           |                     |
| 96.00     | 0.231     | 0.799            | 0.000           |                     |
| 97.00     | 0.265     | 1.046            | 0.000           |                     |
| 98.00     | 0.301     | 1.329            | 0.000           |                     |
| 99.00     | 0.339     | 1.649            | 0.000           |                     |
| 100.00    | 0.380     | 2.008            | 0.000           |                     |
| 101.00    | 0.554     | 2.473            | 0.000           |                     |
| 102.00    | 0.761     | 3.127            | 0.000           |                     |
| 103.00    | 1.000     | 4.005            | 0.000           | Spillway #1         |
| 103.16    | 0.905     | 4.164            | 7.644           | 11.70 Peak Stage    |
| 104.00    | 1.010     | 5.010            | 48.400          |                     |
| 105.00    | 1.020     | 6.025            | 167.398         |                     |

## Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 90.00          | 0.000                    | 0.000                          |
| 90.01          | 0.000                    | 0.000                          |
| 91.00          | 0.000                    | 0.000                          |
| 92.00          | 0.000                    | 0.000                          |
| 93.00          | 0.000                    | 0.000                          |
| 94.00          | 0.000                    | 0.000                          |
| 95.00          | 0.000                    | 0.000                          |
| 96.00          | 0.000                    | 0.000                          |
| 97.00          | 0.000                    | 0.000                          |
| 98.00          | 0.000                    | 0.000                          |
| 99.00          | 0.000                    | 0.000                          |
| 100.00         | 0.000                    | 0.000                          |
| 101.00         | 0.000                    | 0.000                          |
| 102.00         | 0.000                    | 0.000                          |
| 103.00         | 0.000                    | 0.000                          |
| 104.00         | 48.400                   | 48.400                         |
| 105.00         | 167.398                  | 167.398                        |

## Structure #13 (Vegetated Channel)

*Streeter Ditch 91+00 to 111+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 3.2       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 21.13 cfs                       |                                | 21.13 cfs                      |                               |
| Depth:                 | 0.47 ft                         |                                | 0.83 ft                        |                               |
| Top Width:             | 17.83 ft                        |                                | 20.01 ft                       |                               |
| Velocity:              | 2.73 fps                        |                                | 1.45 fps                       |                               |
| X-Section Area:        | 7.73 sq ft                      |                                | 14.62 sq ft                    |                               |
| Hydraulic Radius:      | 0.430 ft                        |                                | 0.721 ft                       |                               |
| Froude Number:         | 0.73                            |                                | 0.30                           |                               |
| Roughness Coefficient: | 0.0555                          |                                | 0.1480                         |                               |

## Structure #12 (Pond)

### *SD-2 Stockpond*

#### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

### Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 103.00        | 20.00                | 2.00:1            | 2.00:1             | 20.00                |

#### Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 103.08 ft |
| H'graph Detention Time: | 5.10 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.13 days |
| Trap Efficiency:        | 100.00 %  |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              | Top of Sed. Storage      |
| 90.01     | 0.050        | 0.001               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              |                          |
| 99.00     | 0.339        | 1.649               | 0.000              |                          |
| 100.00    | 0.380        | 2.008               | 0.000              |                          |
| 101.00    | 0.554        | 2.473               | 0.000              |                          |
| 102.00    | 0.761        | 3.127               | 0.000              |                          |
| 103.00    | 1.000        | 4.005               | 0.000              | Spillway #1              |
| 103.08    | 0.901        | 4.086               | 3.866              | 3.20 Peak Stage          |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 104.00    | 1.020        | 5.015               | 48.400             |                          |
| 105.00    | 1.040        | 6.045               | 167.398            |                          |

### Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                       | 0.000                                   |
| 90.01             | 0.000                       | 0.000                                   |
| 91.00             | 0.000                       | 0.000                                   |
| 92.00             | 0.000                       | 0.000                                   |
| 93.00             | 0.000                       | 0.000                                   |
| 94.00             | 0.000                       | 0.000                                   |
| 95.00             | 0.000                       | 0.000                                   |
| 96.00             | 0.000                       | 0.000                                   |
| 97.00             | 0.000                       | 0.000                                   |
| 98.00             | 0.000                       | 0.000                                   |
| 99.00             | 0.000                       | 0.000                                   |
| 100.00            | 0.000                       | 0.000                                   |
| 101.00            | 0.000                       | 0.000                                   |
| 102.00            | 0.000                       | 0.000                                   |
| 103.00            | 0.000                       | 0.000                                   |
| 104.00            | 48.400                      | 48.400                                  |
| 105.00            | 167.398                     | 167.398                                 |

### Structure #9 (Vegetated Channel)

#### *Stoker Ditch*

Trapezoidal Vegetated Channel Inputs:

#### Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 2.00                 | 1.0:1                      | 7.0:1                       | 3.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 8.04 cfs                              |                                      | 8.04 cfs                             |                                     |
| Depth:                    | 0.68 ft                               |                                      | 1.14 ft                              |                                     |
| Top Width:                | 7.42 ft                               |                                      | 11.14 ft                             |                                     |
| Velocity:                 | 2.52 fps                              |                                      | 1.07 fps                             |                                     |
| X-Section Area:           | 3.19 sq ft                            |                                      | 7.50 sq ft                           |                                     |
| Hydraulic Radius:         | 0.420 ft                              |                                      | 0.657 ft                             |                                     |
| Froude Number:            | 0.68                                  |                                      | 0.23                                 |                                     |
| Roughness<br>Coefficient: | 0.0573                                |                                      | 0.1818                               |                                     |

### Structure #11 (Vegetated Channel)

*Streeter Ditch 80+00 to 91+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 15.00                | 3.0:1                      | 3.0:1                       | 3.2       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 24.37 cfs                             |                                      | 24.37 cfs                            |                                     |
| Depth:                    | 0.50 ft                               |                                      | 0.87 ft                              |                                     |
| Top Width:                | 18.00 ft                              |                                      | 20.23 ft                             |                                     |
| Velocity:                 | 2.95 fps                              |                                      | 1.59 fps                             |                                     |
| X-Section Area:           | 8.25 sq ft                            |                                      | 15.34 sq ft                          |                                     |
| Hydraulic Radius:         | 0.454 ft                              |                                      | 0.748 ft                             |                                     |
| Froude Number:            | 0.77                                  |                                      | 0.32                                 |                                     |
| Roughness<br>Coefficient: | 0.0533                                |                                      | 0.1381                               |                                     |

### Structure #20 (Pond)

*SD-1 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 100.01 ft  |
| Initial Pool:      | 0.01 ac-ft |

|                    |            |
|--------------------|------------|
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 105.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 104.43 ft |
| H'graph Detention Time: | 0.00 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.00 days |
| Trap Efficiency:        | 0.00 %    |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs)  |
|-----------|-----------|------------------|-----------------|---------------------|
| 100.00    | 0.661     | 0.000            | 0.000           | Top of Sed. Storage |
| 100.01    | 0.661     | 0.007            | 0.000           |                     |
| 101.00    | 0.708     | 0.684            | 0.000           |                     |
| 102.00    | 0.734     | 1.405            | 0.000           |                     |
| 103.00    | 0.757     | 2.151            | 0.000           |                     |
| 104.00    | 0.758     | 2.908            | 0.000           |                     |
| 104.43    | 0.758     | 3.234            | 0.000           | 0.00 Peak Stage     |
| 105.00    | 0.759     | 3.667            | 0.000           | Spillway #1         |
| 106.00    | 0.760     | 4.426            | 48.400          |                     |
| 107.00    | 0.762     | 5.187            | 167.398         |                     |

## Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 100.00         | 0.000                    | 0.000                          |
| 100.01         | 0.000                    | 0.000                          |
| 101.00         | 0.000                    | 0.000                          |
| 102.00         | 0.000                    | 0.000                          |
| 103.00         | 0.000                    | 0.000                          |

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 104.00            | 0.000                       | 0.000                                   |
| 105.00            | 0.000                       | 0.000                                   |
| 106.00            | 48.400                      | 48.400                                  |
| 107.00            | 167.398                     | 167.398                                 |

Structure #10 (Vegetated Channel)

*Streeter Ditch 45+00 to 80+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 2.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.31 cfs                              |                                      | 0.31 cfs                             |                                     |
| Depth:                    | 0.10 ft                               |                                      | 0.30 ft                              |                                     |
| Top Width:                | 12.61 ft                              |                                      | 13.80 ft                             |                                     |
| Velocity:                 | 0.25 fps                              |                                      | 0.08 fps                             |                                     |
| X-Section Area:           | 1.26 sq ft                            |                                      | 3.87 sq ft                           |                                     |
| Hydraulic Radius:         | 0.099 ft                              |                                      | 0.278 ft                             |                                     |
| Froude Number:            | 0.14                                  |                                      | 0.03                                 |                                     |
| Roughness<br>Coefficient: | 0.1811                                |                                      | 1.1200                               |                                     |

Structure #7 (Riprap Channel)

*Streeter Ditch 25+00 to 45+00*

*Streeter Ditch 25+00 to 45+00*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 2.0       |                      |                      |                         |

### Riprap Channel Results:

#### PADER Method - Mild Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 0.31 cfs      |              |
| Depth:            | 0.00 ft       |              |
| Top Width:        | 0.00 ft       |              |
| Velocity:         | 0.00 fps      |              |
| X-Section Area:   | 0.00 sq ft    |              |
| Hydraulic Radius: | 0.000 ft      |              |
| Froude Number:    | 0.00          |              |
| Manning's n:      | 0.0000        |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 0.00 in       |              |
| Dmax:             | 3.00 in       |              |

### Structure #6 (Riprap Channel)

#### *Streeter Ditch 10+00 to 25+00*

### Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 6.00              | 2.0:1                | 2.0:1                 | 10.9      |                      |                      |                         |

### Riprap Channel Results:

#### PADER Method - Mild Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 0.31 cfs      |              |
| Depth:            | 0.00 ft       |              |
| Top Width:        | 0.00 ft       |              |
| Velocity:         | 0.00 fps      |              |
| X-Section Area:   | 0.00 sq ft    |              |
| Hydraulic Radius: | 0.000 ft      |              |
| Froude Number:    | 0.00          |              |
| Manning's n:      | 0.0000        |              |
| Dmin:             | 2.00 in       |              |

|       | w/o Freeboard | w/ Freeboard |
|-------|---------------|--------------|
| D50:  | 0.00 in       |              |
| Dmax: | 4.50 in       |              |

Structure #5 (Vegetated Channel)

*Streeter South Side Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 0.04 cfs                              |                                      | 0.04 cfs                             |                                     |
| Depth:                 | 0.08 ft                               |                                      | 0.27 ft                              |                                     |
| Top Width:             | 2.68 ft                               |                                      | 4.16 ft                              |                                     |
| Velocity:              | 0.22 fps                              |                                      | 0.05 fps                             |                                     |
| X-Section Area:        | 0.20 sq ft                            |                                      | 0.83 sq ft                           |                                     |
| Hydraulic Radius:      | 0.074 ft                              |                                      | 0.197 ft                             |                                     |
| Froude Number:         | 0.14                                  |                                      | 0.02                                 |                                     |
| Roughness Coefficient: | 0.2068                                |                                      | 1.6946                               |                                     |

Structure #4 (Riprap Channel)

*Streeter Ditch 0+00 to 10+00*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 6.00              | 2.0:1                | 2.0:1                 | 28.3      |                      |                      |                         |

Riprap Channel Results:

PADER Method - Mild Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 2.84 cfs      |              |
| Depth:            | 0.00 ft       |              |
| Top Width:        | 0.00 ft       |              |
| Velocity:         | 0.00 fps      |              |
| X-Section Area:   | 0.00 sq ft    |              |
| Hydraulic Radius: | 0.000 ft      |              |
| Froude Number:    | 0.00          |              |
| Manning's n:      | 0.0000        |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 0.00 in       |              |
| Dmax:             | 4.50 in       |              |

### Structure #3 (Null)

*Null Above Streeter Pond*

### Structure #2 (Pond)

*Streeter Pond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 6,583.00 ft |
| Initial Pool:      | 2.45 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 20.00 %     |

*\*No sediment capacity defined*

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 12.00               | 3.00              | 18.00                | 87.00              | 4.50             | 0.0150      | 6,585.00           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 6,588.00      | 50.00             | 1.50:1         | 1.50:1          | 20.00             |

Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 6,583.16 ft |
| H'graph Detention Time: | 15.79 hrs   |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 4.30 days   |
| Trap Efficiency:        | 99.81 %     |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 6,578.00  | 0.010        | 0.000               | 0.000              | Top of Sed. Storage      |
| 6,579.00  | 0.070        | 0.035               | 0.000              |                          |
| 6,580.00  | 0.275        | 0.197               | 0.000              |                          |
| 6,581.00  | 0.441        | 0.551               | 0.000              |                          |
| 6,582.00  | 1.100        | 1.297               | 0.000              |                          |
| 6,583.00  | 1.200        | 2.447               | 0.000              | Low hole SPW #1          |
| 6,583.16  | 1.331        | 2.658               | 0.033              | 25.60 Peak Stage         |
| 6,584.00  | 1.500        | 3.794               | 0.210              |                          |
| 6,585.00  | 1.600        | 5.344               | 0.507              | Spillway #1              |
| 6,586.00  | 1.800        | 7.043               | 3.782              |                          |
| 6,587.00  | 2.000        | 8.942               | 5.348              |                          |
| 6,588.00  | 2.100        | 10.992              | 6.550              | Spillway #2              |
| 6,589.00  | 2.200        | 13.142              | 45.017             |                          |
| 6,590.00  | 2.400        | 15.441              | 150.324            |                          |
| 6,591.00  | 2.500        | 17.891              | 302.542            |                          |

*\*Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,578.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,579.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,580.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,581.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,582.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,583.00          | 2.00>0.000        | 0.000                       | 0.000                                   |
| 6,584.00          | 2.00>0.210        | 0.000                       | 0.210                                   |
| 6,585.00          | 0.507             | 0.000                       | 0.507                                   |
| 6,586.00          | 3.782             | 0.000                       | 3.782                                   |
| 6,587.00          | 5.348             | 0.000                       | 5.348                                   |
| 6,588.00          | 6.550             | 0.000                       | 6.550                                   |
| 6,589.00          | 7.563             | 37.453                      | 45.017                                  |
| 6,590.00          | 8.456             | 141.868                     | 150.324                                 |
| 6,591.00          | 9.263             | 293.279                     | 302.542                                 |

Structure #1 (Null)

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*Null Below Streeter Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #18        | 1        | 8.500          | 0.050              | 0.000        | 0.000  | 80.000       | F   | 4.38                 | 0.315                 |
|            | 2        | 213.800        | 0.803              | 0.000        | 0.000  | 74.000       | F   | 20.63                | 4.368                 |
|            | 3        | 10.200         | 0.035              | 0.000        | 0.000  | 62.000       | M   | 0.08                 | 0.042                 |
|            | 4        | 11.600         | 0.147              | 0.000        | 0.000  | 62.000       | M   | 0.06                 | 0.039                 |
|            | 5        | 55.100         | 0.125              | 0.000        | 0.000  | 62.000       | M   | 0.27                 | 0.184                 |
|            | 6        | 6.300          | 0.118              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 7        | 10.700         | 0.070              | 0.000        | 0.000  | 62.000       | M   | 0.08                 | 0.044                 |
|            | <b>Σ</b> | <b>316.200</b> |                    |              |        |              |     | <b>21.73</b>         | <b>4.990</b>          |
| <b>#19</b> | <b>Σ</b> | <b>316.200</b> |                    |              |        |              |     | <b>21.73</b>         | <b>4.990</b>          |
| #17        | 1        | 31.200         | 0.122              | 0.000        | 0.000  | 80.000       | F   | 16.08                | 1.155                 |
|            | 2        | 101.900        | 0.516              | 0.000        | 0.000  | 62.000       | M   | 0.44                 | 0.333                 |
|            | 3        | 2.600          | 0.021              | 0.000        | 0.000  | 74.000       | F   | 0.78                 | 0.056                 |
|            | <b>Σ</b> | <b>135.700</b> |                    |              |        |              |     | <b>16.85</b>         | <b>1.544</b>          |
| #15        | 1        | 6.600          | 0.044              | 0.000        | 0.000  | 47.000       | M   | 0.00                 | 0.000                 |
|            | 2        | 83.200         | 0.301              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 3        | 16.600         | 0.091              | 0.000        | 0.000  | 62.000       | M   | 0.13                 | 0.068                 |
|            | 4        | 36.700         | 0.087              | 0.000        | 0.000  | 80.000       | F   | 18.91                | 1.358                 |
|            | <b>Σ</b> | <b>595.000</b> |                    |              |        |              |     | <b>42.68</b>         | <b>7.961</b>          |
| <b>#14</b> | <b>Σ</b> | <b>595.000</b> |                    |              |        |              |     | <b>42.68</b>         | <b>7.961</b>          |
| #13        | 1        | 32.800         | 0.034              | 0.000        | 0.000  | 80.000       | F   | 16.90                | 1.214                 |
|            | 2        | 6.900          | 0.055              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 3        | 20.300         | 0.068              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 4        | 8.200          | 0.025              | 0.000        | 0.000  | 80.000       | F   | 4.23                 | 0.303                 |
|            | 5        | 2.900          | 0.067              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 6        | 27.900         | 0.196              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>694.000</b> |                    |              |        |              |     | <b>21.13</b>         | <b>5.471</b>          |
| <b>#12</b> | <b>Σ</b> | <b>694.000</b> |                    |              |        |              |     | <b>21.13</b>         | <b>5.471</b>          |
| #9         | 1        | 4.000          | 0.078              | 0.000        | 0.000  | 62.000       | F   | 0.03                 | 0.016                 |
|            | 2        | 15.600         | 0.073              | 0.000        | 0.000  | 80.000       | F   | 8.04                 | 0.577                 |
|            | <b>Σ</b> | <b>19.600</b>  |                    |              |        |              |     | <b>8.04</b>          | <b>0.594</b>          |
| #11        | 1        | 17.700         | 0.075              | 0.000        | 0.000  | 80.000       | F   | 9.12                 | 0.655                 |
|            | 2        | 6.800          | 0.029              | 0.000        | 0.000  | 80.000       | F   | 3.50                 | 0.252                 |
|            | 3        | 27.900         | 0.205              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 4        | 7.200          | 0.058              | 0.000        | 0.000  | 80.000       | F   | 3.71                 | 0.266                 |
|            | 5        | 11.800         | 0.178              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |

| Stru #     | SWS #    | SWS Area (ac)    | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|------------|----------|------------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|            | <b>Σ</b> | <b>785.000</b>   |                    |              |        |              |     | <b>24.37</b>         | <b>3.230</b>          |
| <b>#20</b> | <b>Σ</b> | <b>785.000</b>   |                    |              |        |              |     | <b>24.37</b>         | <b>3.230</b>          |
| #10        | 1        | 78.800           | 0.424              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 65.200           | 0.120              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 3        | 0.600            | 0.022              | 0.000        | 0.000  | 80.000       | F   | 0.31                 | 0.018                 |
|            | 4        | 16.300           | 0.141              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>945.900</b>   |                    |              |        |              |     | <b>0.31</b>          | <b>0.018</b>          |
| #7         | 1        | 130.200          | 0.381              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 12.200           | 0.168              | 0.000        | 0.000  | 57.000       | S   | 0.01                 | 0.004                 |
|            | <b>Σ</b> | <b>1,088.300</b> |                    |              |        |              |     | <b>0.31</b>          | <b>0.023</b>          |
| #6         | 1        | 22.400           | 0.072              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 35.700           | 0.131              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>1,146.400</b> |                    |              |        |              |     | <b>0.31</b>          | <b>0.023</b>          |
| #5         | 1        | 9.200            | 0.016              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 155.600          | 0.375              | 0.000        | 0.000  | 54.000       | S   | 0.04                 | 0.009                 |
|            | <b>Σ</b> | <b>164.800</b>   |                    |              |        |              |     | <b>0.04</b>          | <b>0.009</b>          |
| #4         | 1        | 9.500            | 0.058              | 0.000        | 0.000  | 74.000       | F   | 2.84                 | 0.206                 |
|            | <b>Σ</b> | <b>174.300</b>   |                    |              |        |              |     | <b>2.84</b>          | <b>0.215</b>          |
| <b>#3</b>  | <b>Σ</b> | <b>1,320.700</b> |                    |              |        |              |     | <b>3.15</b>          | <b>0.238</b>          |
| #2         | 1        | 16.600           | 0.056              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 4.600            | 0.048              | 0.000        | 0.000  | 57.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>1,341.900</b> |                    |              |        |              |     | <b>3.15</b>          | <b>0.238</b>          |
| <b>#1</b>  | <b>Σ</b> | <b>1,341.900</b> |                    |              |        |              |     | <b>0.03</b>          | <b>0.085</b>          |

## Subwatershed Sedimentology Detail:

| Stru # | SWS # | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l) |
|--------|-------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|-------------|
| #18    | 1     | 0.300  | 200.00 | 14.20 | 1.0000 | 0.9000 | 1    | 105.4           | 439,677                    | 250.60                      | 123.57      |
|        | 2     | 0.300  | 400.00 | 9.30  | 0.0100 | 0.3800 | 1    | 3.4             | 1,005                      | 0.37                        | 0.21        |
|        | 3     | 0.300  | 100.00 | 8.50  | 0.0700 | 0.3800 | 1    | 0.0             | 756                        | 0.43                        | 0.33        |
|        | 4     | 0.300  | 100.00 | 1.50  | 0.0700 | 0.3800 | 1    | 0.0             | 123                        | 0.06                        | 0.05        |
|        | 5     | 0.300  | 400.00 | 10.60 | 0.0100 | 0.3800 | 1    | 0.1             | 382                        | 0.19                        | 0.16        |
|        | 6     | 0.300  | 400.00 | 9.50  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | 7     | 0.300  | 200.00 | 8.50  | 0.0310 | 0.3800 | 1    | 0.0             | 476                        | 0.27                        | 0.21        |

| Stru #       | SWS # | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)  |
|--------------|-------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|--------------|
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>109.0</b>    | <b>364,165</b>             | <b>205.23</b>               | <b>8.32</b>  |
| <b>#19 Σ</b> |       |        |        |       |        |        |      | <b>109.0</b>    | <b>364,165</b>             | <b>205.23</b>               | <b>8.32</b>  |
| #17          | 1     | 0.300  | 400.00 | 6.60  | 0.8000 | 0.3800 | 1    | 71.6            | 95,041                     | 54.17                       | 25.34        |
|              | 2     | 0.300  | 400.00 | 7.40  | 0.0100 | 0.3800 | 1    | 0.1             | 191                        | 0.09                        | 0.08         |
|              | 3     | 0.300  | 100.00 | 11.80 | 0.0700 | 0.3800 | 1    | 0.2             | 7,426                      | 4.23                        | 1.73         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>71.9</b>     | <b>91,138</b>              | <b>51.94</b>                | <b>19.06</b> |
| #15          | 1     | 0.300  | 200.00 | 15.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 400.00 | 9.40  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 3     | 0.300  | 400.00 | 11.30 | 0.0100 | 0.3800 | 1    | 0.0             | 414                        | 0.24                        | 0.18         |
|              | 4     | 0.300  | 400.00 | 11.50 | 0.8000 | 0.3800 | 1    | 210.3           | 224,470                    | 127.94                      | 61.00        |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>391.3</b>    | <b>186,389</b>             | <b>105.90</b>               | <b>19.61</b> |
| <b>#14 Σ</b> |       |        |        |       |        |        |      | <b>391.3</b>    | <b>186,389</b>             | <b>105.90</b>               | <b>19.61</b> |
| #13          | 1     | 0.300  | 200.00 | 18.60 | 0.8000 | 0.3800 | 1    | 224.4           | 263,388                    | 150.12                      | 72.00        |
|              | 2     | 0.300  | 300.00 | 15.70 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 3     | 0.300  | 300.00 | 15.80 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 4     | 0.300  | 100.00 | 4.80  | 0.8000 | 0.3800 | 1    | 5.9             | 30,704                     | 17.50                       | 8.11         |
|              | 5     | 0.300  | 200.00 | 5.50  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 6     | 0.300  | 400.00 | 6.70  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>230.4</b>    | <b>220,429</b>             | <b>125.64</b>               | <b>17.24</b> |
| <b>#12 Σ</b> |       |        |        |       |        |        |      | <b>230.4</b>    | <b>220,429</b>             | <b>125.64</b>               | <b>17.24</b> |
| #9           | 1     | 0.300  | 200.00 | 5.00  | 0.0100 | 0.3800 | 1    | 0.0             | 79                         | 0.05                        | 0.03         |
|              | 2     | 0.300  | 300.00 | 7.10  | 0.8000 | 0.3800 | 1    | 30.6            | 81,675                     | 46.55                       | 21.74        |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>30.6</b>     | <b>81,675</b>              | <b>46.55</b>                | <b>21.14</b> |
| #11          | 1     | 0.300  | 400.00 | 14.70 | 0.8000 | 0.3800 | 1    | 128.2           | 277,070                    | 157.92                      | 75.89        |
|              | 2     | 0.300  | 200.00 | 16.90 | 0.8000 | 0.3800 | 1    | 34.4            | 200,127                    | 114.07                      | 54.19        |
|              | 3     | 0.300  | 400.00 | 6.60  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 4     | 0.300  | 200.00 | 5.20  | 0.8000 | 0.3800 | 1    | 7.8             | 45,831                     | 26.12                       | 12.14        |
|              | 5     | 0.300  | 400.00 | 8.40  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>201.0</b>    | <b>170,377</b>             | <b>97.11</b>                | <b>27.30</b> |
| <b>#20 Σ</b> |       |        |        |       |        |        |      | <b>201.0</b>    | <b>170,377</b>             | <b>97.11</b>                | <b>27.30</b> |
| #10          | 1     | 0.300  | 400.00 | 4.70  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 400.00 | 12.70 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 3     | 0.300  | 50.00  | 1.50  | 0.8000 | 0.3800 | 1    | 0.1             | 6,414                      | 3.66                        | 1.92         |
|              | 4     | 0.300  | 400.00 | 9.80  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>201.1</b>    | <b>6,414</b>               | <b>0.00</b>                 | <b>0.00</b>  |
| #7           | 1     | 0.300  | 400.00 | 8.60  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |

| Stru # | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)   |
|--------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|---------------|
|        | 2        | 0.300  | 300.00 | 3.00  | 0.0310 | 0.9000 | 1    | 0.0             | 499                        | 0.25                        | 0.23          |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>201.1</b>    | <b>6,414</b>               | <b>0.00</b>                 | <b>0.00</b>   |
| #6     | 1        | 0.300  | 400.00 | 25.90 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00          |
|        | 2        | 0.300  | 400.00 | 14.10 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00          |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>201.1</b>    | <b>6,414</b>               | <b>0.00</b>                 | <b>0.00</b>   |
| #5     | 1        | 0.300  | 100.00 | 22.20 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00          |
|        | 2        | 0.300  | 400.00 | 11.60 | 0.0310 | 0.9000 | 1    | 0.0             | 5,242                      | 2.54                        | 1.99          |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>5,242</b>               | <b>2.54</b>                 | <b>1.99</b>   |
| #4     | 1        | 0.300  | 400.00 | 34.90 | 0.8000 | 0.9000 | 1    | 216.9           | 1,075,732                  | 613.13                      | 314.33        |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>217.0</b>    | <b>1,075,732</b>           | <b>613.11</b>               | <b>301.85</b> |
| #3     | <b>Σ</b> |        |        |       |        |        |      | <b>418.0</b>    | <b>1,013,139</b>           | <b>299.68</b>               | <b>145.66</b> |
| #2     | 1        | 0.300  | 400.00 | 30.40 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00          |
|        | 2        | 0.300  | 400.00 | 34.10 | 0.0800 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00          |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>418.0</b>    | <b>1,013,139</b>           | <b>299.68</b>               | <b>145.66</b> |
| #1     | <b>Σ</b> |        |        |       |        |        |      | <b>0.8</b>      | <b>8,630</b>               | <b>0.00</b>                 | <b>0.00</b>   |

## Subwatershed Time of Concentration Details:

| Stru # | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|--------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2     | 1        | 3. Short grass pasture        | 30.40     | 270.56           | 890.00            | 4.410          | 0.056        |
| #2     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.056</b> |
| #2     | 2        | 3. Short grass pasture        | 34.00     | 274.04           | 806.00            | 4.660          | 0.048        |
| #2     | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.048</b> |
| #4     | 1        | 3. Short grass pasture        | 35.00     | 351.05           | 1,003.00          | 4.730          | 0.058        |
| #4     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.058</b> |
| #5     | 1        | 3. Short grass pasture        | 22.00     | 49.72            | 226.00            | 3.750          | 0.016        |
| #5     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.016</b> |
| #5     | 2        | 3. Short grass pasture        | 11.60     | 426.64           | 3,677.93          | 2.720          | 0.375        |
| #5     | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.375</b> |
| #6     | 1        | 3. Short grass pasture        | 26.00     | 275.85           | 1,061.00          | 4.070          | 0.072        |
| #6     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.072</b> |
| #6     | 2        | 3. Short grass pasture        | 14.00     | 198.66           | 1,419.00          | 2.990          | 0.131        |
| #6     | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.131</b> |
| #7     | 1        | 3. Short grass pasture        | 8.60      | 276.31           | 3,212.90          | 2.340          | 0.381        |
| #7     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.381</b> |
| #7     | 2        | 3. Short grass pasture        | 3.00      | 25.05            | 835.00            | 1.380          | 0.168        |
| #7     | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.168</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #9         | 1        | 3. Short grass pasture                                | 5.00      | 25.15            | 503.00            | 1.780          | 0.078        |
| <b>#9</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.078</b> |
| #9         | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 7.10      | 49.70            | 700.00            | 2.660          | 0.073        |
| <b>#9</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.073</b> |
| #10        | 1        | 3. Short grass pasture                                | 4.70      | 124.36           | 2,646.00          | 1.730          | 0.424        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.424</b> |
| #10        | 2        | 3. Short grass pasture                                | 11.00     | 126.17           | 1,147.00          | 2.650          | 0.120        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.120</b> |
| #10        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 1.50      | 1.50             | 100.00            | 1.220          | 0.022        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #10        | 4        | 3. Short grass pasture                                | 9.80      | 124.46           | 1,270.00          | 2.500          | 0.141        |
| <b>#10</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.141</b> |
| #11        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 14.00     | 143.22           | 1,023.00          | 3.740          | 0.075        |
| <b>#11</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.075</b> |
| #11        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 17.00     | 75.48            | 444.00            | 4.120          | 0.029        |
| <b>#11</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.029</b> |
| #11        | 3        | 3. Short grass pasture                                | 6.60      | 100.05           | 1,515.90          | 2.050          | 0.205        |
| <b>#11</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.205</b> |
| #11        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 5.20      | 24.80            | 477.00            | 2.280          | 0.058        |
| <b>#11</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.058</b> |
| #11        | 5        | 3. Short grass pasture                                | 8.40      | 124.48           | 1,482.00          | 2.310          | 0.178        |
| <b>#11</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.178</b> |
| #13        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 18.60     | 99.84            | 536.80            | 4.310          | 0.034        |
| <b>#13</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.034</b> |
| #13        | 2        | 3. Short grass pasture                                | 16.00     | 101.75           | 636.00            | 3.200          | 0.055        |
| <b>#13</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.055</b> |
| #13        | 3        | 3. Short grass pasture                                | 16.00     | 126.24           | 789.00            | 3.200          | 0.068        |
| <b>#13</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.068</b> |
| #13        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 5.00      | 10.12            | 202.40            | 2.230          | 0.025        |
| <b>#13</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.025</b> |
| #13        | 5        | 3. Short grass pasture                                | 5.50      | 25.13            | 457.00            | 1.870          | 0.067        |
| <b>#13</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.067</b> |
| #13        | 6        | 3. Short grass pasture                                | 7.00      | 104.72           | 1,496.00          | 2.110          | 0.196        |
| <b>#13</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.196</b> |
| #15        | 1        | 3. Short grass pasture                                | 15.00     | 74.85            | 498.99            | 3.090          | 0.044        |
| <b>#15</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #15        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 11.50     | 125.46           | 1,091.00          | 3.390          | 0.089        |
| <b>#15</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.301</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #15        | 3        | 3. Short grass pasture                                | 11.30     | 100.00           | 885.00            | 2.680          | 0.091        |
| <b>#15</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.091</b> |
| #15        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 12.00     | 130.80           | 1,090.00          | 3.460          | 0.087        |
| <b>#15</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.087</b> |
| #17        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 6.60      | 74.58            | 1,130.00          | 2.560          | 0.122        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.122</b> |
| #17        | 2        | 3. Short grass pasture                                | 7.40      | 298.66           | 4,036.00          | 2.170          | 0.516        |
| <b>#17</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.516</b> |
| #17        | 3        | 3. Short grass pasture                                | 11.80     | 24.89            | 211.00            | 2.740          | 0.021        |
| <b>#17</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #18        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 8.50      | 44.88            | 528.00            | 2.910          | 0.050        |
| <b>#18</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #18        | 2        | 3. Short grass pasture                                | 9.30      | 653.32           | 7,025.00          | 2.430          | 0.803        |
| <b>#18</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.803</b> |
| #18        | 3        | 3. Short grass pasture                                | 8.50      | 25.07            | 295.00            | 2.330          | 0.035        |
| <b>#18</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.035</b> |
| #18        | 4        | 3. Short grass pasture                                | 1.50      | 7.74             | 516.00            | 0.970          | 0.147        |
| <b>#18</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.147</b> |
| #18        | 5        | 3. Short grass pasture                                | 10.60     | 124.86           | 1,178.00          | 2.600          | 0.125        |
| <b>#18</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #18        | 6        | 3. Short grass pasture                                | 9.50      | 99.84            | 1,051.00          | 2.460          | 0.118        |
| <b>#18</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.118</b> |
| #18        | 7        | 3. Short grass pasture                                | 8.50      | 50.23            | 591.00            | 2.330          | 0.070        |
| <b>#18</b> | <b>7</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.070</b> |

# **Streeter Pond** **25 Year 24 Hour Storm Event**

***Emergency Spillway Demonstration***  
***Post-Mining Condition***

Tony Tennyson

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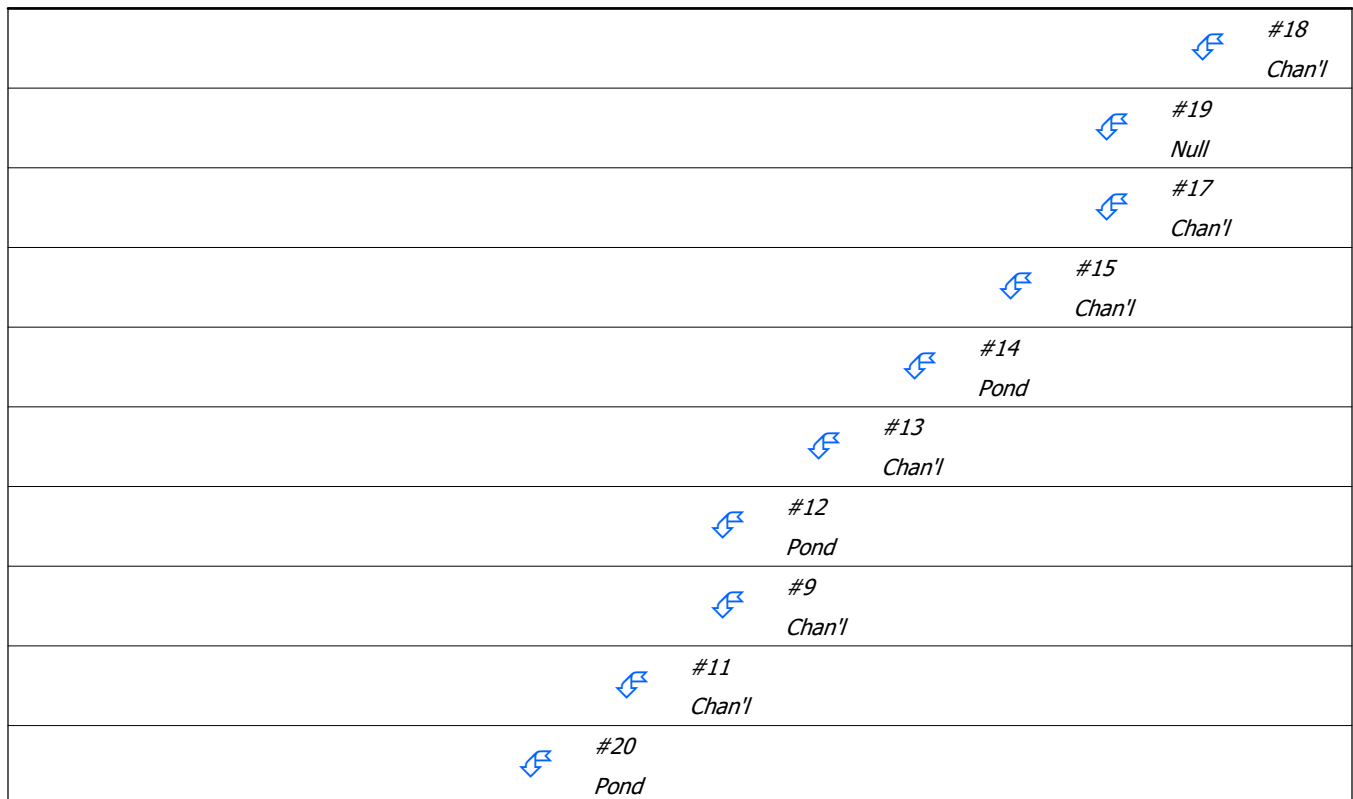
## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 25 yr - 24 hr |
| Rainfall Depth: | 2.300 inches  |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                                    |
|---------|--------|--------------|--------|---------------|---------|----------------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below Streeter Pond                                       |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Streeter Pond                                                  |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above Streeter Pond                                       |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Streeter Ditch 0+00 to 10+00                                   |
| Channel | #5     | ==>          | #4     | 0.000         | 0.000   | Streeter South Side Ditch                                      |
| Channel | #6     | ==>          | #3     | 0.000         | 0.000   | Streeter Ditch 10+00 to 25+00                                  |
| Channel | #7     | ==>          | #6     | 0.000         | 0.000   | Streeter Ditch 25+00 to 45+00<br>Streeter Ditch 25+00 to 45+00 |
| Channel | #9     | ==>          | #11    | 0.000         | 0.000   | Stoker Ditch                                                   |
| Channel | #10    | ==>          | #7     | 0.000         | 0.000   | Streeter Ditch 45+00 to 80+00                                  |
| Channel | #11    | ==>          | #20    | 0.000         | 0.000   | Streeter Ditch 80+00 to 91+00                                  |
| Pond    | #12    | ==>          | #11    | 0.000         | 0.000   | SD-2 Stockpond                                                 |
| Channel | #13    | ==>          | #12    | 0.000         | 0.000   | Streeter Ditch 91+00 to 111+00                                 |
| Pond    | #14    | ==>          | #13    | 0.000         | 0.000   | SD-3 Stockpond                                                 |
| Channel | #15    | ==>          | #14    | 0.000         | 0.000   | Streeter Ditch 111+00 to 125+00                                |
| Channel | #17    | ==>          | #15    | 0.000         | 0.000   | Buckskin Ditch                                                 |
| Channel | #18    | ==>          | #19    | 0.000         | 0.000   | Streeter Ditch 125+00 to 187+00                                |
| Null    | #19    | ==>          | #15    | 0.011         | 0.370   | Null at Confluence Buckskin/Streeter                           |
| Pond    | #20    | ==>          | #10    | 0.000         | 0.000   | SD-1 Stockpond                                                 |



|                                                                                   |                                                                                   |               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |  | #7<br>Chan'l  |
|                                                                                   |  | #6<br>Chan'l  |
|                                                                                   |  | #5<br>Chan'l  |
|                                                                                   |  | #4<br>Chan'l  |
|                                                                                   |  | #3<br>Null    |
|  |                                                                                   | #2<br>Pond    |
| #1<br>Null                                                                        |                                                                                   |               |

## Structure Routing Details:

| Stru #     | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #19        | 8. Large gullies, diversions, and low flowing streams | 2.60      | 5.20             | 200.00            | 4.83           | 0.011        |
| <b>#19</b> | <b>Muskingum K:</b>                                   |           |                  |                   |                | <b>0.011</b> |

### ***Structure Summary:***

|     | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|-----|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #18 | 316.200                                   | 316.200                               | 52.10                      | 9.89                                 |
| #19 | 0.000                                     | 316.200                               | 52.10                      | 9.89                                 |
| #17 | 135.700                                   | 135.700                               | 28.31                      | 3.15                                 |
| #15 | 143.100                                   | 595.000                               | 83.09                      | 15.56                                |
| #14 | In<br>Out                                 | 0.000                                 | 595.000                    | 83.09                                |
|     |                                           |                                       | 41.07                      | 11.55                                |
| #13 | 99.000                                    | 694.000                               | 44.99                      | 14.12                                |
| #12 | In<br>Out                                 | 0.000                                 | 694.000                    | 44.99                                |
|     |                                           |                                       | 26.03                      | 10.11                                |
| #9  | 19.600                                    | 19.600                                | 13.86                      | 1.03                                 |
| #11 | 71.400                                    | 785.000                               | 40.90                      | 13.13                                |
| #20 | In<br>Out                                 | 0.000                                 | 785.000                    | 40.90                                |
|     |                                           |                                       | 21.09                      | 9.47                                 |
| #10 | 160.900                                   | 945.900                               | 21.11                      | 9.51                                 |
| #7  | 142.400                                   | 1,088.300                             | 21.18                      | 9.56                                 |
| #6  | 58.100                                    | 1,146.400                             | 21.18                      | 9.56                                 |
| #5  | 164.800                                   | 164.800                               | 0.42                       | 0.34                                 |
| #4  | 9.500                                     | 174.300                               | 5.52                       | 0.73                                 |
| #3  | 0.000                                     | 1,320.700                             | 21.87                      | 10.29                                |
| #2  | In<br>Out                                 | 21.200                                | 1,341.900                  | 21.90                                |
|     |                                           |                                       | 5.54                       | 7.67                                 |
| #1  | 0.000                                     | 1,341.900                             | 5.54                       | 7.67                                 |

## Structure Detail:

### Structure #18 (Vegetated Channel)

*Streeter Ditch 125+00 to 187+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 2.6       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 52.10 cfs                             |                                      | 52.10 cfs                            |                                     |
| Depth:                 | 0.73 ft                               |                                      | 1.16 ft                              |                                     |
| Top Width:             | 19.40 ft                              |                                      | 21.99 ft                             |                                     |
| Velocity:              | 4.13 fps                              |                                      | 2.42 fps                             |                                     |
| X-Section Area:        | 12.63 sq ft                           |                                      | 21.55 sq ft                          |                                     |
| Hydraulic Radius:      | 0.643 ft                              |                                      | 0.963 ft                             |                                     |
| Froude Number:         | 0.90                                  |                                      | 0.43                                 |                                     |
| Roughness Coefficient: | 0.0433                                |                                      | 0.0969                               |                                     |

### Structure #19 (Null)

*Null at Confluence Buckskin/Streeter*

### Structure #17 (Vegetated Channel)

*Buckskin Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 4.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 28.31 cfs                             |                                      | 28.31 cfs                            |                                     |
| Depth:                    | 0.55 ft                               |                                      | 0.92 ft                              |                                     |
| Top Width:                | 15.29 ft                              |                                      | 17.50 ft                             |                                     |
| Velocity:                 | 3.79 fps                              |                                      | 2.09 fps                             |                                     |
| X-Section Area:           | 7.48 sq ft                            |                                      | 13.53 sq ft                          |                                     |
| Hydraulic Radius:         | 0.483 ft                              |                                      | 0.760 ft                             |                                     |
| Froude Number:            | 0.95                                  |                                      | 0.42                                 |                                     |
| Roughness<br>Coefficient: | 0.0485                                |                                      | 0.1184                               |                                     |

### Structure #15 (Vegetated Channel)

*Streeter Ditch 111+00 to 125+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 15.00                | 3.0:1                      | 3.0:1                       | 2.6       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 83.09 cfs                             |                                      | 83.09 cfs                            |                                     |
| Depth:                    | 0.89 ft                               |                                      | 1.34 ft                              |                                     |
| Top Width:                | 20.36 ft                              |                                      | 23.03 ft                             |                                     |
| Velocity:                 | 5.26 fps                              |                                      | 3.26 fps                             |                                     |
| X-Section Area:           | 15.79 sq ft                           |                                      | 25.46 sq ft                          |                                     |
| Hydraulic Radius:         | 0.765 ft                              |                                      | 1.085 ft                             |                                     |
| Froude Number:            | 1.05                                  |                                      | 0.55                                 |                                     |
| Roughness<br>Coefficient: | 0.0381                                |                                      | 0.0777                               |                                     |

### Structure #14 (Pond)

*SD-3 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 103.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 103.85 ft |
| Dewater Time:   | 0.58 days |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 90.00     | 0.050     | 0.000            | 0.000           |                    |
| 90.01     | 0.050     | 0.001            | 0.000           |                    |
| 91.00     | 0.072     | 0.061            | 0.000           |                    |
| 92.00     | 0.098     | 0.145            | 0.000           |                    |
| 93.00     | 0.128     | 0.258            | 0.000           |                    |
| 94.00     | 0.162     | 0.403            | 0.000           |                    |
| 95.00     | 0.200     | 0.583            | 0.000           |                    |
| 96.00     | 0.231     | 0.799            | 0.000           |                    |
| 97.00     | 0.265     | 1.046            | 0.000           |                    |
| 98.00     | 0.301     | 1.329            | 0.000           |                    |
| 99.00     | 0.339     | 1.649            | 0.000           |                    |
| 100.00    | 0.380     | 2.008            | 0.000           |                    |
| 101.00    | 0.554     | 2.473            | 0.000           |                    |
| 102.00    | 0.761     | 3.127            | 0.000           |                    |
| 103.00    | 1.000     | 4.005            | 0.000           | Spillway #1        |
| 103.85    | 0.991     | 4.858            | 41.072          | 13.90 Peak Stage   |
| 104.00    | 1.010     | 5.010            | 48.400          |                    |
| 105.00    | 1.020     | 6.025            | 167.398         |                    |

## Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 90.00          | 0.000                    | 0.000                          |
| 90.01          | 0.000                    | 0.000                          |
| 91.00          | 0.000                    | 0.000                          |
| 92.00          | 0.000                    | 0.000                          |

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 93.00          | 0.000                    | 0.000                          |
| 94.00          | 0.000                    | 0.000                          |
| 95.00          | 0.000                    | 0.000                          |
| 96.00          | 0.000                    | 0.000                          |
| 97.00          | 0.000                    | 0.000                          |
| 98.00          | 0.000                    | 0.000                          |
| 99.00          | 0.000                    | 0.000                          |
| 100.00         | 0.000                    | 0.000                          |
| 101.00         | 0.000                    | 0.000                          |
| 102.00         | 0.000                    | 0.000                          |
| 103.00         | 0.000                    | 0.000                          |
| 104.00         | 48.400                   | 48.400                         |
| 105.00         | 167.398                  | 167.398                        |

## Structure #13 (Vegetated Channel)

*Streeter Ditch 91+00 to 111+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 3.2       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 44.99 cfs                       |                                | 44.99 cfs                      |                               |
| Depth:                 | 0.65 ft                         |                                | 1.04 ft                        |                               |
| Top Width:             | 18.89 ft                        |                                | 21.27 ft                       |                               |
| Velocity:              | 4.10 fps                        |                                | 2.37 fps                       |                               |
| X-Section Area:        | 10.98 sq ft                     |                                | 18.95 sq ft                    |                               |
| Hydraulic Radius:      | 0.575 ft                        |                                | 0.877 ft                       |                               |
| Froude Number:         | 0.95                            |                                | 0.44                           |                               |
| Roughness Coefficient: | 0.0449                          |                                | 0.1028                         |                               |

## Structure #12 (Pond)

*SD-2 Stockpond*

**Pond Inputs:**

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

**Emergency Spillway**

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 103.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

**Pond Results:**

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 103.54 ft |
| Dewater Time:   | 0.56 days |

*Dewatering time is calculated from peak stage to lowest spillway*

**Elevation-Capacity-Discharge Table**

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 90.00     | 0.050     | 0.000            | 0.000           |                    |
| 90.01     | 0.050     | 0.001            | 0.000           |                    |
| 91.00     | 0.072     | 0.061            | 0.000           |                    |
| 92.00     | 0.098     | 0.145            | 0.000           |                    |
| 93.00     | 0.128     | 0.258            | 0.000           |                    |
| 94.00     | 0.162     | 0.403            | 0.000           |                    |
| 95.00     | 0.200     | 0.583            | 0.000           |                    |
| 96.00     | 0.231     | 0.799            | 0.000           |                    |
| 97.00     | 0.265     | 1.046            | 0.000           |                    |
| 98.00     | 0.301     | 1.329            | 0.000           |                    |
| 99.00     | 0.339     | 1.649            | 0.000           |                    |
| 100.00    | 0.380     | 2.008            | 0.000           |                    |
| 101.00    | 0.554     | 2.473            | 0.000           |                    |
| 102.00    | 0.761     | 3.127            | 0.000           |                    |
| 103.00    | 1.000     | 4.005            | 0.000           | Spillway #1        |
| 103.54    | 0.960     | 4.548            | 26.031          | 13.45 Peak Stage   |
| 104.00    | 1.020     | 5.015            | 48.400          |                    |
| 105.00    | 1.040     | 6.045            | 167.398         |                    |

**Detailed Discharge Table**

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 90.00          | 0.000                    | 0.000                          |
| 90.01          | 0.000                    | 0.000                          |
| 91.00          | 0.000                    | 0.000                          |
| 92.00          | 0.000                    | 0.000                          |
| 93.00          | 0.000                    | 0.000                          |
| 94.00          | 0.000                    | 0.000                          |
| 95.00          | 0.000                    | 0.000                          |
| 96.00          | 0.000                    | 0.000                          |
| 97.00          | 0.000                    | 0.000                          |
| 98.00          | 0.000                    | 0.000                          |
| 99.00          | 0.000                    | 0.000                          |
| 100.00         | 0.000                    | 0.000                          |
| 101.00         | 0.000                    | 0.000                          |
| 102.00         | 0.000                    | 0.000                          |
| 103.00         | 0.000                    | 0.000                          |
| 104.00         | 48.400                   | 48.400                         |
| 105.00         | 167.398                  | 167.398                        |

## Structure #9 (Vegetated Channel)

### *Stoker Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 13.86 cfs                       |                                | 13.86 cfs                      |                               |
| Depth:                 | 0.82 ft                         |                                | 1.31 ft                        |                               |
| Top Width:             | 8.58 ft                         |                                | 12.50 ft                       |                               |
| Velocity:              | 3.18 fps                        |                                | 1.46 fps                       |                               |
| X-Section Area:        | 4.36 sq ft                      |                                | 9.51 sq ft                     |                               |
| Hydraulic Radius:      | 0.496 ft                        |                                | 0.742 ft                       |                               |
| Froude Number:         | 0.79                            |                                | 0.29                           |                               |
| Roughness Coefficient: | 0.0507                          |                                | 0.1451                         |                               |

### Structure #11 (Vegetated Channel)

*Streeter Ditch 80+00 to 91+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 3.2       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 40.90 cfs                             |                                      | 40.90 cfs                            |                                     |
| Depth:                 | 0.62 ft                               |                                      | 1.02 ft                              |                                     |
| Top Width:             | 18.73 ft                              |                                      | 21.10 ft                             |                                     |
| Velocity:              | 3.90 fps                              |                                      | 2.23 fps                             |                                     |
| X-Section Area:        | 10.49 sq ft                           |                                      | 18.34 sq ft                          |                                     |
| Hydraulic Radius:      | 0.554 ft                              |                                      | 0.856 ft                             |                                     |
| Froude Number:         | 0.92                                  |                                      | 0.42                                 |                                     |
| Roughness Coefficient: | 0.0461                                |                                      | 0.1076                               |                                     |

### Structure #20 (Pond)

*SD-1 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 100.01 ft  |
| Initial Pool:      | 0.01 ac-ft |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 105.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 105.44 ft |
| Dewater Time:   | 0.53 days |

*Dewatering time is calculated from peak stage to lowest spillway*

#### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 100.00    | 0.661        | 0.000               | 0.000              |                          |
| 100.01    | 0.661        | 0.007               | 0.000              |                          |
| 101.00    | 0.708        | 0.684               | 0.000              |                          |
| 102.00    | 0.734        | 1.405               | 0.000              |                          |
| 103.00    | 0.757        | 2.151               | 0.000              |                          |
| 104.00    | 0.758        | 2.908               | 0.000              |                          |
| 105.00    | 0.759        | 3.667               | 0.000              | Spillway #1              |
| 105.44    | 0.759        | 3.998               | 21.087             | 12.80 Peak Stage         |
| 106.00    | 0.760        | 4.426               | 48.400             |                          |
| 107.00    | 0.762        | 5.187               | 167.398            |                          |

**Detailed Discharge Table**

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 100.00            | 0.000                       | 0.000                                   |
| 100.01            | 0.000                       | 0.000                                   |
| 101.00            | 0.000                       | 0.000                                   |
| 102.00            | 0.000                       | 0.000                                   |
| 103.00            | 0.000                       | 0.000                                   |
| 104.00            | 0.000                       | 0.000                                   |
| 105.00            | 0.000                       | 0.000                                   |
| 106.00            | 48.400                      | 48.400                                  |
| 107.00            | 167.398                     | 167.398                                 |

**Structure #10 (Vegetated Channel)**

*Streeter Ditch 45+00 to 80+00*

Trapezoidal Vegetated Channel Inputs:

**Material: Smooth brome**

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 2.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 21.11 cfs                             |                                      | 21.11 cfs                            |                                     |
| Depth:                    | 0.60 ft                               |                                      | 1.04 ft                              |                                     |
| Top Width:                | 15.59 ft                              |                                      | 18.27 ft                             |                                     |
| Velocity:                 | 2.56 fps                              |                                      | 1.33 fps                             |                                     |
| X-Section Area:           | 8.25 sq ft                            |                                      | 15.82 sq ft                          |                                     |
| Hydraulic Radius:         | 0.523 ft                              |                                      | 0.850 ft                             |                                     |
| Froude Number:            | 0.62                                  |                                      | 0.25                                 |                                     |
| Roughness<br>Coefficient: | 0.0533                                |                                      | 0.1415                               |                                     |

Structure #7 (Riprap Channel)

*Streeter Ditch 25+00 to 45+00*

*Streeter Ditch 25+00 to 45+00*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 2.0       |                         |                         |                               |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 21.18 cfs     |              |
| Depth:            | 0.25 ft       |              |
| Top Width:        | 13.48 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 3.13 sq ft    |              |
| Hydraulic Radius: | 0.231 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

Structure #6 (Riprap Channel)

### *Streeter Ditch 10+00 to 25+00*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 6.00              | 2.0:1                | 2.0:1                 | 10.9      |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 21.18 cfs     |              |
| Depth:            | 0.29 ft       |              |
| Top Width:        | 7.17 ft       |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.92 sq ft    |              |
| Hydraulic Radius: | 0.263 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 3.00 in       |              |
| D50:              | 9.00 in       |              |
| Dmax:             | 11.25 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### *Structure #5 (Vegetated Channel)*

#### *Streeter South Side Ditch*

Trapezoidal Vegetated Channel Inputs:

#### Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                   | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|-------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge: | 0.42 cfs                        |                                | 0.42 cfs                       |                               |
| Depth:            | 0.22 ft                         |                                | 0.52 ft                        |                               |
| Top Width:        | 3.74 ft                         |                                | 6.15 ft                        |                               |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 0.68 fps                              |                                      | 0.20 fps                             |                                     |
| X-Section Area:           | 0.62 sq ft                            |                                      | 2.12 sq ft                           |                                     |
| Hydraulic Radius:         | 0.164 ft                              |                                      | 0.337 ft                             |                                     |
| Froude Number:            | 0.29                                  |                                      | 0.06                                 |                                     |
| Roughness<br>Coefficient: | 0.1141                                |                                      | 0.6270                               |                                     |

### Structure #4 (Riprap Channel)

*Streeter Ditch 0+00 to 10+00*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 6.00                 | 2.0:1                      | 2.0:1                       | 28.3      |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 5.52 cfs      |              |
| Depth:            | 0.01 ft       |              |
| Top Width:        | 6.04 ft       |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.06 sq ft    |              |
| Hydraulic Radius: | 0.009 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 3.00 in       |              |
| D50:              | 9.00 in       |              |
| Dmax:             | 11.25 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Null)

*Null Above Streeter Pond*

### Structure #2 (Pond)

*Streeter Pond*

## Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 6,583.00 ft |
| Initial Pool:      | 2.45 ac-ft  |

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 12.00               | 3.00              | 18.00                | 87.00              | 4.50             | 0.0150      | 6,585.00           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 6,588.00      | 50.00             | 1.50:1         | 1.50:1          | 20.00             |

## Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 6,587.16 ft |
| Dewater Time:   | 5.57 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 6,578.00  | 0.010     | 0.000            | 0.000           |                    |
| 6,579.00  | 0.070     | 0.035            | 0.000           |                    |
| 6,580.00  | 0.275     | 0.197            | 0.000           |                    |
| 6,581.00  | 0.441     | 0.551            | 0.000           |                    |
| 6,582.00  | 1.100     | 1.297            | 0.000           |                    |
| 6,583.00  | 1.200     | 2.447            | 0.000           | Low hole SPW #1    |
| 6,584.00  | 1.500     | 3.794            | 0.210           | 77.59*             |
| 6,585.00  | 1.600     | 5.344            | 0.507           | 36.97* Spillway #1 |
| 6,586.00  | 1.800     | 7.043            | 3.782           | 12.60              |
| 6,587.00  | 2.000     | 8.942            | 5.348           | 5.15               |
| 6,587.16  | 1.973     | 9.263            | 5.536           | 1.40 Peak Stage    |
| 6,588.00  | 2.100     | 10.992           | 6.550           | Spillway #2        |
| 6,589.00  | 2.200     | 13.142           | 45.017          |                    |
| 6,590.00  | 2.400     | 15.441           | 150.324         |                    |
| 6,591.00  | 2.500     | 17.891           | 302.542         |                    |

### Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,578.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,579.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,580.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,581.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,582.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,583.00          | 2.00>0.000        | 0.000                       | 0.000                                   |
| 6,584.00          | 2.00>0.210        | 0.000                       | 0.210                                   |
| 6,585.00          | 0.507             | 0.000                       | 0.507                                   |
| 6,586.00          | 3.782             | 0.000                       | 3.782                                   |
| 6,587.00          | 5.348             | 0.000                       | 5.348                                   |
| 6,588.00          | 6.550             | 0.000                       | 6.550                                   |
| 6,589.00          | 7.563             | 37.453                      | 45.017                                  |
| 6,590.00          | 8.456             | 141.868                     | 150.324                                 |
| 6,591.00          | 9.263             | 293.279                     | 302.542                                 |

Structure #1 (Null)

*Null Below Streeter Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #18        | 1        | 8.500          | 0.050              | 0.000        | 0.000  | 80.000       | F   | 7.25                 | 0.533                 |
|            | 2        | 213.800        | 0.803              | 0.000        | 0.000  | 74.000       | F   | 47.43                | 8.351                 |
|            | 3        | 10.200         | 0.035              | 0.000        | 0.000  | 62.000       | M   | 1.41                 | 0.136                 |
|            | 4        | 11.600         | 0.147              | 0.000        | 0.000  | 62.000       | M   | 0.62                 | 0.126                 |
|            | 5        | 55.100         | 0.125              | 0.000        | 0.000  | 62.000       | M   | 2.93                 | 0.598                 |
|            | 6        | 6.300          | 0.118              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 7        | 10.700         | 0.070              | 0.000        | 0.000  | 62.000       | M   | 1.48                 | 0.142                 |
|            | <b>Σ</b> | <b>316.200</b> |                    |              |        |              |     | <b>52.10</b>         | <b>9.885</b>          |
| <b>#19</b> | <b>Σ</b> | <b>316.200</b> |                    |              |        |              |     | <b>52.10</b>         | <b>9.885</b>          |
| #17        | 1        | 31.200         | 0.122              | 0.000        | 0.000  | 80.000       | F   | 26.62                | 1.957                 |
|            | 2        | 101.900        | 0.516              | 0.000        | 0.000  | 62.000       | M   | 3.04                 | 1.085                 |
|            | 3        | 2.600          | 0.021              | 0.000        | 0.000  | 74.000       | F   | 1.51                 | 0.108                 |
|            | <b>Σ</b> | <b>135.700</b> |                    |              |        |              |     | <b>28.31</b>         | <b>3.150</b>          |
| #15        | 1        | 6.600          | 0.044              | 0.000        | 0.000  | 47.000       | M   | 0.00                 | 0.000                 |
|            | 2        | 83.200         | 0.301              | 0.000        | 0.000  | 47.000       | S   | 0.01                 | 0.000                 |
|            | 3        | 16.600         | 0.091              | 0.000        | 0.000  | 62.000       | M   | 2.29                 | 0.221                 |
|            | 4        | 36.700         | 0.087              | 0.000        | 0.000  | 80.000       | F   | 31.31                | 2.302                 |
|            | <b>Σ</b> | <b>595.000</b> |                    |              |        |              |     | <b>83.09</b>         | <b>15.558</b>         |
| <b>#14</b> | <b>Σ</b> | <b>595.000</b> |                    |              |        |              |     | <b>83.09</b>         | <b>15.558</b>         |
| #13        | 1        | 32.800         | 0.034              | 0.000        | 0.000  | 80.000       | F   | 27.98                | 2.057                 |
|            | 2        | 6.900          | 0.055              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 3        | 20.300         | 0.068              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 4        | 8.200          | 0.025              | 0.000        | 0.000  | 80.000       | F   | 7.00                 | 0.514                 |
|            | 5        | 2.900          | 0.067              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 6        | 27.900         | 0.196              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>694.000</b> |                    |              |        |              |     | <b>44.99</b>         | <b>14.123</b>         |
| <b>#12</b> | <b>Σ</b> | <b>694.000</b> |                    |              |        |              |     | <b>44.99</b>         | <b>14.123</b>         |
| #9         | 1        | 4.000          | 0.078              | 0.000        | 0.000  | 62.000       | F   | 0.55                 | 0.053                 |
|            | 2        | 15.600         | 0.073              | 0.000        | 0.000  | 80.000       | F   | 13.31                | 0.978                 |
|            | <b>Σ</b> | <b>19.600</b>  |                    |              |        |              |     | <b>13.86</b>         | <b>1.032</b>          |
| #11        | 1        | 17.700         | 0.075              | 0.000        | 0.000  | 80.000       | F   | 15.10                | 1.110                 |
|            | 2        | 6.800          | 0.029              | 0.000        | 0.000  | 80.000       | F   | 5.80                 | 0.426                 |
|            | 3        | 27.900         | 0.205              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 4        | 7.200          | 0.058              | 0.000        | 0.000  | 80.000       | F   | 6.14                 | 0.452                 |
|            | 5        | 11.800         | 0.178              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |

| Stru #     | SWS #    | SWS Area (ac)    | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|------------|----------|------------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|            | <b>Σ</b> | <b>785.000</b>   |                    |              |        |              |     | <b>40.90</b>         | <b>13.134</b>         |
| <b>#20</b> | <b>Σ</b> | <b>785.000</b>   |                    |              |        |              |     | <b>40.90</b>         | <b>13.134</b>         |
| #10        | 1        | 78.800           | 0.424              | 0.000        | 0.000  | 47.000       | S   | 0.01                 | 0.000                 |
|            | 2        | 65.200           | 0.120              | 0.000        | 0.000  | 47.000       | S   | 0.01                 | 0.000                 |
|            | 3        | 0.600            | 0.022              | 0.000        | 0.000  | 80.000       | F   | 0.51                 | 0.037                 |
|            | 4        | 16.300           | 0.141              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>945.900</b>   |                    |              |        |              |     | <b>21.11</b>         | <b>9.508</b>          |
| #7         | 1        | 130.200          | 0.381              | 0.000        | 0.000  | 47.000       | S   | 0.01                 | 0.001                 |
|            | 2        | 12.200           | 0.168              | 0.000        | 0.000  | 57.000       | S   | 0.08                 | 0.051                 |
|            | <b>Σ</b> | <b>1,088.300</b> |                    |              |        |              |     | <b>21.18</b>         | <b>9.560</b>          |
| #6         | 1        | 22.400           | 0.072              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 35.700           | 0.131              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | <b>Σ</b> | <b>1,146.400</b> |                    |              |        |              |     | <b>21.18</b>         | <b>9.560</b>          |
| #5         | 1        | 9.200            | 0.016              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 155.600          | 0.375              | 0.000        | 0.000  | 54.000       | S   | 0.42                 | 0.338                 |
|            | <b>Σ</b> | <b>164.800</b>   |                    |              |        |              |     | <b>0.42</b>          | <b>0.338</b>          |
| #4         | 1        | 9.500            | 0.058              | 0.000        | 0.000  | 74.000       | F   | 5.52                 | 0.395                 |
|            | <b>Σ</b> | <b>174.300</b>   |                    |              |        |              |     | <b>5.52</b>          | <b>0.733</b>          |
| <b>#3</b>  | <b>Σ</b> | <b>1,320.700</b> |                    |              |        |              |     | <b>21.87</b>         | <b>10.293</b>         |
| #2         | 1        | 16.600           | 0.056              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 4.600            | 0.048              | 0.000        | 0.000  | 57.000       | S   | 0.07                 | 0.029                 |
|            | <b>Σ</b> | <b>1,341.900</b> |                    |              |        |              |     | <b>21.90</b>         | <b>10.322</b>         |
| <b>#1</b>  | <b>Σ</b> | <b>1,341.900</b> |                    |              |        |              |     | <b>5.54</b>          | <b>7.672</b>          |

### ***Subwatershed Time of Concentration Details:***

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture        | 30.40     | 270.56           | 890.00            | 4.410          | 0.056        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.056</b> |
| #2        | 2        | 3. Short grass pasture        | 34.00     | 274.04           | 806.00            | 4.660          | 0.048        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.048</b> |
| #4        | 1        | 3. Short grass pasture        | 35.00     | 351.05           | 1,003.00          | 4.730          | 0.058        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.058</b> |
| #5        | 1        | 3. Short grass pasture        | 22.00     | 49.72            | 226.00            | 3.750          | 0.016        |
| <b>#5</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.016</b> |
| #5        | 2        | 3. Short grass pasture        | 11.60     | 426.64           | 3,677.93          | 2.720          | 0.375        |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| <b>#5</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.375</b> |
| #6         | 1        | 3. Short grass pasture                                | 26.00     | 275.85           | 1,061.00          | 4.070          | 0.072        |
| <b>#6</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.072</b> |
| #6         | 2        | 3. Short grass pasture                                | 14.00     | 198.66           | 1,419.00          | 2.990          | 0.131        |
| <b>#6</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.131</b> |
| #7         | 1        | 3. Short grass pasture                                | 8.60      | 276.31           | 3,212.90          | 2.340          | 0.381        |
| <b>#7</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.381</b> |
| #7         | 2        | 3. Short grass pasture                                | 3.00      | 25.05            | 835.00            | 1.380          | 0.168        |
| <b>#7</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.168</b> |
| #9         | 1        | 3. Short grass pasture                                | 5.00      | 25.15            | 503.00            | 1.780          | 0.078        |
| <b>#9</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.078</b> |
| #9         | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 7.10      | 49.70            | 700.00            | 2.660          | 0.073        |
| <b>#9</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.073</b> |
| #10        | 1        | 3. Short grass pasture                                | 4.70      | 124.36           | 2,646.00          | 1.730          | 0.424        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.424</b> |
| #10        | 2        | 3. Short grass pasture                                | 11.00     | 126.17           | 1,147.00          | 2.650          | 0.120        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.120</b> |
| #10        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 1.50      | 1.50             | 100.00            | 1.220          | 0.022        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #10        | 4        | 3. Short grass pasture                                | 9.80      | 124.46           | 1,270.00          | 2.500          | 0.141        |
| <b>#10</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.141</b> |
| #11        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 14.00     | 143.22           | 1,023.00          | 3.740          | 0.075        |
| <b>#11</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.075</b> |
| #11        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 17.00     | 75.48            | 444.00            | 4.120          | 0.029        |
| <b>#11</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.029</b> |
| #11        | 3        | 3. Short grass pasture                                | 6.60      | 100.05           | 1,515.90          | 2.050          | 0.205        |
| <b>#11</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.205</b> |
| #11        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 5.20      | 24.80            | 477.00            | 2.280          | 0.058        |
| <b>#11</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.058</b> |
| #11        | 5        | 3. Short grass pasture                                | 8.40      | 124.48           | 1,482.00          | 2.310          | 0.178        |
| <b>#11</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.178</b> |
| #13        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 18.60     | 99.84            | 536.80            | 4.310          | 0.034        |
| <b>#13</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.034</b> |
| #13        | 2        | 3. Short grass pasture                                | 16.00     | 101.75           | 636.00            | 3.200          | 0.055        |
| <b>#13</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.055</b> |
| #13        | 3        | 3. Short grass pasture                                | 16.00     | 126.24           | 789.00            | 3.200          | 0.068        |
| <b>#13</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.068</b> |
| #13        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 5.00      | 10.12            | 202.40            | 2.230          | 0.025        |
| <b>#13</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.025</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #13        | 5        | 3. Short grass pasture                                | 5.50      | 25.13            | 457.00            | 1.870          | 0.067        |
| <b>#13</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.067</b> |
| #13        | 6        | 3. Short grass pasture                                | 7.00      | 104.72           | 1,496.00          | 2.110          | 0.196        |
| <b>#13</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.196</b> |
| #15        | 1        | 3. Short grass pasture                                | 15.00     | 74.85            | 498.99            | 3.090          | 0.044        |
| <b>#15</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #15        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 11.50     | 125.46           | 1,091.00          | 3.390          | 0.089        |
| <b>#15</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.301</b> |
| #15        | 3        | 3. Short grass pasture                                | 11.30     | 100.00           | 885.00            | 2.680          | 0.091        |
| <b>#15</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.091</b> |
| #15        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 12.00     | 130.80           | 1,090.00          | 3.460          | 0.087        |
| <b>#15</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.087</b> |
| #17        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 6.60      | 74.58            | 1,130.00          | 2.560          | 0.122        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.122</b> |
| #17        | 2        | 3. Short grass pasture                                | 7.40      | 298.66           | 4,036.00          | 2.170          | 0.516        |
| <b>#17</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.516</b> |
| #17        | 3        | 3. Short grass pasture                                | 11.80     | 24.89            | 211.00            | 2.740          | 0.021        |
| <b>#17</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #18        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 8.50      | 44.88            | 528.00            | 2.910          | 0.050        |
| <b>#18</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #18        | 2        | 3. Short grass pasture                                | 9.30      | 653.32           | 7,025.00          | 2.430          | 0.803        |
| <b>#18</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.803</b> |
| #18        | 3        | 3. Short grass pasture                                | 8.50      | 25.07            | 295.00            | 2.330          | 0.035        |
| <b>#18</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.035</b> |
| #18        | 4        | 3. Short grass pasture                                | 1.50      | 7.74             | 516.00            | 0.970          | 0.147        |
| <b>#18</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.147</b> |
| #18        | 5        | 3. Short grass pasture                                | 10.60     | 124.86           | 1,178.00          | 2.600          | 0.125        |
| <b>#18</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #18        | 6        | 3. Short grass pasture                                | 9.50      | 99.84            | 1,051.00          | 2.460          | 0.118        |
| <b>#18</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.118</b> |
| #18        | 7        | 3. Short grass pasture                                | 8.50      | 50.23            | 591.00            | 2.330          | 0.070        |
| <b>#18</b> | <b>7</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.070</b> |

# **Streeter & Buckskin Ditches** **100 Year 24 Hour Storm Event**

***Channel Demonstration***  
***Post-Mining Condition***

Tony Tennyson

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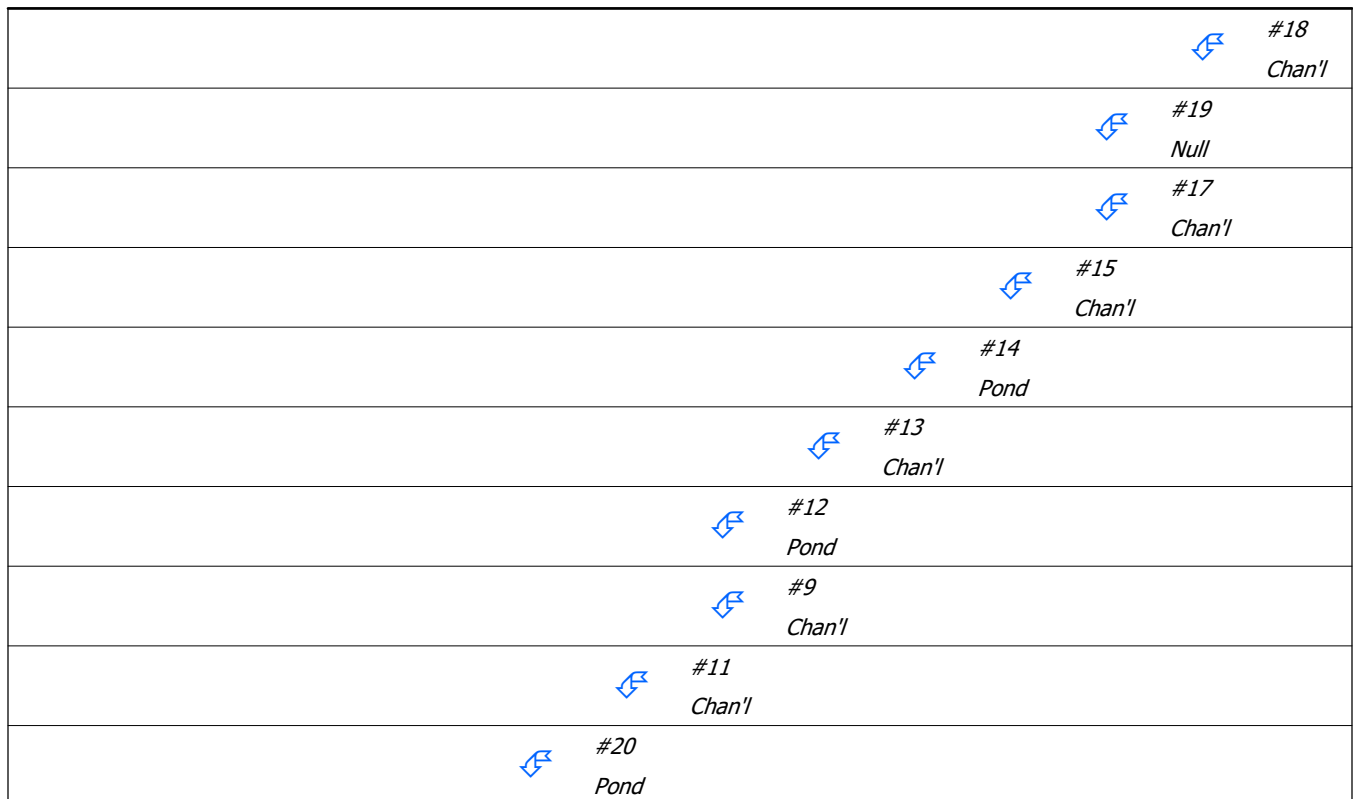
## ***General Information***

### ***Storm Information:***

|                 |                |
|-----------------|----------------|
| Storm Type:     | NRCS Type II   |
| Design Storm:   | 100 yr - 24 hr |
| Rainfall Depth: | 2.700 inches   |

## ***Structure Networking:***

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                                    |
|---------|--------|--------------|--------|---------------|---------|----------------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below Streeter Pond                                       |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Streeter Pond                                                  |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above Streeter Pond                                       |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Streeter Ditch 0+00 to 10+00                                   |
| Channel | #5     | ==>          | #4     | 0.000         | 0.000   | Streeter South Side Ditch                                      |
| Channel | #6     | ==>          | #3     | 0.000         | 0.000   | Streeter Ditch 10+00 to 25+00                                  |
| Channel | #7     | ==>          | #6     | 0.000         | 0.000   | Streeter Ditch 25+00 to 45+00<br>Streeter Ditch 25+00 to 45+00 |
| Channel | #9     | ==>          | #11    | 0.000         | 0.000   | Stoker Ditch                                                   |
| Channel | #10    | ==>          | #7     | 0.000         | 0.000   | Streeter Ditch 45+00 to 80+00                                  |
| Channel | #11    | ==>          | #20    | 0.000         | 0.000   | Streeter Ditch 80+00 to 91+00                                  |
| Pond    | #12    | ==>          | #11    | 0.000         | 0.000   | SD-2 Stockpond                                                 |
| Channel | #13    | ==>          | #12    | 0.000         | 0.000   | Streeter Ditch 91+00 to 111+00                                 |
| Pond    | #14    | ==>          | #13    | 0.000         | 0.000   | SD-3 Stockpond                                                 |
| Channel | #15    | ==>          | #14    | 0.000         | 0.000   | Streeter Ditch 111+00 to 125+00                                |
| Channel | #17    | ==>          | #15    | 0.000         | 0.000   | Buckskin Ditch                                                 |
| Channel | #18    | ==>          | #19    | 0.000         | 0.000   | Streeter Ditch 125+00 to 187+00                                |
| Null    | #19    | ==>          | #15    | 0.011         | 0.370   | Null at Confluence Buckskin/Streeter                           |
| Pond    | #20    | ==>          | #10    | 0.000         | 0.000   | SD-1 Stockpond                                                 |



|                                                                                   |                                                                                   |               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |  | #7<br>Chan'l  |
|                                                                                   |  | #6<br>Chan'l  |
|                                                                                   |  | #5<br>Chan'l  |
|                                                                                   |  | #4<br>Chan'l  |
|                                                                                   |  | #3<br>Null    |
|  | #2<br>Pond                                                                        |               |
| #1<br>Null                                                                        |                                                                                   |               |

## Structure Routing Details:

| Stru #     | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #19        | 8. Large gullies, diversions, and low flowing streams | 2.60      | 5.20             | 200.00            | 4.83           | 0.011        |
| <b>#19</b> | <b>Muskingum K:</b>                                   |           |                  |                   |                | <b>0.011</b> |

### ***Structure Summary:***

|     | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|-----|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #18 | 316.200                                   | 316.200                               | 81.91                      | 14.63                                |
| #19 | 0.000                                     | 316.200                               | 81.91                      | 14.63                                |
| #17 | 135.700                                   | 135.700                               | 39.20                      | 4.77                                 |
| #15 | 143.100                                   | 595.000                               | 127.95                     | 23.03                                |
| #14 | In<br>Out                                 | 0.000                                 | 595.000                    | 127.95                               |
|     |                                           |                                       | 96.72                      | 19.02                                |
| #13 | 99.000                                    | 694.000                               | 103.76                     | 22.60                                |
| #12 | In<br>Out                                 | 0.000                                 | 694.000                    | 103.76                               |
|     |                                           |                                       | 71.93                      | 18.59                                |
| #9  | 19.600                                    | 19.600                                | 19.06                      | 1.43                                 |
| #11 | 71.400                                    | 785.000                               | 78.04                      | 22.78                                |
| #20 | In<br>Out                                 | 0.000                                 | 785.000                    | 78.04                                |
|     |                                           |                                       | 60.76                      | 19.11                                |
| #10 | 160.900                                   | 945.900                               | 60.81                      | 19.34                                |
| #7  | 142.400                                   | 1,088.300                             | 61.01                      | 19.58                                |
| #6  | 58.100                                    | 1,146.400                             | 61.01                      | 19.64                                |
| #5  | 164.800                                   | 164.800                               | 1.42                       | 0.92                                 |
| #4  | 9.500                                     | 174.300                               | 7.93                       | 1.49                                 |
| #3  | 0.000                                     | 1,320.700                             | 63.09                      | 21.13                                |
| #2  | In<br>Out                                 | 21.200                                | 1,341.900                  | 63.19                                |
|     |                                           |                                       | 20.40                      | 18.42                                |
| #1  | 0.000                                     | 1,341.900                             | 20.40                      | 18.42                                |

## Structure Detail:

### Structure #18 (Vegetated Channel)

*Streeter Ditch 125+00 to 187+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 2.6       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 81.91 cfs                             |                                      | 81.91 cfs                            |                                     |
| Depth:                 | 0.89 ft                               |                                      | 1.33 ft                              |                                     |
| Top Width:             | 20.32 ft                              |                                      | 23.00 ft                             |                                     |
| Velocity:              | 5.23 fps                              |                                      | 3.23 fps                             |                                     |
| X-Section Area:        | 15.67 sq ft                           |                                      | 25.35 sq ft                          |                                     |
| Hydraulic Radius:      | 0.760 ft                              |                                      | 1.082 ft                             |                                     |
| Froude Number:         | 1.05                                  |                                      | 0.54                                 |                                     |
| Roughness Coefficient: | 0.0383                                |                                      | 0.0783                               |                                     |

### Structure #19 (Null)

*Null at Confluence Buckskin/Streeter*

### Structure #17 (Vegetated Channel)

*Buckskin Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 4.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 39.20 cfs                             |                                      | 39.20 cfs                            |                                     |
| Depth:                    | 0.63 ft                               |                                      | 1.01 ft                              |                                     |
| Top Width:                | 15.77 ft                              |                                      | 18.06 ft                             |                                     |
| Velocity:                 | 4.49 fps                              |                                      | 2.58 fps                             |                                     |
| X-Section Area:           | 8.73 sq ft                            |                                      | 15.18 sq ft                          |                                     |
| Hydraulic Radius:         | 0.547 ft                              |                                      | 0.826 ft                             |                                     |
| Froude Number:            | 1.06                                  |                                      | 0.50                                 |                                     |
| Roughness<br>Coefficient: | 0.0443                                |                                      | 0.1015                               |                                     |

### Structure #15 (Vegetated Channel)

*Streeter Ditch 111+00 to 125+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 15.00                | 3.0:1                      | 3.0:1                       | 2.6       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 127.95 cfs                            |                                      | 127.95 cfs                           |                                     |
| Depth:                    | 1.07 ft                               |                                      | 1.52 ft                              |                                     |
| Top Width:                | 21.42 ft                              |                                      | 24.14 ft                             |                                     |
| Velocity:                 | 6.57 fps                              |                                      | 4.29 fps                             |                                     |
| X-Section Area:           | 19.48 sq ft                           |                                      | 29.80 sq ft                          |                                     |
| Hydraulic Radius:         | 0.895 ft                              |                                      | 1.210 ft                             |                                     |
| Froude Number:            | 1.21                                  |                                      | 0.68                                 |                                     |
| Roughness<br>Coefficient: | 0.0339                                |                                      | 0.0635                               |                                     |

### Structure #14 (Pond)

*SD-3 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 103.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 104.41 ft |
| Dewater Time:   | 0.60 days |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 90.00     | 0.050     | 0.000            | 0.000           |                    |
| 90.01     | 0.050     | 0.001            | 0.000           |                    |
| 91.00     | 0.072     | 0.061            | 0.000           |                    |
| 92.00     | 0.098     | 0.145            | 0.000           |                    |
| 93.00     | 0.128     | 0.258            | 0.000           |                    |
| 94.00     | 0.162     | 0.403            | 0.000           |                    |
| 95.00     | 0.200     | 0.583            | 0.000           |                    |
| 96.00     | 0.231     | 0.799            | 0.000           |                    |
| 97.00     | 0.265     | 1.046            | 0.000           |                    |
| 98.00     | 0.301     | 1.329            | 0.000           |                    |
| 99.00     | 0.339     | 1.649            | 0.000           |                    |
| 100.00    | 0.380     | 2.008            | 0.000           |                    |
| 101.00    | 0.554     | 2.473            | 0.000           |                    |
| 102.00    | 0.761     | 3.127            | 0.000           |                    |
| 103.00    | 1.000     | 4.005            | 0.000           | Spillway #1        |
| 104.00    | 1.010     | 5.010            | 48.400          | 13.85              |
| 104.41    | 1.014     | 5.422            | 96.715          | 0.65 Peak Stage    |
| 105.00    | 1.020     | 6.025            | 167.398         |                    |

## Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 90.00          | 0.000                    | 0.000                          |
| 90.01          | 0.000                    | 0.000                          |
| 91.00          | 0.000                    | 0.000                          |
| 92.00          | 0.000                    | 0.000                          |

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 93.00          | 0.000                    | 0.000                          |
| 94.00          | 0.000                    | 0.000                          |
| 95.00          | 0.000                    | 0.000                          |
| 96.00          | 0.000                    | 0.000                          |
| 97.00          | 0.000                    | 0.000                          |
| 98.00          | 0.000                    | 0.000                          |
| 99.00          | 0.000                    | 0.000                          |
| 100.00         | 0.000                    | 0.000                          |
| 101.00         | 0.000                    | 0.000                          |
| 102.00         | 0.000                    | 0.000                          |
| 103.00         | 0.000                    | 0.000                          |
| 104.00         | 48.400                   | 48.400                         |
| 105.00         | 167.398                  | 167.398                        |

## Structure #13 (Vegetated Channel)

*Streeter Ditch 91+00 to 111+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 3.2       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 103.76 cfs                      |                                | 103.76 cfs                     |                               |
| Depth:                 | 0.92 ft                         |                                | 1.34 ft                        |                               |
| Top Width:             | 20.52 ft                        |                                | 23.05 ft                       |                               |
| Velocity:              | 6.35 fps                        |                                | 4.07 fps                       |                               |
| X-Section Area:        | 16.34 sq ft                     |                                | 25.51 sq ft                    |                               |
| Hydraulic Radius:      | 0.785 ft                        |                                | 1.086 ft                       |                               |
| Froude Number:         | 1.25                            |                                | 0.68                           |                               |
| Roughness Coefficient: | 0.0357                          |                                | 0.0692                         |                               |

## Structure #12 (Pond)

*SD-2 Stockpond*

**Pond Inputs:**

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

**Emergency Spillway**

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 103.00        | 20.00                | 2.00:1            | 2.00:1             | 20.00                |

**Pond Results:**

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 104.20 ft |
| Dewater Time:   | 0.61 days |

*Dewatering time is calculated from peak stage to lowest spillway*

**Elevation-Capacity-Discharge Table**

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 90.01     | 0.050        | 0.001               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              |                          |
| 99.00     | 0.339        | 1.649               | 0.000              |                          |
| 100.00    | 0.380        | 2.008               | 0.000              |                          |
| 101.00    | 0.554        | 2.473               | 0.000              |                          |
| 102.00    | 0.761        | 3.127               | 0.000              |                          |
| 103.00    | 1.000        | 4.005               | 0.000              | Spillway #1              |
| 104.00    | 1.020        | 5.015               | 48.400             | 13.95                    |
| 104.20    | 1.024        | 5.219               | 71.925             | 0.60 Peak Stage          |
| 105.00    | 1.040        | 6.045               | 167.398            |                          |

**Detailed Discharge Table**

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                       | 0.000                                   |
| 90.01             | 0.000                       | 0.000                                   |
| 91.00             | 0.000                       | 0.000                                   |
| 92.00             | 0.000                       | 0.000                                   |
| 93.00             | 0.000                       | 0.000                                   |
| 94.00             | 0.000                       | 0.000                                   |
| 95.00             | 0.000                       | 0.000                                   |
| 96.00             | 0.000                       | 0.000                                   |
| 97.00             | 0.000                       | 0.000                                   |
| 98.00             | 0.000                       | 0.000                                   |
| 99.00             | 0.000                       | 0.000                                   |
| 100.00            | 0.000                       | 0.000                                   |
| 101.00            | 0.000                       | 0.000                                   |
| 102.00            | 0.000                       | 0.000                                   |
| 103.00            | 0.000                       | 0.000                                   |
| 104.00            | 48.400                      | 48.400                                  |
| 105.00            | 167.398                     | 167.398                                 |

## Structure #9 (Vegetated Channel)

### *Stoker Ditch*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 2.00                 | 1.0:1                      | 7.0:1                       | 3.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 19.06 cfs                             |                                      | 19.06 cfs                            |                                     |
| Depth:                    | 0.92 ft                               |                                      | 1.42 ft                              |                                     |
| Top Width:                | 9.37 ft                               |                                      | 13.38 ft                             |                                     |
| Velocity:                 | 3.64 fps                              |                                      | 1.74 fps                             |                                     |
| X-Section Area:           | 5.23 sq ft                            |                                      | 10.95 sq ft                          |                                     |
| Hydraulic Radius:         | 0.546 ft                              |                                      | 0.797 ft                             |                                     |
| Froude Number:            | 0.86                                  |                                      | 0.34                                 |                                     |
| Roughness<br>Coefficient: | 0.0473                                |                                      | 0.1272                               |                                     |

### Structure #11 (Vegetated Channel)

*Streeter Ditch 80+00 to 91+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 15.00             | 3.0:1                | 3.0:1                 | 3.2       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 78.04 cfs                             |                                      | 78.04 cfs                            |                                     |
| Depth:                 | 0.82 ft                               |                                      | 1.23 ft                              |                                     |
| Top Width:             | 19.90 ft                              |                                      | 22.39 ft                             |                                     |
| Velocity:              | 5.47 fps                              |                                      | 3.39 fps                             |                                     |
| X-Section Area:        | 14.26 sq ft                           |                                      | 23.01 sq ft                          |                                     |
| Hydraulic Radius:      | 0.707 ft                              |                                      | 1.010 ft                             |                                     |
| Froude Number:         | 1.14                                  |                                      | 0.59                                 |                                     |
| Roughness Coefficient: | 0.0386                                |                                      | 0.0791                               |                                     |

### Structure #20 (Pond)

*SD-1 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 100.01 ft  |
| Initial Pool:      | 0.01 ac-ft |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 105.00        | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 106.10 ft |
| Dewater Time:   | 0.61 days |

*Dewatering time is calculated from peak stage to lowest spillway*

#### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 100.00    | 0.661        | 0.000               | 0.000              |                          |
| 100.01    | 0.661        | 0.007               | 0.000              |                          |
| 101.00    | 0.708        | 0.684               | 0.000              |                          |
| 102.00    | 0.734        | 1.405               | 0.000              |                          |
| 103.00    | 0.757        | 2.151               | 0.000              |                          |
| 104.00    | 0.758        | 2.908               | 0.000              |                          |
| 105.00    | 0.759        | 3.667               | 0.000              | Spillway #1              |
| 106.00    | 0.760        | 4.426               | 48.400             | 13.95                    |
| 106.10    | 0.761        | 4.505               | 60.759             | 0.60 Peak Stage          |
| 107.00    | 0.762        | 5.187               | 167.398            |                          |

**Detailed Discharge Table**

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 100.00            | 0.000                       | 0.000                                   |
| 100.01            | 0.000                       | 0.000                                   |
| 101.00            | 0.000                       | 0.000                                   |
| 102.00            | 0.000                       | 0.000                                   |
| 103.00            | 0.000                       | 0.000                                   |
| 104.00            | 0.000                       | 0.000                                   |
| 105.00            | 0.000                       | 0.000                                   |
| 106.00            | 48.400                      | 48.400                                  |
| 107.00            | 167.398                     | 167.398                                 |

**Structure #10 (Vegetated Channel)**

*Streeter Ditch 45+00 to 80+00*

Trapezoidal Vegetated Channel Inputs:

**Material: Smooth brome**

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 2.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 60.81 cfs                             |                                      | 60.81 cfs                            |                                     |
| Depth:                    | 0.93 ft                               |                                      | 1.43 ft                              |                                     |
| Top Width:                | 17.59 ft                              |                                      | 20.59 ft                             |                                     |
| Velocity:                 | 4.41 fps                              |                                      | 2.61 fps                             |                                     |
| X-Section Area:           | 13.79 sq ft                           |                                      | 23.34 sq ft                          |                                     |
| Hydraulic Radius:         | 0.771 ft                              |                                      | 1.108 ft                             |                                     |
| Froude Number:            | 0.88                                  |                                      | 0.43                                 |                                     |
| Roughness<br>Coefficient: | 0.0401                                |                                      | 0.0865                               |                                     |

Structure #7 (Riprap Channel)

*Streeter Ditch 25+00 to 45+00*

*Streeter Ditch 25+00 to 45+00*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 2.0       |                         |                         |                               |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 61.01 cfs     |              |
| Depth:            | 0.55 ft       |              |
| Top Width:        | 15.31 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 7.52 sq ft    |              |
| Hydraulic Radius: | 0.486 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

Structure #6 (Riprap Channel)

### *Streeter Ditch 10+00 to 25+00*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 6.00              | 2.0:1                | 2.0:1                 | 10.9      |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 61.01 cfs     |              |
| Depth:            | 0.62 ft       |              |
| Top Width:        | 8.49 ft       |              |
| Velocity*:        |               |              |
| X-Section Area:   | 4.50 sq ft    |              |
| Hydraulic Radius: | 0.513 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 4.00 in       |              |
| D50:              | 12.00 in      |              |
| Dmax:             | 15.00 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### *Structure #5 (Vegetated Channel)*

#### *Streeter South Side Ditch*

Trapezoidal Vegetated Channel Inputs:

#### Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                   | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|-------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge: | 1.42 cfs                        |                                | 1.42 cfs                       |                               |
| Depth:            | 0.35 ft                         |                                | 0.72 ft                        |                               |
| Top Width:        | 4.82 ft                         |                                | 7.79 ft                        |                               |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 1.18 fps                              |                                      | 0.40 fps                             |                                     |
| X-Section Area:           | 1.20 sq ft                            |                                      | 3.54 sq ft                           |                                     |
| Hydraulic Radius:         | 0.245 ft                              |                                      | 0.445 ft                             |                                     |
| Froude Number:            | 0.42                                  |                                      | 0.10                                 |                                     |
| Roughness<br>Coefficient: | 0.0851                                |                                      | 0.3748                               |                                     |

### Structure #4 (Riprap Channel)

*Streeter Ditch 0+00 to 10+00*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 6.00                 | 2.0:1                      | 2.0:1                       | 28.3      |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 7.93 cfs      |              |
| Depth:            | 0.03 ft       |              |
| Top Width:        | 6.11 ft       |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.16 sq ft    |              |
| Hydraulic Radius: | 0.027 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 4.00 in       |              |
| D50:              | 12.00 in      |              |
| Dmax:             | 15.00 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Null)

*Null Above Streeter Pond*

### Structure #2 (Pond)

*Streeter Pond*

**Pond Inputs:**

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 6,583.00 ft |
| Initial Pool:      | 2.45 ac-ft  |

**Perforated Riser**

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 12.00               | 3.00              | 18.00                | 87.00              | 4.50             | 0.0150      | 6,585.00           | 2                        |

**Emergency Spillway**

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 6,588.00      | 50.00             | 1.50:1         | 1.50:1          | 20.00             |

**Pond Results:**

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 6,588.36 ft |
| Dewater Time:   | 6.04 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

**Elevation-Capacity-Discharge Table**

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 6,578.00  | 0.010     | 0.000            | 0.000           |                    |
| 6,579.00  | 0.070     | 0.035            | 0.000           |                    |
| 6,580.00  | 0.275     | 0.197            | 0.000           |                    |
| 6,581.00  | 0.441     | 0.551            | 0.000           |                    |
| 6,582.00  | 1.100     | 1.297            | 0.000           |                    |
| 6,583.00  | 1.200     | 2.447            | 0.000           | Low hole SPW #1    |
| 6,584.00  | 1.500     | 3.794            | 0.210           | 77.59*             |
| 6,585.00  | 1.600     | 5.344            | 0.507           | 36.97* Spillway #1 |
| 6,586.00  | 1.800     | 7.043            | 3.782           | 12.65              |
| 6,587.00  | 2.000     | 8.942            | 5.348           | 5.05               |
| 6,588.00  | 2.100     | 10.992           | 6.550           | 4.45 Spillway #2   |
| 6,588.36  | 2.136     | 11.766           | 20.397          | 8.30 Peak Stage    |
| 6,589.00  | 2.200     | 13.142           | 45.017          |                    |
| 6,590.00  | 2.400     | 15.441           | 150.324         |                    |
| 6,591.00  | 2.500     | 17.891           | 302.542         |                    |

**Detailed Discharge Table**

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,578.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,579.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,580.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,581.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,582.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,583.00          | 2.00>0.000        | 0.000                       | 0.000                                   |
| 6,584.00          | 2.00>0.210        | 0.000                       | 0.210                                   |
| 6,585.00          | 0.507             | 0.000                       | 0.507                                   |
| 6,586.00          | 3.782             | 0.000                       | 3.782                                   |
| 6,587.00          | 5.348             | 0.000                       | 5.348                                   |
| 6,588.00          | 6.550             | 0.000                       | 6.550                                   |
| 6,589.00          | 7.563             | 37.453                      | 45.017                                  |
| 6,590.00          | 8.456             | 141.868                     | 150.324                                 |
| 6,591.00          | 9.263             | 293.279                     | 302.542                                 |

Structure #1 (Null)

*Null Below Streeter Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #18        | 1        | 8.500          | 0.050              | 0.000        | 0.000  | 80.000       | F   | 9.72                 | 0.729                 |
|            | 2        | 213.800        | 0.803              | 0.000        | 0.000  | 74.000       | F   | 73.74                | 12.109                |
|            | 3        | 10.200         | 0.035              | 0.000        | 0.000  | 62.000       | M   | 3.13                 | 0.242                 |
|            | 4        | 11.600         | 0.147              | 0.000        | 0.000  | 62.000       | M   | 1.64                 | 0.225                 |
|            | 5        | 55.100         | 0.125              | 0.000        | 0.000  | 62.000       | M   | 7.78                 | 1.067                 |
|            | 6        | 6.300          | 0.118              | 0.000        | 0.000  | 47.000       | S   | 0.02                 | 0.008                 |
|            | 7        | 10.700         | 0.070              | 0.000        | 0.000  | 62.000       | M   | 3.29                 | 0.254                 |
|            | <b>Σ</b> | <b>316.200</b> |                    |              |        |              |     | <b>81.91</b>         | <b>14.633</b>         |
| <b>#19</b> | <b>Σ</b> | <b>316.200</b> |                    |              |        |              |     | <b>81.91</b>         | <b>14.633</b>         |
| #17        | 1        | 31.200         | 0.122              | 0.000        | 0.000  | 80.000       | F   | 35.67                | 2.674                 |
|            | 2        | 101.900        | 0.516              | 0.000        | 0.000  | 62.000       | M   | 8.12                 | 1.936                 |
|            | 3        | 2.600          | 0.021              | 0.000        | 0.000  | 74.000       | F   | 2.17                 | 0.157                 |
|            | <b>Σ</b> | <b>135.700</b> |                    |              |        |              |     | <b>39.20</b>         | <b>4.767</b>          |
| #15        | 1        | 6.600          | 0.044              | 0.000        | 0.000  | 47.000       | M   | 0.02                 | 0.008                 |
|            | 2        | 83.200         | 0.301              | 0.000        | 0.000  | 47.000       | S   | 0.13                 | 0.078                 |
|            | 3        | 16.600         | 0.091              | 0.000        | 0.000  | 62.000       | M   | 5.10                 | 0.395                 |
|            | 4        | 36.700         | 0.087              | 0.000        | 0.000  | 80.000       | F   | 41.96                | 3.146                 |
|            | <b>Σ</b> | <b>595.000</b> |                    |              |        |              |     | <b>127.95</b>        | <b>23.027</b>         |
| <b>#14</b> | <b>Σ</b> | <b>595.000</b> |                    |              |        |              |     | <b>127.95</b>        | <b>23.027</b>         |
| #13        | 1        | 32.800         | 0.034              | 0.000        | 0.000  | 80.000       | F   | 37.50                | 2.812                 |
|            | 2        | 6.900          | 0.055              | 0.000        | 0.000  | 47.000       | S   | 0.02                 | 0.009                 |
|            | 3        | 20.300         | 0.068              | 0.000        | 0.000  | 47.000       | S   | 0.05                 | 0.028                 |
|            | 4        | 8.200          | 0.025              | 0.000        | 0.000  | 80.000       | F   | 9.38                 | 0.703                 |
|            | 5        | 2.900          | 0.067              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 6        | 27.900         | 0.196              | 0.000        | 0.000  | 47.000       | S   | 0.04                 | 0.026                 |
|            | <b>Σ</b> | <b>694.000</b> |                    |              |        |              |     | <b>103.76</b>        | <b>22.598</b>         |
| <b>#12</b> | <b>Σ</b> | <b>694.000</b> |                    |              |        |              |     | <b>103.76</b>        | <b>22.598</b>         |
| #9         | 1        | 4.000          | 0.078              | 0.000        | 0.000  | 62.000       | F   | 1.23                 | 0.095                 |
|            | 2        | 15.600         | 0.073              | 0.000        | 0.000  | 80.000       | F   | 17.84                | 1.337                 |
|            | <b>Σ</b> | <b>19.600</b>  |                    |              |        |              |     | <b>19.06</b>         | <b>1.432</b>          |
| #11        | 1        | 17.700         | 0.075              | 0.000        | 0.000  | 80.000       | F   | 20.24                | 1.517                 |
|            | 2        | 6.800          | 0.029              | 0.000        | 0.000  | 80.000       | F   | 7.77                 | 0.583                 |
|            | 3        | 27.900         | 0.205              | 0.000        | 0.000  | 47.000       | S   | 0.04                 | 0.026                 |
|            | 4        | 7.200          | 0.058              | 0.000        | 0.000  | 80.000       | F   | 8.23                 | 0.617                 |
|            | 5        | 11.800         | 0.178              | 0.000        | 0.000  | 47.000       | S   | 0.02                 | 0.010                 |

| Stru #     | SWS #    | SWS Area (ac)    | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|------------|----------|------------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| <b>Σ</b>   |          | <b>785.000</b>   |                    |              |        |              |     | <b>78.04</b>         | <b>22.775</b>         |
| <b>#20</b> | <b>Σ</b> | <b>785.000</b>   |                    |              |        |              |     | <b>78.04</b>         | <b>22.775</b>         |
| #10        | 1        | 78.800           | 0.424              | 0.000        | 0.000  | 47.000       | S   | 0.12                 | 0.074                 |
|            | 2        | 65.200           | 0.120              | 0.000        | 0.000  | 47.000       | S   | 0.16                 | 0.091                 |
|            | 3        | 0.600            | 0.022              | 0.000        | 0.000  | 80.000       | F   | 0.69                 | 0.051                 |
|            | 4        | 16.300           | 0.141              | 0.000        | 0.000  | 47.000       | S   | 0.03                 | 0.015                 |
| <b>Σ</b>   |          | <b>945.900</b>   |                    |              |        |              |     | <b>60.81</b>         | <b>19.342</b>         |
| #7         | 1        | 130.200          | 0.381              | 0.000        | 0.000  | 47.000       | S   | 0.20                 | 0.122                 |
|            | 2        | 12.200           | 0.168              | 0.000        | 0.000  | 57.000       | S   | 0.29                 | 0.111                 |
| <b>Σ</b>   |          | <b>1,088.300</b> |                    |              |        |              |     | <b>61.01</b>         | <b>19.576</b>         |
| #6         | 1        | 22.400           | 0.072              | 0.000        | 0.000  | 47.000       | S   | 0.05                 | 0.031                 |
|            | 2        | 35.700           | 0.131              | 0.000        | 0.000  | 47.000       | S   | 0.06                 | 0.034                 |
| <b>Σ</b>   |          | <b>1,146.400</b> |                    |              |        |              |     | <b>61.01</b>         | <b>19.640</b>         |
| #5         | 1        | 9.200            | 0.016              | 0.000        | 0.000  | 47.000       | S   | 0.02                 | 0.012                 |
|            | 2        | 155.600          | 0.375              | 0.000        | 0.000  | 54.000       | S   | 1.42                 | 0.904                 |
| <b>Σ</b>   |          | <b>164.800</b>   |                    |              |        |              |     | <b>1.42</b>          | <b>0.916</b>          |
| #4         | 1        | 9.500            | 0.058              | 0.000        | 0.000  | 74.000       | F   | 7.93                 | 0.572                 |
| <b>Σ</b>   |          | <b>174.300</b>   |                    |              |        |              |     | <b>7.93</b>          | <b>1.489</b>          |
| <b>#3</b>  | <b>Σ</b> | <b>1,320.700</b> |                    |              |        |              |     | <b>63.09</b>         | <b>21.129</b>         |
| #2         | 1        | 16.600           | 0.056              | 0.000        | 0.000  | 47.000       | S   | 0.04                 | 0.023                 |
|            | 2        | 4.600            | 0.048              | 0.000        | 0.000  | 57.000       | S   | 0.55                 | 0.062                 |
| <b>Σ</b>   |          | <b>1,341.900</b> |                    |              |        |              |     | <b>63.19</b>         | <b>21.214</b>         |
| <b>#1</b>  | <b>Σ</b> | <b>1,341.900</b> |                    |              |        |              |     | <b>20.40</b>         | <b>18.417</b>         |

## Subwatershed Time of Concentration Details:

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture        | 30.40     | 270.56           | 890.00            | 4.410          | 0.056        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.056</b> |
| #2        | 2        | 3. Short grass pasture        | 34.00     | 274.04           | 806.00            | 4.660          | 0.048        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.048</b> |
| #4        | 1        | 3. Short grass pasture        | 35.00     | 351.05           | 1,003.00          | 4.730          | 0.058        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.058</b> |
| #5        | 1        | 3. Short grass pasture        | 22.00     | 49.72            | 226.00            | 3.750          | 0.016        |
| <b>#5</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.016</b> |
| #5        | 2        | 3. Short grass pasture        | 11.60     | 426.64           | 3,677.93          | 2.720          | 0.375        |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| <b>#5</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.375</b> |
| #6         | 1        | 3. Short grass pasture                                | 26.00     | 275.85           | 1,061.00          | 4.070          | 0.072        |
| <b>#6</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.072</b> |
| #6         | 2        | 3. Short grass pasture                                | 14.00     | 198.66           | 1,419.00          | 2.990          | 0.131        |
| <b>#6</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.131</b> |
| #7         | 1        | 3. Short grass pasture                                | 8.60      | 276.31           | 3,212.90          | 2.340          | 0.381        |
| <b>#7</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.381</b> |
| #7         | 2        | 3. Short grass pasture                                | 3.00      | 25.05            | 835.00            | 1.380          | 0.168        |
| <b>#7</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.168</b> |
| #9         | 1        | 3. Short grass pasture                                | 5.00      | 25.15            | 503.00            | 1.780          | 0.078        |
| <b>#9</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.078</b> |
| #9         | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 7.10      | 49.70            | 700.00            | 2.660          | 0.073        |
| <b>#9</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.073</b> |
| #10        | 1        | 3. Short grass pasture                                | 4.70      | 124.36           | 2,646.00          | 1.730          | 0.424        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.424</b> |
| #10        | 2        | 3. Short grass pasture                                | 11.00     | 126.17           | 1,147.00          | 2.650          | 0.120        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.120</b> |
| #10        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 1.50      | 1.50             | 100.00            | 1.220          | 0.022        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #10        | 4        | 3. Short grass pasture                                | 9.80      | 124.46           | 1,270.00          | 2.500          | 0.141        |
| <b>#10</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.141</b> |
| #11        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 14.00     | 143.22           | 1,023.00          | 3.740          | 0.075        |
| <b>#11</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.075</b> |
| #11        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 17.00     | 75.48            | 444.00            | 4.120          | 0.029        |
| <b>#11</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.029</b> |
| #11        | 3        | 3. Short grass pasture                                | 6.60      | 100.05           | 1,515.90          | 2.050          | 0.205        |
| <b>#11</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.205</b> |
| #11        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 5.20      | 24.80            | 477.00            | 2.280          | 0.058        |
| <b>#11</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.058</b> |
| #11        | 5        | 3. Short grass pasture                                | 8.40      | 124.48           | 1,482.00          | 2.310          | 0.178        |
| <b>#11</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.178</b> |
| #13        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 18.60     | 99.84            | 536.80            | 4.310          | 0.034        |
| <b>#13</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.034</b> |
| #13        | 2        | 3. Short grass pasture                                | 16.00     | 101.75           | 636.00            | 3.200          | 0.055        |
| <b>#13</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.055</b> |
| #13        | 3        | 3. Short grass pasture                                | 16.00     | 126.24           | 789.00            | 3.200          | 0.068        |
| <b>#13</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.068</b> |
| #13        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 5.00      | 10.12            | 202.40            | 2.230          | 0.025        |
| <b>#13</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.025</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #13        | 5        | 3. Short grass pasture                                | 5.50      | 25.13            | 457.00            | 1.870          | 0.067        |
| <b>#13</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.067</b> |
| #13        | 6        | 3. Short grass pasture                                | 7.00      | 104.72           | 1,496.00          | 2.110          | 0.196        |
| <b>#13</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.196</b> |
| #15        | 1        | 3. Short grass pasture                                | 15.00     | 74.85            | 498.99            | 3.090          | 0.044        |
| <b>#15</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #15        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 11.50     | 125.46           | 1,091.00          | 3.390          | 0.089        |
| <b>#15</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.301</b> |
| #15        | 3        | 3. Short grass pasture                                | 11.30     | 100.00           | 885.00            | 2.680          | 0.091        |
| <b>#15</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.091</b> |
| #15        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 12.00     | 130.80           | 1,090.00          | 3.460          | 0.087        |
| <b>#15</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.087</b> |
| #17        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 6.60      | 74.58            | 1,130.00          | 2.560          | 0.122        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.122</b> |
| #17        | 2        | 3. Short grass pasture                                | 7.40      | 298.66           | 4,036.00          | 2.170          | 0.516        |
| <b>#17</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.516</b> |
| #17        | 3        | 3. Short grass pasture                                | 11.80     | 24.89            | 211.00            | 2.740          | 0.021        |
| <b>#17</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #18        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 8.50      | 44.88            | 528.00            | 2.910          | 0.050        |
| <b>#18</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #18        | 2        | 3. Short grass pasture                                | 9.30      | 653.32           | 7,025.00          | 2.430          | 0.803        |
| <b>#18</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.803</b> |
| #18        | 3        | 3. Short grass pasture                                | 8.50      | 25.07            | 295.00            | 2.330          | 0.035        |
| <b>#18</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.035</b> |
| #18        | 4        | 3. Short grass pasture                                | 1.50      | 7.74             | 516.00            | 0.970          | 0.147        |
| <b>#18</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.147</b> |
| #18        | 5        | 3. Short grass pasture                                | 10.60     | 124.86           | 1,178.00          | 2.600          | 0.125        |
| <b>#18</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #18        | 6        | 3. Short grass pasture                                | 9.50      | 99.84            | 1,051.00          | 2.460          | 0.118        |
| <b>#18</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.118</b> |
| #18        | 7        | 3. Short grass pasture                                | 8.50      | 50.23            | 591.00            | 2.330          | 0.070        |
| <b>#18</b> | <b>7</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.070</b> |

**Exhibit 7**  
**Hydrology Information**

**Volume 2B**

- 1) Ground Water Quality Colowyo Coal Mine, Leonard Rice Consulting Water Engineers, Inc., 1979
- 6) Hydrologic and Erosional Characteristics of Regraded Surface Coal Mined Land in Colorado, Striffler and Rhodes, 1981
- 7) Modification of both Surface Water Monitoring and Alluvial Groundwater Monitoring Locations, 1991
- 8) Geotechnical Assessment East Taylor Pond, CTL/Thompson, Inc. 1995
- 9) Haulroad Culvert Redesign, 1997
- 10) Stoker Crusher Ditch, 1997
- 12) Section 16 Taylor Ditch, 1997
- 14) Lower Administration Building Small Area Exemption
- 15) Haul Road A Upper and Lower Ditches

**Volume 2C**

- 14) Emergency Spillway, Temporary and Permanent Channel Designs, Existing Structures  
Summary Text  
Appendix Exh. 7-14A Emergency Spillway Outslope Channel Designs  
Appendix Exh. 7-14B Side Channel Designs (Temporary)  
Appendix Exh. 7-14E Streeter Gulch and Buckskin Draw Ditches (Permanent)  
Appendix Exh. 7-14F Coal Road Ditch  
Appendix Exh. 7-14P Small Area Exemption  
Appendix Exh. 7-14R East Pit Reclamation Area, Prospect Ditch, North Trib East Pit  
Ditch, Final East Pit Ditch
- 15) Stability Evaluation, Existing Sedimentation Pond Embankments, CTL/Thompson Inc.  
1998
- 16) Adjudicated and permitted surface and groundwater locations within 1 mile of the Permit  
boundary
- 18) Gulch A Small Area Exemption

## **Volume 2D**

Introductory Text - Methodologies and Assumptions for Sediment Pond Design  
Appendix Exh. 7-14SP Streeter Pond  
Work Area Pond  
Gossard Pond  
Stoker Siding Pond  
Rail Loop Pond

## **Volume 2E**

Prospect Pond  
West Pit Pond  
Appendix Exh. 7-14S Section 16 Pond  
Appendix Exh. 7-14ET East Taylor Pond  
Taylor Pump Pond

**(Note: For hydrology information in the South Taylor Area, See Volume 13, Exhibit 7 Item 20 and for the Collom Area, See Volumes 18B through 18D.)**

## **Appendix Exh. 7-14ET**

### **East Taylor Pond & Permanent Channels**

## **Appendix Exh. 7-14ET East Taylor Pond and Permanent Channels**

The location of the East Taylor Pond is presented on Map 12. The profiles of the associated permanent channels associated with the East Taylor Pond watershed are presented on Map 33. These channels consist of the Taylor Ditch, the East Taylor Ditch the Taylor Tributary Ditch, several terrace ditches, and their respective design information is presented in this exhibit. The as-built configuration for the East Taylor Pond is presented on Figure Exh. 7-14ET-1, and Figure Exh. 7-14ET-2 provides the breakdown of drainage areas and hydrologic conditions for this sediment pond in the post mining condition. Figure Exh. 7-14ET-3 provides as-built information on the three stockponds that are constructed in the permanent channels to help reduce peak flows and provide a water source to support the post mine land use.

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used in sediment pond and post mine channel assumptions. Runoff curve numbers assigned to the undisturbed and reclaimed lands in various stages of reclamation have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD<sup>TM</sup>. For channels to be protected by a vegetative liner, the permissible velocities are also determined using SEDCAD<sup>TM</sup> routines.

### **East Taylor Pond**

The following pages present the results of the SEDCAD<sup>TM</sup> models for the worst-case hydrologic conditions under the post mining condition. At this stage the oldest reclamation is on the northern extent of the reclaimed West Pit, and the younger (topsoil and seeded) reclamation is the southern reaches of the East Taylor Pond watershed.

The SEDCAD<sup>TM</sup> model herein provides the results of the 10 year 24 hour design storm and demonstrates the East Taylor Pond will meet the applicable settleable solids standard under this modeled storm event. The second SEDCAD<sup>TM</sup> model demonstrates that the East Taylor Pond emergency spillway elevation is capable of containing the 25 year 24 hour storm.

The final post mining topographic surface and the final locations of the permanent drainage channels as presented on Map 12 were used to model the watershed for the post-mining condition. Three in-stream stock ponds (TD-1, TD-2, and ETD-1) are included in the permanent channels to decrease peak flows from the modeled storm event, and to provide a water source to support the post-mining land use. An as-built of each stock pond in the East Taylor Pond watershed are provided on Figure Exh. 7-20ET-3.

Also included in the models for the East Taylor Pond is flow from the East Taylor Seep. Currently, the East Taylor Seep is routed through a french drain and ultimately to a pipe which collects the flows and discharges it into the inlet of the East Taylor Pond.

Modeling a constant inflow using SEDCAD™ is somewhat complex. The methodology suggested by SEDCAD™ primary author, Pam Schwab, was used to model the impact of a constant inflow. In the current version of SEDCAD™, a fixed flow can only be input by inserting a "dummy" upstream reservoir with a watershed large enough to produce a "tank" flow, and then setting the output of the dummy reservoir as a constant "User Defined" outflow curve, independent of pool elevation in the dummy reservoir. A flow of 0.56 cfs (250 gpm) was conservatively utilized. The synthesized 250 gpm flow was then dropped into directly into East Taylor Pond.

For the post mining case at the East Taylor Pond, the 10 year 24 hour storm produces 1.72 acre feet of runoff, and the entire storm event is contained below the principal spillway elevation. The 25 year 24 hour storm event peaks at the 6,952.1' elevation which is well below the emergency spill way elevation of 6,954.0'.

### **East Taylor Permanent Post Mine Channels**

The East Taylor watershed is comprised of three post-mining channels. One channel, the Taylor Ditch, conveys all the post mining surface water flows to the East Taylor Pond, while the East Taylor Ditch and Taylor Trib Ditch are tributaries to the Taylor Ditch. The locations of all three channels are presented on Map 12 and Figure Exh. 7-14ET-2. The channel profiles are presented on Map 33.

The assumed hydrologic condition for all three channels is the post mine condition when the entire East Taylor watershed is reclaimed and reporting to the East Taylor Pond.

#### **Taylor Ditch**

The area contributory to the Taylor Ditch in some locations is less than one square mile. However, portions of this channel pass over a permanent fill, and the lower portion below the confluence with the East Taylor Ditch is larger than one square mile so the modeled storm event required by rule is the 100 year 24 hour event. The entire length of the Taylor Ditch will be riprap lined. Two stock ponds TD-1 and TD-2 have been constructed inline in the channel to reduce peak flows from larger storm events, and provide a water source to support the post mine land use.

A SEDCAD™ model has been included which evaluates the peak flow and total runoff volume for each of the channel segments for the 100 year, 24-hour storm event. The channel configurations for the 100 year, 24 hour storm for the Taylor Ditch summarized below.

### **Taylor Ditch**

| <u>Station</u>         | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
|------------------------|--------------------------------|------------------------------|---------------------------|------------------------|-------------------------------------|-------------------------------|
| Station 0+00 to 10+00  | 52.28                          | 6.9                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 6"           |
| Station 10+00 to 35+00 | 34.57                          | 7.1                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 6"           |
| Station 35+00 to TD-1  | 30.99                          | 10.7                         | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 6"           |
| TD-1 to TD-2           | 31.46                          | 6.8                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 6"           |
| TD-2 to 117+58         | 49.39                          | 9.8                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 6"           |

### East Taylor Ditch

The East Taylor Ditch is a tributary channel to the Taylor Ditch. The area contributory to the East Taylor Ditch is less than one square mile. Therefore, the appropriate storm event for the design of this channel is the 10-year 24-hour event. The lower portion of the East Taylor Ditch from ETD-1 stock pond to the confluence with the Taylor Ditch is riprap lined.

A SEDCAD™ model (10 Year 24 Hour Effluent Demonstration model) has been included which evaluates the peak flow and total runoff volume for each of the channel segments for the 10 year, 24-hour storm event. The channel configurations for the 10 year 24 hour storm for the East Taylor Ditch are summarized below.

### **East Taylor Ditch**

| <u>Station</u>        | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
|-----------------------|--------------------------------|------------------------------|---------------------------|------------------------|-------------------------------------|-------------------------------|
| Station 0+00 to ETD-1 | 1.13                           | 11.8                         | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 3"           |
| ETD-1 to 38+30        | 3.35                           | 1.8                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Vegetation                    |
| 38+30 to 73+40        | 3.35                           | 9.5                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 3"           |

### Taylor Trib Ditch

The Taylor Trib Ditch is a tributary channel to the main Taylor Ditch. The area contributory to the Taylor Ditch is very small; therefore, the appropriate storm event for

the design of this channel is the 10-year 24-hour event. The entire length of the Taylor Trib Ditch is riprapped lined.

A SEDCAD™ model (10 Year 24 Hour Effluent Demonstration model) which evaluates the peak flow and total runoff volume for the Taylor Trib Ditch for the 10 year 24-hour storm event. The channel configurations for the 10 year 24 hour storm for the Taylor Ditch are summarized below.

#### **Taylor Trib Ditch**

| <u>Station</u> | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
|----------------|--------------------------------|------------------------------|---------------------------|------------------------|-------------------------------------|-------------------------------|
| Entire Length  | 0.05                           | 17                           | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 6"           |

#### **Terrace Ditches**

A series of terrace ditches will be constructed across the face of the East Taylor Fill which reports surface water runoff to the East Taylor Pond. The locations of terrace ditches are shown on Map 12. The terrace ditches on the East Taylor Fill will originate near the post mining contours of 7700', 7800', 7900, and 7975' elevations on the fill face. Actual on the ground topography will dictate the final placement and profile of the terrace ditches to ensure proper water flow.

The function of the terrace ditches are to collect surface flows and direct the flows to the Taylor Ditch. The design basis for these terrace ditches is the 100-year, 24-hours event as they will be permanent in the post mine topography, and the 100-year 24-hour storm provides a conservative plan. The southern terrace ditch (near 7975' elevation) has the largest watershed (50.1 acres), and was utilized as a conservative configuration for all four terrace ditches

A summary of the configurations for 7975' terrace ditch is provided on the table below. Each terrace ditch on the East Taylor Fill will be constructed to these specifications.

| <b><u>Terrace Ditch</u></b>    |                                |                                  |                         |                                   |                                     |                               |
|--------------------------------|--------------------------------|----------------------------------|-------------------------|-----------------------------------|-------------------------------------|-------------------------------|
| <u>Terrance<br/>Ditch Name</u> | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope<br/>(%)</u> | <u>Channel<br/>Type</u> | <u>Side Slopes</u>                | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
| 7975'                          | 47.4                           | 1.5                              | Triangular              | Left - 1.5H:1V<br>Right - 3.0H:1V | 3.0                                 | Vegetation                    |

# **East Taylor Pond** **10 Year - 24 Hour Storm Event**

***Effluent Demonstration***  
***Post Mining***

Tony Tennyson

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## ***General Information***

### ***Storm Information:***

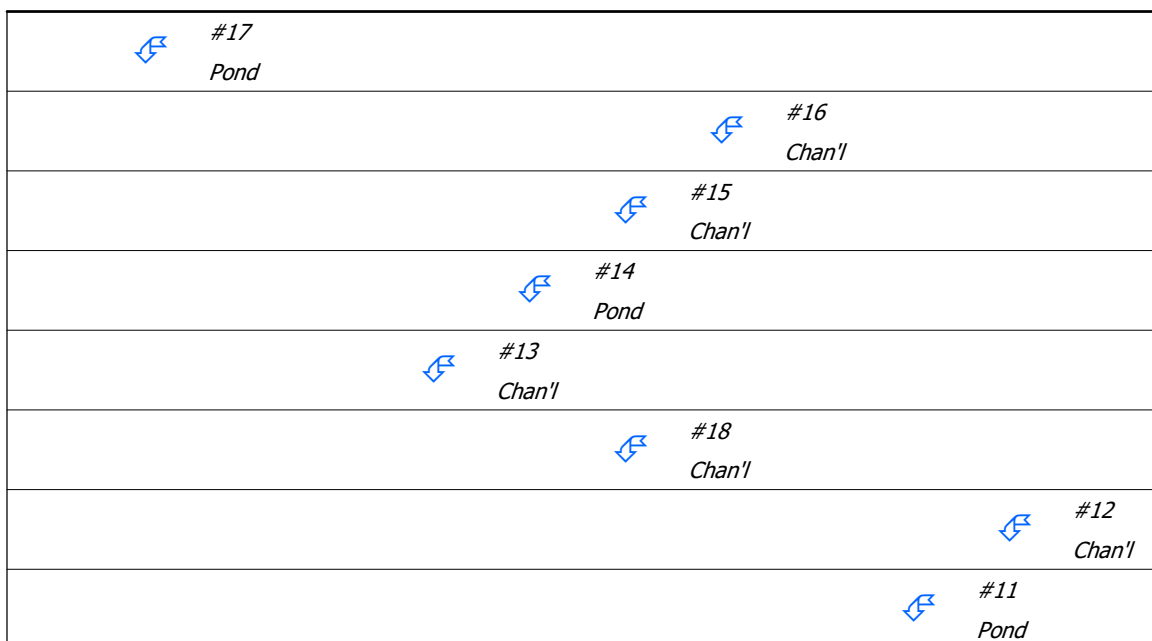
|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 10 yr - 24 hr |
| Rainfall Depth: | 1.800 inches  |

### ***Particle Size Distribution:***

| Size (mm) | Colowyo Particle Size |
|-----------|-----------------------|
| 4.7500    | 100.000%              |
| 0.0750    | 73.000%               |
| 0.0400    | 33.000%               |
| 0.0010    | 20.000%               |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                                                    |
|---------|--------|--------------|--------|---------------|---------|--------------------------------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below East Taylor Pond                                                    |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | East Taylor Pond                                                               |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above East Taylor Pond                                                    |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Taylor Ditch 0+00 to 10+00                                                     |
| Null    | #5     | ==>          | #4     | 0.000         | 0.000   | Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Taylor Ditch 10+00 to 35+00                                                    |
| Null    | #7     | ==>          | #6     | 0.000         | 0.000   | Null at Confluence of Taylor/Taylor Trib                                       |
| Channel | #8     | ==>          | #7     | 0.000         | 0.000   | Taylor Ditch 35+00 to TD-1 Stockpond                                           |
| Pond    | #9     | ==>          | #8     | 0.000         | 0.000   | TD-1 Stockpond                                                                 |
| Channel | #10    | ==>          | #9     | 0.000         | 0.000   | Taylor Ditch TD-1 to TD-2 Stockpond                                            |
| Pond    | #11    | ==>          | #10    | 0.000         | 0.000   | TD-2 Stockpond                                                                 |
| Channel | #12    | ==>          | #11    | 0.000         | 0.000   | Taylor Ditch TD-2 Stockpond to 117+58                                          |
| Channel | #13    | ==>          | #5     | 0.000         | 0.000   | East Taylor Ditch 0+00 to ETD-1                                                |
| Pond    | #14    | ==>          | #13    | 0.000         | 0.000   | ETD-1 Stock Pond                                                               |
| Channel | #15    | ==>          | #14    | 0.000         | 0.000   | East Taylor Ditch - Veg ETD-1 to 38+30                                         |
| Channel | #16    | ==>          | #15    | 0.000         | 0.000   | East Taylor Ditch 38+30 to 73+40                                               |
| Pond    | #17    | ==>          | #2     | 0.000         | 0.000   | Simulated 250 GPM - East Taylor Seep                                           |
| Channel | #18    | ==>          | #7     | 0.000         | 0.000   | Taylor Trib Ditch                                                              |



|                                                                                   |                                                                                     |               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |    | #9<br>Pond    |
|                                                                                   |    | #8<br>Chan'l  |
|                                                                                   |    | #7<br>Null    |
|                                                                                   |    | #6<br>Chan'l  |
|                                                                                   |    | #5<br>Null    |
|                                                                                   |    | #4<br>Chan'l  |
|                                                                                   |    | #3<br>Null    |
|  | #2<br>Pond                                                                          |               |
| #1<br>Null                                                                        |                                                                                     |               |

### ***Structure Summary:***

|         | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) | Sediment<br>(tons) | Peak<br>Sediment<br>Conc.<br>(mg/l) | Peak<br>Settleable<br>Conc.<br>(ml/l) | 24VW<br>(ml/l) |
|---------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|--------------------|-------------------------------------|---------------------------------------|----------------|
| #17 In  | 0.100                                     | 0.100                                 | 0.05                       | 0.00                                 | 0.0                | 2,943                               | 1.68                                  | 1.25           |
| #17 Out |                                           |                                       | 0.01                       | 0.00                                 | 0.0                | 351                                 | 0.00                                  | 0.00           |
| #16     | 154.500                                   | 154.500                               | 3.35                       | 0.73                                 | 24.0               | 148,016                             | 84.23                                 | 13.29          |
| #15     | 100.200                                   | 254.700                               | 3.35                       | 1.06                                 | 24.1               | 148,016                             | 84.20                                 | 9.17           |
| #14 In  | 0.000                                     | 254.700                               | 3.35                       | 1.06                                 | 24.1               | 148,016                             | 84.20                                 | 9.17           |
| #14 Out |                                           |                                       | 0.00                       | 0.00                                 | 24.1               | 0                                   | 0.00                                  | 0.00           |
| #13     | 84.900                                    | 339.600                               | 1.13                       | 0.35                                 | 24.8               | 11,109                              | 8.82                                  | 1.10           |
| #18     | 6.000                                     | 6.000                                 | 0.05                       | 0.02                                 | 0.0                | 661                                 | 0.38                                  | 0.29           |
| #12     | 319.800                                   | 319.800                               | 19.27                      | 2.23                                 | 149.0              | 160,099                             | 91.22                                 | 26.80          |
| #11 In  | 0.000                                     | 319.800                               | 19.27                      | 2.23                                 | 149.0              | 160,099                             | 91.22                                 | 26.80          |
| #11 Out |                                           |                                       | 1.18                       | 0.37                                 | 0.0                | 0                                   | 0.00                                  | 0.00           |
| #10     | 123.000                                   | 442.800                               | 1.53                       | 0.77                                 | 0.3                | 660                                 | 0.36                                  | 0.14           |
| #9 In   | 0.000                                     | 442.800                               | 1.53                       | 0.77                                 | 0.3                | 660                                 | 0.36                                  | 0.14           |
| #9 Out  |                                           |                                       | 1.52                       | 0.27                                 | 0.0                | 1                                   | 0.00                                  | 0.00           |
| #8      | 21.600                                    | 464.400                               | 1.57                       | 0.33                                 | 0.0                | 654                                 | 0.37                                  | 0.05           |
| #7      | 0.000                                     | 470.400                               | 1.60                       | 0.35                                 | 0.1                | 656                                 | 0.37                                  | 0.07           |
| #6      | 82.000                                    | 552.400                               | 1.79                       | 0.58                                 | 0.2                | 581                                 | 0.32                                  | 0.13           |
| #5      | 0.000                                     | 892.000                               | 2.06                       | 0.94                                 | 25.0               | 11,109                              | 8.79                                  | 0.54           |
| #4      | 145.900                                   | 1,037.900                             | 5.20                       | 1.68                                 | 35.1               | 43,953                              | 31.95                                 | 3.48           |
| #3      | 0.000                                     | 1,037.900                             | 5.20                       | 1.68                                 | 35.1               | 43,953                              | 31.95                                 | 3.48           |
| #2 In   | 10.900                                    | 1,048.900                             | 5.22                       | 1.72                                 | 35.2               | 43,863                              | 31.88                                 | 3.42           |
| #2 Out  |                                           |                                       | 0.00                       | 0.00                                 | 35.2               | 0                                   | 0.00                                  | 0.00           |
| #1      | 0.000                                     | 1,048.900                             | 0.00                       | 0.00                                 | 35.2               | 1                                   | 0.00                                  | 0.00           |

## ***Particle Size Distribution(s) at Each Structure***

### ***Structure #17 (Simulated 250 GPM - East Taylor Seep):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 73.000%  | 100.000% |
| 0.0400    | 33.000%  | 100.000% |
| 0.0010    | 20.000%  | 100.000% |

### ***Structure #16 (East Taylor Ditch 38+30 to 73+40):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.282%  |
| 0.0400    | 33.127%  |
| 0.0010    | 20.077%  |

### ***Structure #15 (East Taylor Ditch - Veg ETD-1 to 38+30):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.351%  |
| 0.0400    | 33.159%  |
| 0.0010    | 20.096%  |

### ***Structure #14 (ETD-1 Stock Pond):***

| Size (mm) | In       | Out    |
|-----------|----------|--------|
| 4.7500    | 100.000% | 0.000% |
| 0.0750    | 73.351%  | 0.000% |
| 0.0400    | 33.159%  | 0.000% |
| 0.0010    | 20.096%  | 0.000% |

### ***Structure #13 (East Taylor Ditch 0+00 to ETD-1):***

| Size (mm) | In/Out |
|-----------|--------|
| 4.7500    | 2.701% |
| 0.0750    | 2.060% |
| 0.0400    | 0.931% |
| 0.0010    | 0.564% |

***Structure #18 (Taylor Trib Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #12 (Taylor Ditch TD-2 Stockpond to 117+58):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.055%  |
| 0.0400    | 33.025%  |
| 0.0010    | 20.015%  |

***Structure #11 (TD-2 Stockpond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 73.055%  | 100.000% |
| 0.0400    | 33.025%  | 100.000% |
| 0.0010    | 20.015%  | 100.000% |

***Structure #10 (Taylor Ditch TD-1 to TD-2 Stockpond):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 83.002%  |
| 0.0400    | 37.526%  |
| 0.0010    | 22.746%  |

***Structure #9 (TD-1 Stockpond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |

| Size (mm) | In      | Out      |
|-----------|---------|----------|
| 0.0750    | 83.002% | 100.000% |
| 0.0400    | 37.526% | 100.000% |
| 0.0010    | 22.746% | 100.000% |

***Structure #8 (Taylor Ditch 35+00 to TD-1 Stockpond):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.137%  |
| 0.0400    | 33.341%  |
| 0.0010    | 20.407%  |

***Structure #7 (Null at Confluence of Taylor/Taylor Trib):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.096%  |
| 0.0400    | 33.239%  |
| 0.0010    | 20.285%  |

***Structure #6 (Taylor Ditch 10+00 to 35+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 80.058%  |
| 0.0400    | 36.247%  |
| 0.0010    | 22.009%  |

***Structure #5 (Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor):***

| Size (mm) | In/Out |
|-----------|--------|
| 4.7500    | 3.450% |
| 0.0750    | 2.661% |
| 0.0400    | 1.203% |
| 0.0010    | 0.730% |

***Structure #4 (Taylor Ditch 0+00 to 10+00):***

| Size (mm) | In/Out  |
|-----------|---------|
| 4.7500    | 31.413% |

| Size (mm) | In/Out  |
|-----------|---------|
| 0.0750    | 23.190% |
| 0.0400    | 10.483% |
| 0.0010    | 6.354%  |

***Structure #3 (Null Above East Taylor Pond):***

| Size (mm) | In/Out  |
|-----------|---------|
| 4.7500    | 31.413% |
| 0.0750    | 23.190% |
| 0.0400    | 10.483% |
| 0.0010    | 6.354%  |

***Structure #2 (East Taylor Pond):***

| Size (mm) | In      | Out    |
|-----------|---------|--------|
| 4.7500    | 31.493% | 0.000% |
| 0.0750    | 23.249% | 0.000% |
| 0.0400    | 10.511% | 0.000% |
| 0.0010    | 6.371%  | 0.000% |

***Structure #1:***

| Size (mm) | In/Out |
|-----------|--------|
| 4.7500    | 0.000% |
| 0.0750    | 0.000% |
| 0.0400    | 0.000% |
| 0.0010    | 0.000% |

## ***Structure Detail:***

### ***Structure #17 (Pond)***

*Simulated 250 GPM - East Taylor Seep*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 20.00 %    |

*\*No sediment capacity defined*

Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 90.03 ft  |
| H'graph Detention Time: | 1.08 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.06 days |
| Trap Efficiency:        | 85.20 %   |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              | Top of Sed. Storage      |
| 90.01     | 0.050        | 0.001               | 0.000              |                          |
| 90.03     | 0.050        | 0.002               | 0.012              | 1.35 Peak Stage          |
| 91.00     | 0.051        | 0.050               | 0.560              |                          |
| 92.00     | 0.190        | 0.164               | 0.560              |                          |
| 93.00     | 0.260        | 0.388               | 0.560              |                          |
| 94.00     | 0.350        | 0.692               | 0.560              |                          |
| 95.00     | 0.440        | 1.086               | 0.560              |                          |
| 96.00     | 0.540        | 1.575               | 0.560              |                          |
| 97.00     | 0.650        | 2.169               | 0.560              |                          |
| 98.00     | 0.760        | 2.873               | 0.560              |                          |
| 99.00     | 0.880        | 3.693               | 0.560              |                          |
| 100.00    | 1.200        | 4.728               | 0.560              |                          |
| 101.00    | 1.240        | 5.948               | 0.560              |                          |
| 102.00    | 1.414        | 7.275               | 0.560              |                          |
| 103.00    | 1.600        | 8.781               | 0.560              |                          |

### Detailed Discharge Table

| Elevation (ft) | User-input discharge (cfs) | Combined Total Discharge (cfs) |
|----------------|----------------------------|--------------------------------|
| 90.00          | 0.000                      | 0.000                          |
| 90.01          | 0.000                      | 0.000                          |
| 91.00          | 0.560                      | 0.560                          |
| 92.00          | 0.560                      | 0.560                          |
| 93.00          | 0.560                      | 0.560                          |
| 94.00          | 0.560                      | 0.560                          |
| 95.00          | 0.560                      | 0.560                          |
| 96.00          | 0.560                      | 0.560                          |
| 97.00          | 0.560                      | 0.560                          |
| 98.00          | 0.560                      | 0.560                          |
| 99.00          | 0.560                      | 0.560                          |
| 100.00         | 0.560                      | 0.560                          |
| 101.00         | 0.560                      | 0.560                          |
| 102.00         | 0.560                      | 0.560                          |
| 103.00         | 0.560                      | 0.560                          |

### Structure #16 (Riprap Channel)

*East Taylor Ditch 38+30 to 73+40*

Trapezoidal Riprap Channel Inputs:

### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 9.5       |                      |                      |                         |

Riprap Channel Results:

### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 3.35 cfs      |              |
| Depth:            | 0.06 ft       |              |
| Top Width:        | 12.33 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.67 sq ft    |              |
| Hydraulic Radius: | 0.055 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |

| w/o Freeboard | w/ Freeboard |
|---------------|--------------|
| Dmax:         | 3.75 in      |

Velocity and Manning's n calculations may not apply for this method.

### Structure #15 (Vegetated Channel)

*East Taylor Ditch - Veg ETD-1 to 38+30*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.8       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 3.35 cfs                              |                                      | 3.35 cfs                             |                                     |
| Depth:                 | 0.28 ft                               |                                      | 0.62 ft                              |                                     |
| Top Width:             | 13.71 ft                              |                                      | 15.74 ft                             |                                     |
| Velocity:              | 0.91 fps                              |                                      | 0.39 fps                             |                                     |
| X-Section Area:        | 3.66 sq ft                            |                                      | 8.66 sq ft                           |                                     |
| Hydraulic Radius:      | 0.265 ft                              |                                      | 0.543 ft                             |                                     |
| Froude Number:         | 0.31                                  |                                      | 0.09                                 |                                     |
| Roughness Coefficient: | 0.0899                                |                                      | 0.3437                               |                                     |

### Structure #14 (Pond)

*ETD-1 Stock Pond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,287.01 ft |
| Initial Pool:      | 0.01 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 0.00 %      |

*\*No sediment capacity defined*

Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,289.00      | 30.00             | 2.00:1         | 2.00:1          | 32.00             |

Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 7,291.00      | 20.00                | 2.00:1            | 2.00:1             | 15.00                |

## Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 7,288.52 ft |
| H'graph Detention Time: | 0.00 hrs    |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 0.00 days   |
| Trap Efficiency:        | 0.00 %      |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,287.00  | 0.661        | 0.000               | 0.000              | Top of Sed. Storage      |
| 7,287.01  | 0.661        | 0.006               | 0.000              |                          |
| 7,288.00  | 0.708        | 0.684               | 0.000              |                          |
| 7,288.52  | 0.734        | 1.066               | 0.000              | 0.00 Peak Stage          |
| 7,289.00  | 0.757        | 1.416               | 0.000              | Spillway #1              |
| 7,290.00  | 0.758        | 2.174               | 68.938             |                          |
| 7,291.00  | 0.759        | 2.932               | 239.116            | Spillway #2              |
| 7,292.00  | 0.760        | 3.692               | 525.594            |                          |
| 7,293.00  | 0.762        | 4.453               | 944.414            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------|-----------------------------------------|
| 7,287.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,287.01          | 0.000                       | 0.000                       | 0.000                                   |
| 7,288.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,289.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,290.00          | 68.938                      | 0.000                       | 68.938                                  |
| 7,291.00          | 239.116                     | 0.000                       | 239.116                                 |
| 7,292.00          | 488.655                     | 36.939                      | 525.594                                 |
| 7,293.00          | 814.228                     | 130.185                     | 944.414                                 |

Structure #13 (Riprap Channel)

### East Taylor Ditch 0+00 to ETD-1

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 11.8      |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.13 cfs      |              |
| Depth:            | 0.03 ft       |              |
| Top Width:        | 12.19 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.39 sq ft    |              |
| Hydraulic Radius: | 0.032 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #18 (Riprap Channel)

#### *Taylor Trib Ditch*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 17.0      |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Mild Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 0.05 cfs      |              |
| Depth:            | 0.02 ft       |              |
| Top Width:        | 12.10 ft      |              |

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Velocity:         | 0.23 fps      |              |
| X-Section Area:   | 0.19 sq ft    |              |
| Hydraulic Radius: | 0.016 ft      |              |
| Froude Number:    | 0.33          |              |
| Manning's n:      | 0.0324        |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 9.00 in       |              |

### Structure #12 (Riprap Channel)

*Taylor Ditch TD-2 Stockpond to 117+58*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 9.8       | 3.67                 |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 19.27 cfs     |              |
| Depth:            | 0.17 ft       | 3.84 ft      |
| Top Width:        | 13.05 ft      | 35.07 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 2.19 sq ft    |              |
| Hydraulic Radius: | 0.167 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #11 (Pond)

*TD-2 Stockpond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,445.00 ft |
|--------------------|-------------|

|                    |            |
|--------------------|------------|
| Initial Pool:      | 0.09 ac-ft |
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,454.00      | 30.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 7,454.03 ft |
| H'graph Detention Time: | 6.71 hrs    |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 0.10 days   |
| Trap Efficiency:        | 100.00 %    |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs)  |
|-----------|-----------|------------------|-----------------|---------------------|
| 7,443.00  | 0.014     | 0.000            | 0.000           | Top of Sed. Storage |
| 7,444.00  | 0.050     | 0.030            | 0.000           |                     |
| 7,445.00  | 0.079     | 0.094            | 0.000           |                     |
| 7,446.00  | 0.106     | 0.186            | 0.000           |                     |
| 7,447.00  | 0.133     | 0.305            | 0.000           |                     |
| 7,448.00  | 0.161     | 0.452            | 0.000           |                     |
| 7,449.00  | 0.190     | 0.627            | 0.000           |                     |
| 7,450.00  | 0.219     | 0.831            | 0.000           |                     |
| 7,451.00  | 0.249     | 1.065            | 0.000           |                     |
| 7,452.00  | 0.280     | 1.329            | 0.000           |                     |
| 7,453.00  | 0.313     | 1.625            | 0.000           |                     |
| 7,454.00  | 0.348     | 1.955            | 0.000           | Spillway #1         |
| 7,454.03  | 0.352     | 1.965            | 1.183           | 2.50 Peak Stage     |
| 7,455.00  | 0.389     | 2.324            | 43.900          |                     |

## Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 7,443.00          | 0.000                       | 0.000                                   |
| 7,444.00          | 0.000                       | 0.000                                   |
| 7,445.00          | 0.000                       | 0.000                                   |
| 7,446.00          | 0.000                       | 0.000                                   |
| 7,447.00          | 0.000                       | 0.000                                   |
| 7,448.00          | 0.000                       | 0.000                                   |
| 7,449.00          | 0.000                       | 0.000                                   |
| 7,450.00          | 0.000                       | 0.000                                   |
| 7,451.00          | 0.000                       | 0.000                                   |
| 7,452.00          | 0.000                       | 0.000                                   |
| 7,453.00          | 0.000                       | 0.000                                   |
| 7,454.00          | 0.000                       | 0.000                                   |
| 7,455.00          | 43.900                      | 43.900                                  |

### Structure #10 (Riprap Channel)

*Taylor Ditch TD-1 to TD-2 Stockpond*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 6.8       |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.53 cfs      |              |
| Depth:            | 0.05 ft       |              |
| Top Width:        | 12.33 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.66 sq ft    |              |
| Hydraulic Radius: | 0.053 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

Structure #9 (Pond)

*TD-1 Stockpond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,283.01 ft |
| Initial Pool:      | 0.00 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 0.00 %      |

*\*No sediment capacity defined*

Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,287.00      | 20.00             | 2.00:1         | 2.00:1          | 30.00             |

Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 7,287.02 ft |
| H'graph Detention Time: | 3.38 hrs    |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 0.10 days   |
| Trap Efficiency:        | 99.93 %     |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs)  |
|-----------|-----------|------------------|-----------------|---------------------|
| 7,283.00  | 0.001     | 0.000            | 0.000           | Top of Sed. Storage |
| 7,283.01  | 0.001     | 0.000            | 0.000           |                     |
| 7,284.00  | 0.059     | 0.023            | 0.000           |                     |
| 7,285.00  | 0.159     | 0.128            | 0.000           |                     |
| 7,286.00  | 0.182     | 0.298            | 0.000           |                     |
| 7,287.00  | 0.213     | 0.495            | 0.000           | Spillway #1         |
| 7,287.02  | 0.215     | 0.500            | 1.524           | 2.50 Peak Stage     |
| 7,288.00  | 0.247     | 0.725            | 71.329          |                     |

Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 7,283.00       | 0.000                    | 0.000                          |
| 7,283.01       | 0.000                    | 0.000                          |
| 7,284.00       | 0.000                    | 0.000                          |
| 7,285.00       | 0.000                    | 0.000                          |
| 7,286.00       | 0.000                    | 0.000                          |
| 7,287.00       | 0.000                    | 0.000                          |
| 7,288.00       | 71.329                   | 71.329                         |

Structure #8 (Riprap Channel)*Taylor Ditch 35+00 to TD-1 Stockpond*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 10.7      |                      |                      |                         |

Riprap Channel Results:

## Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.57 cfs      |              |
| Depth:            | 0.04 ft       |              |
| Top Width:        | 12.22 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.45 sq ft    |              |
| Hydraulic Radius: | 0.037 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

Structure #7 (Null)*Null at Confluence of Taylor/Taylor Trib*Structure #6 (Riprap Channel)*Taylor Ditch 10+00 to 35+00*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 7.1       |                      |                      |                         |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.79 cfs      |              |
| Depth:            | 0.06 ft       |              |
| Top Width:        | 12.33 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.67 sq ft    |              |
| Hydraulic Radius: | 0.054 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

Structure #5 (Null)

*Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor*

Structure #4 (Riprap Channel)

*Taylor Ditch 0+00 to 10+00*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 6.9       |                      |                      |                         |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 5.20 cfs      |              |
| Depth:            | 0.09 ft       |              |

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Top Width:        | 12.52 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.07 sq ft    |              |
| Hydraulic Radius: | 0.085 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

## Structure #3 (Null)

*Null Above East Taylor Pond*

## Structure #2 (Pond)

*East Taylor Pond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 6,944.00 ft |
| Initial Pool:      | 2.87 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 20.00 %     |

*\*No sediment capacity defined*

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 10.00             | 18.00                | 122.00             | 4.00             | 0.0150      | 6,951.00           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 6,954.00      | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 6,947.58 ft |
| H'graph Detention Time: | 0.00 hrs    |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 0.00 days   |
| Trap Efficiency:        | 0.00 %      |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 6,930.00  | 0.001        | 0.000               | 0.000              | Top of Sed. Storage      |
| 6,931.00  | 0.036        | 0.014               | 0.000              |                          |
| 6,932.00  | 0.076        | 0.069               | 0.000              |                          |
| 6,933.00  | 0.110        | 0.161               | 0.000              |                          |
| 6,934.00  | 0.134        | 0.283               | 0.000              |                          |
| 6,935.00  | 0.156        | 0.428               | 0.000              |                          |
| 6,936.00  | 0.178        | 0.595               | 0.000              |                          |
| 6,937.00  | 0.201        | 0.785               | 0.000              |                          |
| 6,938.00  | 0.226        | 0.998               | 0.000              |                          |
| 6,939.00  | 0.252        | 1.237               | 0.000              |                          |
| 6,940.00  | 0.280        | 1.504               | 0.000              |                          |
| 6,941.00  | 0.310        | 1.799               | 0.000              |                          |
| 6,942.00  | 0.340        | 2.123               | 0.000              |                          |
| 6,943.00  | 0.373        | 2.480               | 0.000              |                          |
| 6,944.00  | 0.409        | 2.871               | 0.000              |                          |
| 6,945.00  | 0.446        | 3.298               | 0.000              |                          |
| 6,946.00  | 0.486        | 3.764               | 0.000              |                          |
| 6,947.00  | 0.527        | 4.270               | 0.000              |                          |
| 6,947.58  | 0.553        | 4.587               | 0.000              | 0.00 Peak Stage          |
| 6,948.00  | 0.571        | 4.819               | 0.000              |                          |
| 6,949.00  | 0.615        | 5.412               | 0.000              |                          |
| 6,950.00  | 0.660        | 6.049               | 0.000              |                          |
| 6,951.00  | 0.706        | 6.732               | 0.000              | Spillway #1              |
| 6,952.00  | 0.754        | 7.462               | 8.509              |                          |
| 6,953.00  | 0.804        | 8.241               | 12.033             |                          |
| 6,954.00  | 0.857        | 9.072               | 14.738             | Spillway #2              |
| 6,955.00  | 0.975        | 9.987               | 65.418             |                          |
| 6,956.00  | 1.033        | 10.991              | 186.424            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,930.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,931.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,932.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,933.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,934.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,935.00          | 0.000             | 0.000                       | 0.000                                   |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,936.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,937.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,938.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,939.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,940.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,941.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,942.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,943.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,944.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,945.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,946.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,947.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,948.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,949.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,950.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,951.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,952.00          | 8.509             | 0.000                       | 8.509                                   |
| 6,953.00          | 12.033            | 0.000                       | 12.033                                  |
| 6,954.00          | 14.738            | 0.000                       | 14.738                                  |
| 6,955.00          | 17.018            | 48.400                      | 65.418                                  |
| 6,956.00          | 19.026            | 167.398                     | 186.424                                 |

Structure #1 (Null)

*Null Below East Taylor Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #17        | 1        | 0.100          | 0.003              | 0.000        | 0.000  | 80.000       | S   | 0.05                 | 0.002                 |
|            | <b>Σ</b> | <b>0.100</b>   |                    |              |        |              |     | <b>0.05</b>          | <b>0.002</b>          |
| #16        | 1        | 142.100        | 0.518              | 0.000        | 0.000  | 62.000       | M   | 0.62                 | 0.464                 |
|            | 2        | 6.500          | 0.024              | 0.000        | 0.000  | 80.000       | F   | 3.35                 | 0.241                 |
|            | 3        | 5.900          | 0.074              | 0.000        | 0.000  | 62.000       | M   | 0.04                 | 0.024                 |
|            | <b>Σ</b> | <b>154.500</b> |                    |              |        |              |     | <b>3.35</b>          | <b>0.729</b>          |
| #15        | 1        | 28.500         | 0.142              | 0.000        | 0.000  | 62.000       | M   | 0.14                 | 0.095                 |
|            | 2        | 71.700         | 0.230              | 0.000        | 0.000  | 62.000       | M   | 0.34                 | 0.236                 |
|            | <b>Σ</b> | <b>254.700</b> |                    |              |        |              |     | <b>3.35</b>          | <b>1.060</b>          |
| <b>#14</b> | <b>Σ</b> | <b>254.700</b> |                    |              |        |              |     | <b>3.35</b>          | <b>1.060</b>          |
| #13        | 1        | 18.000         | 0.128              | 0.000        | 0.000  | 62.000       | M   | 0.09                 | 0.060                 |
|            | 2        | 64.700         | 0.349              | 0.000        | 0.000  | 62.000       | M   | 0.30                 | 0.212                 |
|            | 3        | 2.200          | 0.045              | 0.000        | 0.000  | 80.000       | F   | 1.13                 | 0.081                 |
|            | <b>Σ</b> | <b>339.600</b> |                    |              |        |              |     | <b>1.13</b>          | <b>0.353</b>          |
| #18        | 1        | 6.000          | 0.032              | 0.000        | 0.000  | 62.000       | M   | 0.05                 | 0.024                 |
|            | <b>Σ</b> | <b>6.000</b>   |                    |              |        |              |     | <b>0.05</b>          | <b>0.024</b>          |
| #12        | 1        | 25.800         | 0.125              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 242.800        | 0.593              | 0.000        | 0.000  | 62.000       | M   | 1.04                 | 0.794                 |
|            | 3        | 37.400         | 0.089              | 0.000        | 0.000  | 80.000       | F   | 19.27                | 1.384                 |
|            | 4        | 13.800         | 0.089              | 0.000        | 0.000  | 62.000       | M   | 0.10                 | 0.056                 |
|            | <b>Σ</b> | <b>319.800</b> |                    |              |        |              |     | <b>19.27</b>         | <b>2.234</b>          |
| <b>#11</b> | <b>Σ</b> | <b>319.800</b> |                    |              |        |              |     | <b>19.27</b>         | <b>2.234</b>          |
| #10        | 1        | 13.000         | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 43.900         | 0.100              | 0.000        | 0.000  | 62.000       | M   | 0.33                 | 0.179                 |
|            | 3        | 66.100         | 0.229              | 0.000        | 0.000  | 62.000       | M   | 0.32                 | 0.218                 |
|            | <b>Σ</b> | <b>442.800</b> |                    |              |        |              |     | <b>1.53</b>          | <b>0.769</b>          |
| <b>#9</b>  | <b>Σ</b> | <b>442.800</b> |                    |              |        |              |     | <b>1.53</b>          | <b>0.769</b>          |
| #8         | 1        | 7.500          | 0.044              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 9.700          | 0.060              | 0.000        | 0.000  | 62.000       | M   | 0.07                 | 0.040                 |
|            | 3        | 4.400          | 0.048              | 0.000        | 0.000  | 62.000       | M   | 0.03                 | 0.018                 |
|            | <b>Σ</b> | <b>464.400</b> |                    |              |        |              |     | <b>1.57</b>          | <b>0.330</b>          |
| <b>#7</b>  | <b>Σ</b> | <b>470.400</b> |                    |              |        |              |     | <b>1.60</b>          | <b>0.355</b>          |
| #6         | 1        | 19.000         | 0.070              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |

| Stru #    | SWS #    | SWS Area (ac)    | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|-----------|----------|------------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|           | 2        | 26.400           | 0.105              | 0.000        | 0.000  | 62.000       | M   | 0.20                 | 0.108                 |
|           | 3        | 36.600           | 0.184              | 0.000        | 0.000  | 62.000       | M   | 0.18                 | 0.121                 |
|           | <b>Σ</b> | <b>552.400</b>   |                    |              |        |              |     | <b>1.79</b>          | <b>0.584</b>          |
| <b>#5</b> | <b>Σ</b> | <b>892.000</b>   |                    |              |        |              |     | <b>2.06</b>          | <b>0.937</b>          |
| #4        | 1        | 7.900            | 0.053              | 0.000        | 0.000  | 80.000       | F   | 4.07                 | 0.292                 |
|           | 2        | 126.900          | 0.386              | 0.000        | 0.000  | 62.000       | M   | 0.58                 | 0.414                 |
|           | 3        | 8.500            | 0.041              | 0.000        | 0.000  | 62.000       | M   | 0.06                 | 0.035                 |
|           | 4        | 2.600            | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>1,037.900</b> |                    |              |        |              |     | <b>5.20</b>          | <b>1.679</b>          |
| <b>#3</b> | <b>Σ</b> | <b>1,037.900</b> |                    |              |        |              |     | <b>5.20</b>          | <b>1.679</b>          |
| #2        | 1        | 0.700            | 0.006              | 0.000        | 0.000  | 61.000       | S   | 0.00                 | 0.000                 |
|           | 2        | 1.100            | 0.015              | 0.000        | 0.000  | 61.000       | S   | 0.00                 | 0.000                 |
|           | 3        | 9.100            | 0.104              | 0.000        | 0.000  | 62.000       | M   | 0.07                 | 0.037                 |
|           | <b>Σ</b> | <b>1,048.900</b> |                    |              |        |              |     | <b>5.22</b>          | <b>1.717</b>          |
| <b>#1</b> | <b>Σ</b> | <b>1,048.900</b> |                    |              |        |              |     | <b>0.00</b>          | <b>0.000</b>          |

## Subwatershed Sedimentology Detail:

| Stru #     | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)  |
|------------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|--------------|
| #17        | 1        | 0.300  | 10.00  | 1.00  | 0.8000 | 0.3800 | 1    | 0.0             | 2,943                      | 1.68                        | 1.25         |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>2,943</b>               | <b>1.68</b>                 | <b>1.25</b>  |
| #16        | 1        | 0.300  | 400.00 | 12.00 | 0.0100 | 0.3800 | 1    | 0.3             | 463                        | 0.23                        | 0.20         |
|            | 2        | 0.300  | 150.00 | 15.00 | 0.8000 | 0.3800 | 1    | 23.8            | 148,016                    | 84.36                       | 39.77        |
|            | 3        | 0.300  | 200.00 | 5.00  | 0.0100 | 0.3800 | 1    | 0.0             | 83                         | 0.05                        | 0.04         |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>24.0</b>     | <b>148,016</b>             | <b>84.23</b>                | <b>13.29</b> |
| #15        | 1        | 0.300  | 400.00 | 8.40  | 0.0100 | 0.3800 | 1    | 0.0             | 210                        | 0.11                        | 0.09         |
|            | 2        | 0.300  | 400.00 | 8.00  | 0.0100 | 0.3800 | 1    | 0.1             | 213                        | 0.11                        | 0.09         |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>24.1</b>     | <b>148,016</b>             | <b>84.20</b>                | <b>9.17</b>  |
| <b>#14</b> | <b>Σ</b> |        |        |       |        |        |      | <b>24.1</b>     | <b>148,016</b>             | <b>84.20</b>                | <b>9.17</b>  |
| #13        | 1        | 0.300  | 400.00 | 12.00 | 0.0100 | 0.3800 | 1    | 0.0             | 396                        | 0.20                        | 0.17         |
|            | 2        | 0.300  | 400.00 | 10.00 | 0.0100 | 0.3800 | 1    | 0.1             | 290                        | 0.14                        | 0.12         |
|            | 3        | 0.300  | 100.00 | 2.00  | 0.8000 | 0.3800 | 1    | 0.6             | 11,109                     | 6.33                        | 2.93         |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>24.8</b>     | <b>11,109</b>              | <b>8.82</b>                 | <b>1.10</b>  |
| #18        | 1        | 0.300  | 200.00 | 26.00 | 0.0100 | 0.3800 | 1    | 0.0             | 661                        | 0.38                        | 0.29         |

| Stru #       | SWS # | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)  |
|--------------|-------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|--------------|
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.0</b>      | <b>661</b>                 | <b>0.38</b>                 | <b>0.29</b>  |
| #12          | 1     | 0.300  | 400.00 | 13.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 400.00 | 10.00 | 0.0100 | 0.3800 | 1    | 0.3             | 320                        | 0.15                        | 0.14         |
|              | 3     | 0.300  | 400.00 | 10.00 | 0.8000 | 0.3800 | 1    | 148.7           | 160,099                    | 91.25                       | 43.09        |
|              | 4     | 0.300  | 200.00 | 4.50  | 0.0100 | 0.3800 | 1    | 0.0             | 83                         | 0.05                        | 0.04         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>149.0</b>    | <b>160,099</b>             | <b>91.22</b>                | <b>26.80</b> |
| <b>#11 Σ</b> |       |        |        |       |        |        |      | <b>149.0</b>    | <b>160,099</b>             | <b>91.22</b>                | <b>26.80</b> |
| #10          | 1     | 0.300  | 100.00 | 20.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 400.00 | 17.00 | 0.0100 | 0.3800 | 1    | 0.1             | 786                        | 0.45                        | 0.34         |
|              | 3     | 0.300  | 400.00 | 13.00 | 0.0100 | 0.3800 | 1    | 0.1             | 506                        | 0.25                        | 0.22         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.3</b>      | <b>660</b>                 | <b>0.36</b>                 | <b>0.14</b>  |
| <b>#9 Σ</b>  |       |        |        |       |        |        |      | <b>0.3</b>      | <b>660</b>                 | <b>0.36</b>                 | <b>0.14</b>  |
| #8           | 1     | 0.300  | 200.00 | 21.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 250.00 | 24.00 | 0.0100 | 0.3800 | 1    | 0.0             | 734                        | 0.42                        | 0.32         |
|              | 3     | 0.300  | 200.00 | 20.00 | 0.0100 | 0.3800 | 1    | 0.0             | 477                        | 0.27                        | 0.21         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.0</b>      | <b>654</b>                 | <b>0.37</b>                 | <b>0.05</b>  |
| <b>#7 Σ</b>  |       |        |        |       |        |        |      | <b>0.1</b>      | <b>656</b>                 | <b>0.37</b>                 | <b>0.07</b>  |
| #6           | 1     | 0.300  | 400.00 | 18.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 400.00 | 15.00 | 0.0100 | 0.3800 | 1    | 0.1             | 634                        | 0.36                        | 0.27         |
|              | 3     | 0.300  | 400.00 | 13.00 | 0.0100 | 0.3800 | 1    | 0.1             | 477                        | 0.24                        | 0.20         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.2</b>      | <b>581</b>                 | <b>0.32</b>                 | <b>0.13</b>  |
| <b>#5 Σ</b>  |       |        |        |       |        |        |      | <b>25.0</b>     | <b>11,109</b>              | <b>8.79</b>                 | <b>0.54</b>  |
| #4           | 1     | 0.300  | 200.00 | 6.00  | 0.8000 | 0.3800 | 1    | 9.9             | 52,945                     | 30.18                       | 14.03        |
|              | 2     | 0.300  | 400.00 | 12.00 | 0.0100 | 0.3800 | 1    | 0.2             | 477                        | 0.24                        | 0.20         |
|              | 3     | 0.300  | 200.00 | 19.00 | 0.0100 | 0.3800 | 1    | 0.0             | 486                        | 0.28                        | 0.21         |
|              | 4     | 0.300  | 100.00 | 20.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>35.1</b>     | <b>43,953</b>              | <b>31.95</b>                | <b>3.48</b>  |
| <b>#3 Σ</b>  |       |        |        |       |        |        |      | <b>35.1</b>     | <b>43,953</b>              | <b>31.95</b>                | <b>3.48</b>  |
| #2           | 1     | 0.300  | 50.00  | 40.00 | 0.0800 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 100.00 | 48.00 | 0.0800 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 3     | 0.300  | 400.00 | 26.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1,053                      | 0.60                        | 0.46         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>35.2</b>     | <b>43,863</b>              | <b>31.88</b>                | <b>3.42</b>  |
| <b>#1 Σ</b>  |       |        |        |       |        |        |      | <b>35.2</b>     | <b>1</b>                   | <b>0.00</b>                 | <b>0.00</b>  |

***Subwatershed Time of Concentration Details:***

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2         | 1        | 3. Short grass pasture                                | 40.00     | 48.80            | 122.00            | 5.050          | 0.006        |
| <b>#2</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.006</b> |
| #2         | 2        | 3. Short grass pasture                                | 48.00     | 150.23           | 313.00            | 5.540          | 0.015        |
| <b>#2</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #2         | 3        | 3. Short grass pasture                                | 26.00     | 397.02           | 1,527.00          | 4.070          | 0.104        |
| <b>#2</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.104</b> |
| #4         | 1        | 4. Cultivated, straight row                           | 6.00      | 25.38            | 423.00            | 2.180          | 0.053        |
| <b>#4</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.053</b> |
| #4         | 2        | 3. Short grass pasture                                | 12.00     | 462.24           | 3,852.00          | 2.770          | 0.386        |
| <b>#4</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.386</b> |
| #4         | 3        | 3. Short grass pasture                                | 19.00     | 99.37            | 523.00            | 3.480          | 0.041        |
| <b>#4</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.041</b> |
| #4         | 4        | 3. Short grass pasture                                | 20.00     | 50.40            | 252.00            | 3.570          | 0.019        |
| <b>#4</b>  | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #6         | 1        | 3. Short grass pasture                                | 18.00     | 154.08           | 856.00            | 3.390          | 0.070        |
| <b>#6</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.070</b> |
| #6         | 2        | 3. Short grass pasture                                | 15.00     | 175.35           | 1,169.00          | 3.090          | 0.105        |
| <b>#6</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.105</b> |
| #6         | 3        | 3. Short grass pasture                                | 13.00     | 248.04           | 1,908.00          | 2.880          | 0.184        |
| <b>#6</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.184</b> |
| #8         | 1        | 3. Short grass pasture                                | 21.00     | 122.64           | 584.00            | 3.660          | 0.044        |
| <b>#8</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #8         | 2        | 3. Short grass pasture                                | 24.00     | 204.48           | 852.00            | 3.910          | 0.060        |
| <b>#8</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.060</b> |
| #8         | 3        | 3. Short grass pasture                                | 20.00     | 125.80           | 629.00            | 3.570          | 0.048        |
| <b>#8</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.048</b> |
| #10        | 1        | 3. Short grass pasture                                | 20.00     | 49.80            | 249.00            | 3.570          | 0.019        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #10        | 2        | 3. Short grass pasture                                | 17.00     | 202.98           | 1,194.00          | 3.290          | 0.100        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.100</b> |
| #10        | 3        | 3. Short grass pasture                                | 13.00     | 309.91           | 2,384.00          | 2.880          | 0.229        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.229</b> |
| #12        | 1        | 3. Short grass pasture                                | 9.00      | 97.38            | 1,082.00          | 2.400          | 0.125        |
| <b>#12</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #12        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 10.00     | 102.10           | 1,021.00          | 3.160          | 0.089        |
| <b>#12</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.089</b> |
| #12        | 4        | 3. Short grass pasture                                | 5.00      | 28.60            | 572.00            | 1.780          | 0.089        |
| <b>#12</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.089</b> |
| #13        | 1        | 3. Short grass pasture                                | 12.00     | 153.59           | 1,280.00          | 2.770          | 0.128        |
| <b>#13</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.128</b> |
| #13        | 2        | 3. Short grass pasture                                | 10.00     | 317.10           | 3,171.00          | 2.520          | 0.349        |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| <b>#13</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.349</b> |
| #13        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 2.00      | 4.64             | 232.00            | 1.410          | 0.045        |
| <b>#13</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.045</b> |
| #15        | 1        | 3. Short grass pasture                                | 8.40      | 99.62            | 1,186.00          | 2.310          | 0.142        |
| <b>#15</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.142</b> |
| #15        | 2        | 3. Short grass pasture                                | 8.00      | 150.23           | 1,878.00          | 2.260          | 0.230        |
| <b>#15</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.230</b> |
| #16        | 1        | 3. Short grass pasture                                | 12.00     | 620.64           | 5,172.00          | 2.770          | 0.518        |
| <b>#16</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.518</b> |
| #16        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 15.00     | 51.15            | 341.00            | 3.870          | 0.024        |
| <b>#16</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #16        | 3        | 3. Short grass pasture                                | 5.00      | 23.85            | 477.00            | 1.780          | 0.074        |
| <b>#16</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.074</b> |
| #17        | 1        | 3. Short grass pasture                                | 1.00      | 0.09             | 10.00             | 0.800          | 0.003        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.003</b> |
| #18        | 1        | 3. Short grass pasture                                | 26.00     | 124.53           | 479.00            | 4.070          | 0.032        |
| <b>#18</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.032</b> |

# **East Taylor Pond** **25 Year - 24 Hour Storm Event**

***Emergency Spillway Demonstration***  
***Post Mining***

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.  
1100 West 116th Avenue  
Westminster, CO 80234

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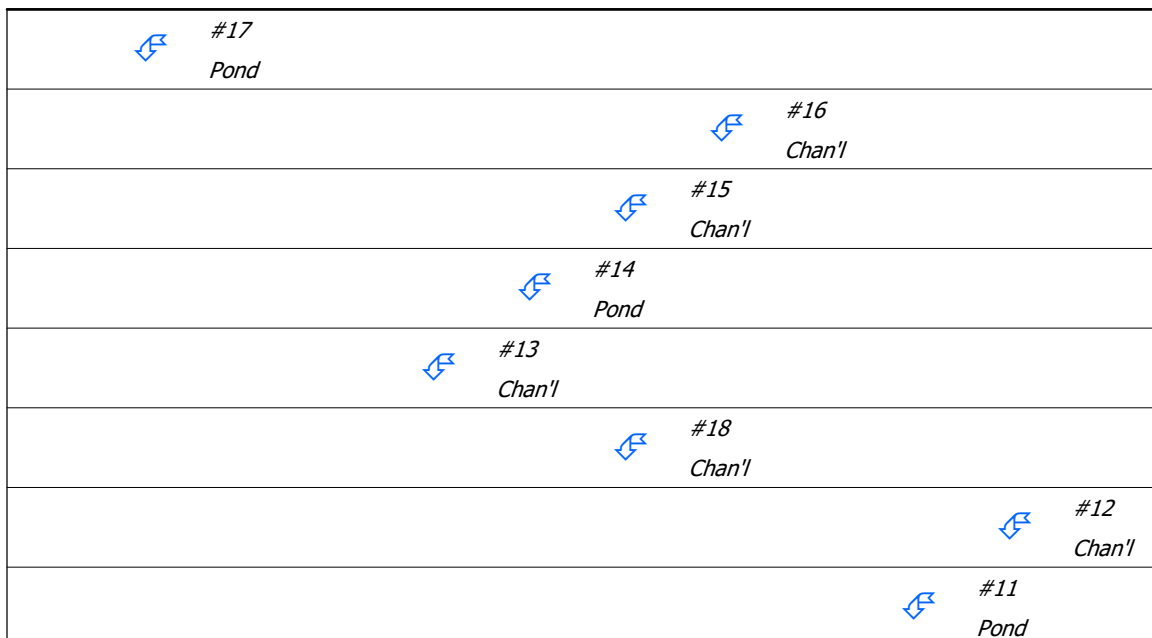
## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 25 yr - 24 hr |
| Rainfall Depth: | 2.300 inches  |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                                                    |
|---------|--------|--------------|--------|---------------|---------|--------------------------------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below East Taylor Pond                                                    |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | East Taylor Pond                                                               |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above East Taylor Pond                                                    |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Taylor Ditch 0+00 to 10+00                                                     |
| Null    | #5     | ==>          | #4     | 0.000         | 0.000   | Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Taylor Ditch 10+00 to 35+00                                                    |
| Null    | #7     | ==>          | #6     | 0.000         | 0.000   | Null at Confluence of Taylor/Taylor Trib                                       |
| Channel | #8     | ==>          | #7     | 0.000         | 0.000   | Taylor Ditch 35+00 to TD-1 Stockpond                                           |
| Pond    | #9     | ==>          | #8     | 0.000         | 0.000   | TD-1 Stockpond                                                                 |
| Channel | #10    | ==>          | #9     | 0.000         | 0.000   | Taylor Ditch TD-1 to TD-2 Stockpond                                            |
| Pond    | #11    | ==>          | #10    | 0.000         | 0.000   | TD-2 Stockpond                                                                 |
| Channel | #12    | ==>          | #11    | 0.000         | 0.000   | Taylor Ditch TD-2 Stockpond to 117+58                                          |
| Channel | #13    | ==>          | #5     | 0.000         | 0.000   | East Taylor Ditch 0+00 to ETD-1                                                |
| Pond    | #14    | ==>          | #13    | 0.000         | 0.000   | ETD-1 Stock Pond                                                               |
| Channel | #15    | ==>          | #14    | 0.000         | 0.000   | East Taylor Ditch - Veg ETD-1 to 38+30                                         |
| Channel | #16    | ==>          | #15    | 0.000         | 0.000   | East Taylor Ditch 38+30 to 73+40                                               |
| Pond    | #17    | ==>          | #2     | 0.000         | 0.000   | Simulated 250 GPM - East Taylor Seep                                           |
| Channel | #18    | ==>          | #7     | 0.000         | 0.000   | Taylor Trib Ditch                                                              |



|                                                                                   |                                                                                     |               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |    | #9<br>Pond    |
|                                                                                   |    | #8<br>Chan'l  |
|                                                                                   |    | #7<br>Null    |
|                                                                                   |    | #6<br>Chan'l  |
|                                                                                   |    | #5<br>Null    |
|                                                                                   |    | #4<br>Chan'l  |
|                                                                                   |    | #3<br>Null    |
|  | #2<br>Pond                                                                          |               |
| #1<br>Null                                                                        |                                                                                     |               |

### ***Structure Summary:***

|         | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|---------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #17 In  | 0.100                                     | 0.100                                 | 0.09                       | 0.00                                 |
| #17 Out |                                           |                                       | 0.02                       | 0.00                                 |
| #16     | 154.500                                   | 154.500                               | 6.62                       | 2.00                                 |
| #15     | 100.200                                   | 254.700                               | 8.73                       | 3.08                                 |
| #14 In  | 0.000                                     | 254.700                               | 8.73                       | 3.08                                 |
| #14 Out |                                           |                                       | 3.24                       | 1.67                                 |
| #13     | 84.900                                    | 339.600                               | 4.31                       | 2.69                                 |
| #18     | 6.000                                     | 6.000                                 | 0.83                       | 0.08                                 |
| #12     | 319.800                                   | 319.800                               | 34.12                      | 5.11                                 |
| #11 In  | 0.000                                     | 319.800                               | 34.12                      | 5.11                                 |
| #11 Out |                                           |                                       | 7.68                       | 3.25                                 |
| #10     | 123.000                                   | 442.800                               | 9.77                       | 4.55                                 |
| #9 In   | 0.000                                     | 442.800                               | 9.77                       | 4.55                                 |
| #9 Out  |                                           |                                       | 9.71                       | 4.05                                 |
| #8      | 21.600                                    | 464.400                               | 10.01                      | 4.24                                 |
| #7      | 0.000                                     | 470.400                               | 10.14                      | 4.32                                 |
| #6      | 82.000                                    | 552.400                               | 11.34                      | 5.06                                 |
| #5      | 0.000                                     | 892.000                               | 13.00                      | 7.75                                 |
| #4      | 145.900                                   | 1,037.900                             | 17.22                      | 9.71                                 |
| #3      | 0.000                                     | 1,037.900                             | 17.22                      | 9.71                                 |
| #2 In   | 10.900                                    | 1,048.900                             | 18.69                      | 9.85                                 |
| #2 Out  |                                           |                                       | 8.96                       | 5.98                                 |
| #1      | 0.000                                     | 1,048.900                             | 8.96                       | 5.98                                 |

***Structure Detail:******Structure #17 (Pond)****Simulated 250 GPM - East Taylor Seep*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 90.05 ft  |
| Dewater Time:   | 0.08 days |

*Dewatering time is calculated from peak stage to lowest spillway***Elevation-Capacity-Discharge Table**

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 90.01     | 0.050        | 0.001               | 0.000              |                          |
| 90.05     | 0.050        | 0.003               | 0.022              | 2.00 Peak Stage          |
| 91.00     | 0.051        | 0.050               | 0.560              |                          |
| 92.00     | 0.190        | 0.164               | 0.560              |                          |
| 93.00     | 0.260        | 0.388               | 0.560              |                          |
| 94.00     | 0.350        | 0.692               | 0.560              |                          |
| 95.00     | 0.440        | 1.086               | 0.560              |                          |
| 96.00     | 0.540        | 1.575               | 0.560              |                          |
| 97.00     | 0.650        | 2.169               | 0.560              |                          |
| 98.00     | 0.760        | 2.873               | 0.560              |                          |
| 99.00     | 0.880        | 3.693               | 0.560              |                          |
| 100.00    | 1.200        | 4.728               | 0.560              |                          |
| 101.00    | 1.240        | 5.948               | 0.560              |                          |
| 102.00    | 1.414        | 7.275               | 0.560              |                          |
| 103.00    | 1.600        | 8.781               | 0.560              |                          |

**Detailed Discharge Table**

| Elevation<br>(ft) | User-<br>input discharge<br>(cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------------|-----------------------------------------|
| 90.00             | 0.000                             | 0.000                                   |
| 90.01             | 0.000                             | 0.000                                   |
| 91.00             | 0.560                             | 0.560                                   |
| 92.00             | 0.560                             | 0.560                                   |
| 93.00             | 0.560                             | 0.560                                   |
| 94.00             | 0.560                             | 0.560                                   |
| 95.00             | 0.560                             | 0.560                                   |
| 96.00             | 0.560                             | 0.560                                   |
| 97.00             | 0.560                             | 0.560                                   |
| 98.00             | 0.560                             | 0.560                                   |
| 99.00             | 0.560                             | 0.560                                   |
| 100.00            | 0.560                             | 0.560                                   |
| 101.00            | 0.560                             | 0.560                                   |
| 102.00            | 0.560                             | 0.560                                   |
| 103.00            | 0.560                             | 0.560                                   |

### Structure #16 (Riprap Channel)

*East Taylor Ditch 38+30 to 73+40*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 9.5       |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 6.62 cfs      |              |
| Depth:            | 0.08 ft       |              |
| Top Width:        | 12.49 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.00 sq ft    |              |
| Hydraulic Radius: | 0.080 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #15 (Vegetated Channel)

*East Taylor Ditch - Veg ETD-1 to 38+30*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.8       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 8.73 cfs                              |                                      | 8.73 cfs                             |                                     |
| Depth:                 | 0.43 ft                               |                                      | 0.83 ft                              |                                     |
| Top Width:             | 14.56 ft                              |                                      | 16.98 ft                             |                                     |
| Velocity:              | 1.54 fps                              |                                      | 0.73 fps                             |                                     |
| X-Section Area:        | 5.66 sq ft                            |                                      | 12.03 sq ft                          |                                     |
| Hydraulic Radius:      | 0.385 ft                              |                                      | 0.697 ft                             |                                     |
| Froude Number:         | 0.44                                  |                                      | 0.15                                 |                                     |
| Roughness Coefficient: | 0.0684                                |                                      | 0.2163                               |                                     |

### Structure #14 (Pond)

*ETD-1 Stock Pond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,287.01 ft |
| Initial Pool:      | 0.01 ac-ft  |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,289.00      | 30.00             | 2.00:1         | 2.00:1          | 32.00             |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,291.00      | 20.00             | 2.00:1         | 2.00:1          | 15.00             |

Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,289.05 ft |
| Dewater Time:   | 0.46 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,287.00  | 0.661        | 0.000               | 0.000              |                          |
| 7,287.01  | 0.661        | 0.006               | 0.000              |                          |
| 7,288.00  | 0.708        | 0.684               | 0.000              |                          |
| 7,289.00  | 0.757        | 1.416               | 0.000              | Spillway #1              |
| 7,289.05  | 0.734        | 1.452               | 3.239              | 11.05 Peak Stage         |
| 7,290.00  | 0.758        | 2.174               | 68.938             |                          |
| 7,291.00  | 0.759        | 2.932               | 239.116            | Spillway #2              |
| 7,292.00  | 0.760        | 3.692               | 525.594            |                          |
| 7,293.00  | 0.762        | 4.453               | 944.414            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------|-----------------------------------------|
| 7,287.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,287.01          | 0.000                       | 0.000                       | 0.000                                   |
| 7,288.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,289.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,290.00          | 68.938                      | 0.000                       | 68.938                                  |
| 7,291.00          | 239.116                     | 0.000                       | 239.116                                 |
| 7,292.00          | 488.655                     | 36.939                      | 525.594                                 |
| 7,293.00          | 814.228                     | 130.185                     | 944.414                                 |

Structure #13 (Riprap Channel)

*East Taylor Ditch 0+00 to ETD-1*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 11.8      |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 4.31 cfs      |              |
| Depth:            | 0.06 ft       |              |
| Top Width:        | 12.34 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.68 sq ft    |              |
| Hydraulic Radius: | 0.055 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #18 (Riprap Channel)

#### *Taylor Trib Ditch*

### Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 17.0      |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 0.83 cfs      |              |
| Depth:            | 0.02 ft       |              |
| Top Width:        | 12.13 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.26 sq ft    |              |
| Hydraulic Radius: | 0.021 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |

|       | w/o Freeboard | w/ Freeboard |
|-------|---------------|--------------|
| Dmin: | 2.00 in       |              |
| D50:  | 6.00 in       |              |
| Dmax: | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #12 (Riprap Channel)

*Taylor Ditch TD-2 Stockpond to 117+58*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 9.8       | 3.67                 |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 34.12 cfs     |              |
| Depth:            | 0.28 ft       | 3.95 ft      |
| Top Width:        | 13.67 ft      | 35.69 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 3.58 sq ft    |              |
| Hydraulic Radius: | 0.260 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #11 (Pond)

*TD-2 Stockpond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,445.00 ft |
| Initial Pool:      | 0.09 ac-ft  |

#### Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 7,454.00      | 30.00                | 2.00:1            | 2.00:1             | 20.00                |

## Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,454.17 ft |
| Dewater Time:   | 0.55 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,443.00  | 0.014        | 0.000               | 0.000              |                          |
| 7,444.00  | 0.050        | 0.030               | 0.000              |                          |
| 7,445.00  | 0.079        | 0.094               | 0.000              |                          |
| 7,446.00  | 0.106        | 0.186               | 0.000              |                          |
| 7,447.00  | 0.133        | 0.305               | 0.000              |                          |
| 7,448.00  | 0.161        | 0.452               | 0.000              |                          |
| 7,449.00  | 0.190        | 0.627               | 0.000              |                          |
| 7,450.00  | 0.219        | 0.831               | 0.000              |                          |
| 7,451.00  | 0.249        | 1.065               | 0.000              |                          |
| 7,452.00  | 0.280        | 1.329               | 0.000              |                          |
| 7,453.00  | 0.313        | 1.625               | 0.000              |                          |
| 7,454.00  | 0.348        | 1.955               | 0.000              | Spillway #1              |
| 7,454.17  | 0.357        | 2.020               | 7.679              | 13.10 Peak Stage         |
| 7,455.00  | 0.389        | 2.324               | 43.900             |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 7,443.00          | 0.000                       | 0.000                                   |
| 7,444.00          | 0.000                       | 0.000                                   |
| 7,445.00          | 0.000                       | 0.000                                   |
| 7,446.00          | 0.000                       | 0.000                                   |
| 7,447.00          | 0.000                       | 0.000                                   |
| 7,448.00          | 0.000                       | 0.000                                   |
| 7,449.00          | 0.000                       | 0.000                                   |
| 7,450.00          | 0.000                       | 0.000                                   |
| 7,451.00          | 0.000                       | 0.000                                   |

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 7,452.00          | 0.000                       | 0.000                                   |
| 7,453.00          | 0.000                       | 0.000                                   |
| 7,454.00          | 0.000                       | 0.000                                   |
| 7,455.00          | 43.900                      | 43.900                                  |

### Structure #10 (Riprap Channel)

*Taylor Ditch TD-1 to TD-2 Stockpond*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 6.8       |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 9.77 cfs      |              |
| Depth:            | 0.13 ft       |              |
| Top Width:        | 12.77 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.59 sq ft    |              |
| Hydraulic Radius: | 0.124 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #9 (Pond)

*TD-1 Stockpond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,283.01 ft |
| Initial Pool:      | 0.00 ac-ft  |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,287.00      | 20.00             | 2.00:1         | 2.00:1          | 30.00             |

## Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,287.14 ft |
| Dewater Time:   | 0.55 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 7,283.00  | 0.001     | 0.000            | 0.000           |                    |
| 7,283.01  | 0.001     | 0.000            | 0.000           |                    |
| 7,284.00  | 0.059     | 0.023            | 0.000           |                    |
| 7,285.00  | 0.159     | 0.128            | 0.000           |                    |
| 7,286.00  | 0.182     | 0.298            | 0.000           |                    |
| 7,287.00  | 0.213     | 0.495            | 0.000           | Spillway #1        |
| 7,287.14  | 0.219     | 0.527            | 9.706           | 13.10 Peak Stage   |
| 7,288.00  | 0.247     | 0.725            | 71.329          |                    |

## Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 7,283.00       | 0.000                    | 0.000                          |
| 7,283.01       | 0.000                    | 0.000                          |
| 7,284.00       | 0.000                    | 0.000                          |
| 7,285.00       | 0.000                    | 0.000                          |
| 7,286.00       | 0.000                    | 0.000                          |
| 7,287.00       | 0.000                    | 0.000                          |
| 7,288.00       | 71.329                   | 71.329                         |

## Structure #8 (Riprap Channel)

*Taylor Ditch 35+00 to TD-1 Stockpond*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 10.7      |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 10.01 cfs     |              |
| Depth:            | 0.10 ft       |              |
| Top Width:        | 12.61 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.25 sq ft    |              |
| Hydraulic Radius: | 0.099 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #7 (Null)

*Null at Confluence of Taylor/Taylor Trib*

### Structure #6 (Riprap Channel)

*Taylor Ditch 10+00 to 35+00*

### Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 7.1       |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 11.34 cfs     |              |
| Depth:            | 0.14 ft       |              |
| Top Width:        | 12.84 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.73 sq ft    |              |

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Hydraulic Radius: | 0.134 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #5 (Null)

*Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor*

### Structure #4 (Riprap Channel)

*Taylor Ditch 0+00 to 10+00*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 6.9       |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 17.22 cfs     |              |
| Depth:            | 0.19 ft       |              |
| Top Width:        | 13.14 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 2.40 sq ft    |              |
| Hydraulic Radius: | 0.182 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Null)

*Null Above East Taylor Pond*

### Structure #2 (Pond)

*East Taylor Pond*

## Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 6,944.00 ft |
| Initial Pool:      | 2.87 ac-ft  |

Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 10.00             | 18.00                | 122.00             | 4.00             | 0.0150      | 6,951.00           | 2                        |

Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 6,954.00      | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 6,952.13 ft |
| Dewater Time:   | 0.58 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 6,930.00  | 0.001     | 0.000            | 0.000           |                    |
| 6,931.00  | 0.036     | 0.014            | 0.000           |                    |
| 6,932.00  | 0.076     | 0.069            | 0.000           |                    |
| 6,933.00  | 0.110     | 0.161            | 0.000           |                    |
| 6,934.00  | 0.134     | 0.283            | 0.000           |                    |
| 6,935.00  | 0.156     | 0.428            | 0.000           |                    |
| 6,936.00  | 0.178     | 0.595            | 0.000           |                    |
| 6,937.00  | 0.201     | 0.785            | 0.000           |                    |
| 6,938.00  | 0.226     | 0.998            | 0.000           |                    |
| 6,939.00  | 0.252     | 1.237            | 0.000           |                    |
| 6,940.00  | 0.280     | 1.504            | 0.000           |                    |
| 6,941.00  | 0.310     | 1.799            | 0.000           |                    |
| 6,942.00  | 0.340     | 2.123            | 0.000           |                    |
| 6,943.00  | 0.373     | 2.480            | 0.000           |                    |
| 6,944.00  | 0.409     | 2.871            | 0.000           |                    |
| 6,945.00  | 0.446     | 3.298            | 0.000           |                    |
| 6,946.00  | 0.486     | 3.764            | 0.000           |                    |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 6,947.00  | 0.527        | 4.270               | 0.000              |                          |
| 6,948.00  | 0.571        | 4.819               | 0.000              |                          |
| 6,949.00  | 0.615        | 5.412               | 0.000              |                          |
| 6,950.00  | 0.660        | 6.049               | 0.000              |                          |
| 6,951.00  | 0.706        | 6.732               | 0.000              | Spillway #1              |
| 6,952.00  | 0.754        | 7.462               | 8.509              | 12.15                    |
| 6,952.13  | 0.762        | 7.562               | 8.957              | 1.70 Peak Stage          |
| 6,953.00  | 0.804        | 8.241               | 12.033             |                          |
| 6,954.00  | 0.857        | 9.072               | 14.738             | Spillway #2              |
| 6,955.00  | 0.975        | 9.987               | 65.418             |                          |
| 6,956.00  | 1.033        | 10.991              | 186.424            |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,930.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,931.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,932.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,933.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,934.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,935.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,936.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,937.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,938.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,939.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,940.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,941.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,942.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,943.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,944.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,945.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,946.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,947.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,948.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,949.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,950.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,951.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,952.00          | 8.509             | 0.000                       | 8.509                                   |
| 6,953.00          | 12.033            | 0.000                       | 12.033                                  |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,954.00          | 14.738            | 0.000                       | 14.738                                  |
| 6,955.00          | 17.018            | 48.400                      | 65.418                                  |
| 6,956.00          | 19.026            | 167.398                     | 186.424                                 |

## Structure #1 (Null)

*Null Below East Taylor Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #17        | 1        | 0.100          | 0.003              | 0.000        | 0.000  | 80.000       | S   | 0.09                 | 0.003                 |
|            | <b>Σ</b> | <b>0.100</b>   |                    |              |        |              |     | <b>0.09</b>          | <b>0.003</b>          |
| #16        | 1        | 142.100        | 0.518              | 0.000        | 0.000  | 62.000       | M   | 4.23                 | 1.513                 |
|            | 2        | 6.500          | 0.024              | 0.000        | 0.000  | 80.000       | F   | 5.54                 | 0.408                 |
|            | 3        | 5.900          | 0.074              | 0.000        | 0.000  | 62.000       | M   | 0.81                 | 0.079                 |
|            | <b>Σ</b> | <b>154.500</b> |                    |              |        |              |     | <b>6.62</b>          | <b>1.999</b>          |
| #15        | 1        | 28.500         | 0.142              | 0.000        | 0.000  | 62.000       | M   | 1.52                 | 0.309                 |
|            | 2        | 71.700         | 0.230              | 0.000        | 0.000  | 62.000       | M   | 3.20                 | 0.769                 |
|            | <b>Σ</b> | <b>254.700</b> |                    |              |        |              |     | <b>8.73</b>          | <b>3.078</b>          |
| <b>#14</b> | <b>Σ</b> | <b>254.700</b> |                    |              |        |              |     | <b>8.73</b>          | <b>3.078</b>          |
| #13        | 1        | 18.000         | 0.128              | 0.000        | 0.000  | 62.000       | M   | 0.96                 | 0.195                 |
|            | 2        | 64.700         | 0.349              | 0.000        | 0.000  | 62.000       | M   | 2.26                 | 0.691                 |
|            | 3        | 2.200          | 0.045              | 0.000        | 0.000  | 80.000       | F   | 1.88                 | 0.138                 |
|            | <b>Σ</b> | <b>339.600</b> |                    |              |        |              |     | <b>4.31</b>          | <b>2.691</b>          |
| #18        | 1        | 6.000          | 0.032              | 0.000        | 0.000  | 62.000       | M   | 0.83                 | 0.080                 |
|            | <b>Σ</b> | <b>6.000</b>   |                    |              |        |              |     | <b>0.83</b>          | <b>0.080</b>          |
| #12        | 1        | 25.800         | 0.125              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 242.800        | 0.593              | 0.000        | 0.000  | 62.000       | M   | 6.98                 | 2.585                 |
|            | 3        | 37.400         | 0.089              | 0.000        | 0.000  | 80.000       | F   | 31.90                | 2.345                 |
|            | 4        | 13.800         | 0.089              | 0.000        | 0.000  | 62.000       | M   | 1.91                 | 0.184                 |
|            | <b>Σ</b> | <b>319.800</b> |                    |              |        |              |     | <b>34.12</b>         | <b>5.114</b>          |
| <b>#11</b> | <b>Σ</b> | <b>319.800</b> |                    |              |        |              |     | <b>34.12</b>         | <b>5.114</b>          |
| #10        | 1        | 13.000         | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 43.900         | 0.100              | 0.000        | 0.000  | 62.000       | M   | 6.06                 | 0.585                 |
|            | 3        | 66.100         | 0.229              | 0.000        | 0.000  | 62.000       | M   | 2.95                 | 0.709                 |
|            | <b>Σ</b> | <b>442.800</b> |                    |              |        |              |     | <b>9.77</b>          | <b>4.546</b>          |
| <b>#9</b>  | <b>Σ</b> | <b>442.800</b> |                    |              |        |              |     | <b>9.77</b>          | <b>4.546</b>          |
| #8         | 1        | 7.500          | 0.044              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 9.700          | 0.060              | 0.000        | 0.000  | 62.000       | M   | 1.34                 | 0.129                 |
|            | 3        | 4.400          | 0.048              | 0.000        | 0.000  | 62.000       | M   | 0.61                 | 0.059                 |
|            | <b>Σ</b> | <b>464.400</b> |                    |              |        |              |     | <b>10.01</b>         | <b>4.238</b>          |
| <b>#7</b>  | <b>Σ</b> | <b>470.400</b> |                    |              |        |              |     | <b>10.14</b>         | <b>4.317</b>          |
| #6         | 1        | 19.000         | 0.070              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |

| Stru #    | SWS #    | SWS Area (ac)    | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|-----------|----------|------------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|           | 2        | 26.400           | 0.105              | 0.000        | 0.000  | 62.000       | M   | 3.65                 | 0.352                 |
|           | 3        | 36.600           | 0.184              | 0.000        | 0.000  | 62.000       | M   | 1.85                 | 0.394                 |
|           | <b>Σ</b> | <b>552.400</b>   |                    |              |        |              |     | <b>11.34</b>         | <b>5.063</b>          |
| <b>#5</b> | <b>Σ</b> | <b>892.000</b>   |                    |              |        |              |     | <b>13.00</b>         | <b>7.755</b>          |
| #4        | 1        | 7.900            | 0.053              | 0.000        | 0.000  | 80.000       | F   | 6.74                 | 0.495                 |
|           | 2        | 126.900          | 0.386              | 0.000        | 0.000  | 62.000       | M   | 4.18                 | 1.350                 |
|           | 3        | 8.500            | 0.041              | 0.000        | 0.000  | 62.000       | M   | 1.17                 | 0.113                 |
|           | 4        | 2.600            | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>1,037.900</b> |                    |              |        |              |     | <b>17.22</b>         | <b>9.713</b>          |
| <b>#3</b> | <b>Σ</b> | <b>1,037.900</b> |                    |              |        |              |     | <b>17.22</b>         | <b>9.713</b>          |
| #2        | 1        | 0.700            | 0.006              | 0.000        | 0.000  | 61.000       | S   | 0.07                 | 0.003                 |
|           | 2        | 1.100            | 0.015              | 0.000        | 0.000  | 61.000       | S   | 0.12                 | 0.009                 |
|           | 3        | 9.100            | 0.104              | 0.000        | 0.000  | 62.000       | M   | 1.26                 | 0.121                 |
|           | <b>Σ</b> | <b>1,048.900</b> |                    |              |        |              |     | <b>18.69</b>         | <b>9.850</b>          |
| <b>#1</b> | <b>Σ</b> | <b>1,048.900</b> |                    |              |        |              |     | <b>8.96</b>          | <b>5.985</b>          |

## Subwatershed Time of Concentration Details:

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture        | 40.00     | 48.80            | 122.00            | 5.050          | 0.006        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.006</b> |
| #2        | 2        | 3. Short grass pasture        | 48.00     | 150.23           | 313.00            | 5.540          | 0.015        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.015</b> |
| #2        | 3        | 3. Short grass pasture        | 26.00     | 397.02           | 1,527.00          | 4.070          | 0.104        |
| <b>#2</b> | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.104</b> |
| #4        | 1        | 4. Cultivated, straight row   | 6.00      | 25.38            | 423.00            | 2.180          | 0.053        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.053</b> |
| #4        | 2        | 3. Short grass pasture        | 12.00     | 462.24           | 3,852.00          | 2.770          | 0.386        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.386</b> |
| #4        | 3        | 3. Short grass pasture        | 19.00     | 99.37            | 523.00            | 3.480          | 0.041        |
| <b>#4</b> | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.041</b> |
| #4        | 4        | 3. Short grass pasture        | 20.00     | 50.40            | 252.00            | 3.570          | 0.019        |
| <b>#4</b> | <b>4</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.019</b> |
| #6        | 1        | 3. Short grass pasture        | 18.00     | 154.08           | 856.00            | 3.390          | 0.070        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.070</b> |
| #6        | 2        | 3. Short grass pasture        | 15.00     | 175.35           | 1,169.00          | 3.090          | 0.105        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.105</b> |
| #6        | 3        | 3. Short grass pasture        | 13.00     | 248.04           | 1,908.00          | 2.880          | 0.184        |
| <b>#6</b> | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.184</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #8         | 1        | 3. Short grass pasture                                | 21.00     | 122.64           | 584.00            | 3.660          | 0.044        |
| <b>#8</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #8         | 2        | 3. Short grass pasture                                | 24.00     | 204.48           | 852.00            | 3.910          | 0.060        |
| <b>#8</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.060</b> |
| #8         | 3        | 3. Short grass pasture                                | 20.00     | 125.80           | 629.00            | 3.570          | 0.048        |
| <b>#8</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.048</b> |
| #10        | 1        | 3. Short grass pasture                                | 20.00     | 49.80            | 249.00            | 3.570          | 0.019        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #10        | 2        | 3. Short grass pasture                                | 17.00     | 202.98           | 1,194.00          | 3.290          | 0.100        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.100</b> |
| #10        | 3        | 3. Short grass pasture                                | 13.00     | 309.91           | 2,384.00          | 2.880          | 0.229        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.229</b> |
| #12        | 1        | 3. Short grass pasture                                | 9.00      | 97.38            | 1,082.00          | 2.400          | 0.125        |
| <b>#12</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #12        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 10.00     | 102.10           | 1,021.00          | 3.160          | 0.089        |
| <b>#12</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.089</b> |
| #12        | 4        | 3. Short grass pasture                                | 5.00      | 28.60            | 572.00            | 1.780          | 0.089        |
| <b>#12</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.089</b> |
| #13        | 1        | 3. Short grass pasture                                | 12.00     | 153.59           | 1,280.00          | 2.770          | 0.128        |
| <b>#13</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.128</b> |
| #13        | 2        | 3. Short grass pasture                                | 10.00     | 317.10           | 3,171.00          | 2.520          | 0.349        |
| <b>#13</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.349</b> |
| #13        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 2.00      | 4.64             | 232.00            | 1.410          | 0.045        |
| <b>#13</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.045</b> |
| #15        | 1        | 3. Short grass pasture                                | 8.40      | 99.62            | 1,186.00          | 2.310          | 0.142        |
| <b>#15</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.142</b> |
| #15        | 2        | 3. Short grass pasture                                | 8.00      | 150.23           | 1,878.00          | 2.260          | 0.230        |
| <b>#15</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.230</b> |
| #16        | 1        | 3. Short grass pasture                                | 12.00     | 620.64           | 5,172.00          | 2.770          | 0.518        |
| <b>#16</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.518</b> |
| #16        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 15.00     | 51.15            | 341.00            | 3.870          | 0.024        |
| <b>#16</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #16        | 3        | 3. Short grass pasture                                | 5.00      | 23.85            | 477.00            | 1.780          | 0.074        |
| <b>#16</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.074</b> |
| #17        | 1        | 3. Short grass pasture                                | 1.00      | 0.09             | 10.00             | 0.800          | 0.003        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.003</b> |
| #18        | 1        | 3. Short grass pasture                                | 26.00     | 124.53           | 479.00            | 4.070          | 0.032        |
| <b>#18</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.032</b> |

# **Taylor Ditch** **100 Year - 24 Hour Storm Event**

***Ditch Size Demonstration***  
***Post Mining***

Tony Tennyson

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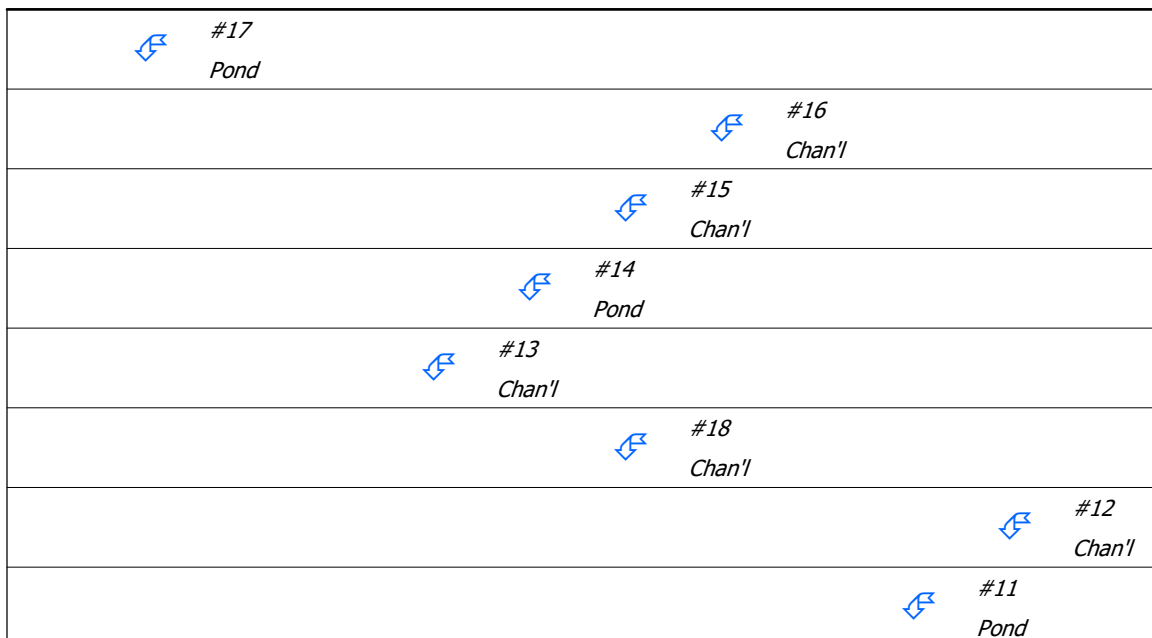
## ***General Information***

### ***Storm Information:***

|                 |                |
|-----------------|----------------|
| Storm Type:     | NRCS Type II   |
| Design Storm:   | 100 yr - 24 hr |
| Rainfall Depth: | 2.700 inches   |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                                                    |
|---------|--------|--------------|--------|---------------|---------|--------------------------------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below East Taylor Pond                                                    |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | East Taylor Pond                                                               |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above East Taylor Pond                                                    |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Taylor Ditch 0+00 to 10+00                                                     |
| Null    | #5     | ==>          | #4     | 0.000         | 0.000   | Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Taylor Ditch 10+00 to 35+00                                                    |
| Null    | #7     | ==>          | #6     | 0.000         | 0.000   | Null at Confluence of Taylor/Taylor Trib                                       |
| Channel | #8     | ==>          | #7     | 0.000         | 0.000   | Taylor Ditch 35+00 to TD-1 Stockpond                                           |
| Pond    | #9     | ==>          | #8     | 0.000         | 0.000   | TD-1 Stockpond                                                                 |
| Channel | #10    | ==>          | #9     | 0.000         | 0.000   | Taylor Ditch TD-1 to TD-2 Stockpond                                            |
| Pond    | #11    | ==>          | #10    | 0.000         | 0.000   | TD-2 Stockpond                                                                 |
| Channel | #12    | ==>          | #11    | 0.000         | 0.000   | Taylor Ditch TD-2 Stockpond to 117+58                                          |
| Channel | #13    | ==>          | #5     | 0.000         | 0.000   | East Taylor Ditch 0+00 to ETD-1                                                |
| Pond    | #14    | ==>          | #13    | 0.000         | 0.000   | ETD-1 Stock Pond                                                               |
| Channel | #15    | ==>          | #14    | 0.000         | 0.000   | East Taylor Ditch - Veg ETD-1 to 38+30                                         |
| Channel | #16    | ==>          | #15    | 0.000         | 0.000   | East Taylor Ditch 38+30 to 73+40                                               |
| Pond    | #17    | ==>          | #2     | 0.000         | 0.000   | Simulated 250 GPM - East Taylor Seep                                           |
| Channel | #18    | ==>          | #7     | 0.000         | 0.000   | Taylor Trib Ditch                                                              |



|                                                                                   |                                                                                     |               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |    | #9<br>Pond    |
|                                                                                   |    | #8<br>Chan'l  |
|                                                                                   |    | #7<br>Null    |
|                                                                                   |    | #6<br>Chan'l  |
|                                                                                   |    | #5<br>Null    |
|                                                                                   |    | #4<br>Chan'l  |
|                                                                                   |    | #3<br>Null    |
|  | #2<br>Pond                                                                          |               |
| #1<br>Null                                                                        |                                                                                     |               |

### ***Structure Summary:***

|        | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|--------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #17 In | 0.100                                     | 0.100                                 | 0.11                       | 0.00                                 |
| Out    |                                           |                                       | 0.03                       | 0.00                                 |
| #16    | 154.500                                   | 154.500                               | 13.25                      | 3.40                                 |
| #15    | 100.200                                   | 254.700                               | 22.28                      | 5.32                                 |
| #14 In | 0.000                                     | 254.700                               | 22.28                      | 5.32                                 |
| Out    |                                           |                                       | 10.80                      | 3.91                                 |
| #13    | 84.900                                    | 339.600                               | 14.42                      | 5.68                                 |
| #18    | 6.000                                     | 6.000                                 | 1.84                       | 0.14                                 |
| #12    | 319.800                                   | 319.800                               | 49.39                      | 8.17                                 |
| #11 In | 0.000                                     | 319.800                               | 49.39                      | 8.17                                 |
| Out    |                                           |                                       | 24.13                      | 6.31                                 |
| #10    | 123.000                                   | 442.800                               | 31.46                      | 8.63                                 |
| #9 In  | 0.000                                     | 442.800                               | 31.46                      | 8.63                                 |
| Out    |                                           |                                       | 30.40                      | 8.14                                 |
| #8     | 21.600                                    | 464.400                               | 30.99                      | 8.48                                 |
| #7     | 0.000                                     | 470.400                               | 31.24                      | 8.63                                 |
| #6     | 82.000                                    | 552.400                               | 34.97                      | 9.98                                 |
| #5     | 0.000                                     | 892.000                               | 41.15                      | 15.66                                |
| #4     | 145.900                                   | 1,037.900                             | 52.28                      | 18.95                                |
| #3     | 0.000                                     | 1,037.900                             | 52.28                      | 18.95                                |
| #2 In  | 10.900                                    | 1,048.900                             | 53.17                      | 19.21                                |
| Out    |                                           |                                       | 25.10                      | 15.34                                |
| #1     | 0.000                                     | 1,048.900                             | 25.10                      | 15.34                                |

***Structure Detail:******Structure #17 (Pond)****Simulated 250 GPM - East Taylor Seep*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 90.01 ft   |
| Initial Pool:      | 0.00 ac-ft |

Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 90.07 ft  |
| Dewater Time:   | 0.11 days |

*Dewatering time is calculated from peak stage to lowest spillway***Elevation-Capacity-Discharge Table**

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 90.01     | 0.050        | 0.001               | 0.000              |                          |
| 90.07     | 0.050        | 0.003               | 0.032              | 2.60 Peak Stage          |
| 91.00     | 0.051        | 0.050               | 0.560              |                          |
| 92.00     | 0.190        | 0.164               | 0.560              |                          |
| 93.00     | 0.260        | 0.388               | 0.560              |                          |
| 94.00     | 0.350        | 0.692               | 0.560              |                          |
| 95.00     | 0.440        | 1.086               | 0.560              |                          |
| 96.00     | 0.540        | 1.575               | 0.560              |                          |
| 97.00     | 0.650        | 2.169               | 0.560              |                          |
| 98.00     | 0.760        | 2.873               | 0.560              |                          |
| 99.00     | 0.880        | 3.693               | 0.560              |                          |
| 100.00    | 1.200        | 4.728               | 0.560              |                          |
| 101.00    | 1.240        | 5.948               | 0.560              |                          |
| 102.00    | 1.414        | 7.275               | 0.560              |                          |
| 103.00    | 1.600        | 8.781               | 0.560              |                          |

**Detailed Discharge Table**

| Elevation<br>(ft) | User-<br>input discharge<br>(cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------------|-----------------------------------------|
| 90.00             | 0.000                             | 0.000                                   |
| 90.01             | 0.000                             | 0.000                                   |
| 91.00             | 0.560                             | 0.560                                   |
| 92.00             | 0.560                             | 0.560                                   |
| 93.00             | 0.560                             | 0.560                                   |
| 94.00             | 0.560                             | 0.560                                   |
| 95.00             | 0.560                             | 0.560                                   |
| 96.00             | 0.560                             | 0.560                                   |
| 97.00             | 0.560                             | 0.560                                   |
| 98.00             | 0.560                             | 0.560                                   |
| 99.00             | 0.560                             | 0.560                                   |
| 100.00            | 0.560                             | 0.560                                   |
| 101.00            | 0.560                             | 0.560                                   |
| 102.00            | 0.560                             | 0.560                                   |
| 103.00            | 0.560                             | 0.560                                   |

### Structure #16 (Riprap Channel)

*East Taylor Ditch 38+30 to 73+40*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 9.5       |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 13.25 cfs     |              |
| Depth:            | 0.13 ft       |              |
| Top Width:        | 12.80 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.65 sq ft    |              |
| Hydraulic Radius: | 0.128 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 1.00 in       |              |
| D50:              | 3.00 in       |              |
| Dmax:             | 3.75 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #15 (Vegetated Channel)

*East Taylor Ditch - Veg ETD-1 to 38+30*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.8       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 22.28 cfs                             |                                      | 22.28 cfs                            |                                     |
| Depth:                 | 0.63 ft                               |                                      | 1.10 ft                              |                                     |
| Top Width:             | 15.79 ft                              |                                      | 18.58 ft                             |                                     |
| Velocity:              | 2.54 fps                              |                                      | 1.33 fps                             |                                     |
| X-Section Area:        | 8.78 sq ft                            |                                      | 16.77 sq ft                          |                                     |
| Hydraulic Radius:      | 0.549 ft                              |                                      | 0.886 ft                             |                                     |
| Froude Number:         | 0.60                                  |                                      | 0.25                                 |                                     |
| Roughness Coefficient: | 0.0527                                |                                      | 0.1388                               |                                     |

### Structure #14 (Pond)

*ETD-1 Stock Pond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,287.01 ft |
| Initial Pool:      | 0.01 ac-ft  |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,289.00      | 30.00             | 2.00:1         | 2.00:1          | 32.00             |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,291.00      | 20.00             | 2.00:1         | 2.00:1          | 15.00             |

Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,289.16 ft |
| Dewater Time:   | 0.55 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,287.00  | 0.661        | 0.000               | 0.000              |                          |
| 7,287.01  | 0.661        | 0.006               | 0.000              |                          |
| 7,288.00  | 0.708        | 0.684               | 0.000              |                          |
| 7,289.00  | 0.757        | 1.416               | 0.000              | Spillway #1              |
| 7,289.16  | 0.737        | 1.535               | 10.804             | 13.20 Peak Stage         |
| 7,290.00  | 0.758        | 2.174               | 68.938             |                          |
| 7,291.00  | 0.759        | 2.932               | 239.116            | Spillway #2              |
| 7,292.00  | 0.760        | 3.692               | 525.594            |                          |
| 7,293.00  | 0.762        | 4.453               | 944.414            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------|-----------------------------------------|
| 7,287.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,287.01          | 0.000                       | 0.000                       | 0.000                                   |
| 7,288.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,289.00          | 0.000                       | 0.000                       | 0.000                                   |
| 7,290.00          | 68.938                      | 0.000                       | 68.938                                  |
| 7,291.00          | 239.116                     | 0.000                       | 239.116                                 |
| 7,292.00          | 488.655                     | 36.939                      | 525.594                                 |
| 7,293.00          | 814.228                     | 130.185                     | 944.414                                 |

Structure #13 (Riprap Channel)

*East Taylor Ditch 0+00 to ETD-1*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 11.8      |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 14.42 cfs     |              |
| Depth:            | 0.13 ft       |              |
| Top Width:        | 12.78 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 1.61 sq ft    |              |
| Hydraulic Radius: | 0.126 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #18 (Riprap Channel)

#### *Taylor Trib Ditch*

### Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 17.0      |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.84 cfs      |              |
| Depth:            | 0.03 ft       |              |
| Top Width:        | 12.17 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.34 sq ft    |              |
| Hydraulic Radius: | 0.028 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |

|       | w/o Freeboard | w/ Freeboard |
|-------|---------------|--------------|
| Dmin: | 2.00 in       |              |
| D50:  | 6.00 in       |              |
| Dmax: | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #12 (Riprap Channel)

*Taylor Ditch TD-2 Stockpond to 117+58*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 9.8       |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 49.39 cfs     |              |
| Depth:            | 0.38 ft       |              |
| Top Width:        | 14.27 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 4.96 sq ft    |              |
| Hydraulic Radius: | 0.345 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #11 (Pond)

*TD-2 Stockpond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,445.00 ft |
| Initial Pool:      | 0.09 ac-ft  |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,454.00      | 30.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,454.55 ft |
| Dewater Time:   | 0.59 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 7,443.00  | 0.014     | 0.000            | 0.000           |                    |
| 7,444.00  | 0.050     | 0.030            | 0.000           |                    |
| 7,445.00  | 0.079     | 0.094            | 0.000           |                    |
| 7,446.00  | 0.106     | 0.186            | 0.000           |                    |
| 7,447.00  | 0.133     | 0.305            | 0.000           |                    |
| 7,448.00  | 0.161     | 0.452            | 0.000           |                    |
| 7,449.00  | 0.190     | 0.627            | 0.000           |                    |
| 7,450.00  | 0.219     | 0.831            | 0.000           |                    |
| 7,451.00  | 0.249     | 1.065            | 0.000           |                    |
| 7,452.00  | 0.280     | 1.329            | 0.000           |                    |
| 7,453.00  | 0.313     | 1.625            | 0.000           |                    |
| 7,454.00  | 0.348     | 1.955            | 0.000           | Spillway #1        |
| 7,454.55  | 0.371     | 2.158            | 24.134          | 14.05 Peak Stage   |
| 7,455.00  | 0.389     | 2.324            | 43.900          |                    |

## Detailed Discharge Table

| Elevation (ft) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|--------------------------|--------------------------------|
| 7,443.00       | 0.000                    | 0.000                          |
| 7,444.00       | 0.000                    | 0.000                          |
| 7,445.00       | 0.000                    | 0.000                          |
| 7,446.00       | 0.000                    | 0.000                          |
| 7,447.00       | 0.000                    | 0.000                          |
| 7,448.00       | 0.000                    | 0.000                          |
| 7,449.00       | 0.000                    | 0.000                          |
| 7,450.00       | 0.000                    | 0.000                          |
| 7,451.00       | 0.000                    | 0.000                          |

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 7,452.00          | 0.000                       | 0.000                                   |
| 7,453.00          | 0.000                       | 0.000                                   |
| 7,454.00          | 0.000                       | 0.000                                   |
| 7,455.00          | 43.900                      | 43.900                                  |

Structure #10 (Riprap Channel)

*Taylor Ditch TD-1 to TD-2 Stockpond*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 6.8       |                         |                         |                               |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 31.46 cfs     |              |
| Depth:            | 0.31 ft       |              |
| Top Width:        | 13.83 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 3.95 sq ft    |              |
| Hydraulic Radius: | 0.283 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

Structure #9 (Pond)

*TD-1 Stockpond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,283.01 ft |
| Initial Pool:      | 0.00 ac-ft  |

Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 7,287.00      | 20.00                | 2.00:1            | 2.00:1             | 30.00                |

**Pond Results:**

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,287.43 ft |
| Dewater Time:   | 0.59 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

**Elevation-Capacity-Discharge Table**

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,283.00  | 0.001        | 0.000               | 0.000              |                          |
| 7,283.01  | 0.001        | 0.000               | 0.000              |                          |
| 7,284.00  | 0.059        | 0.023               | 0.000              |                          |
| 7,285.00  | 0.159        | 0.128               | 0.000              |                          |
| 7,286.00  | 0.182        | 0.298               | 0.000              |                          |
| 7,287.00  | 0.213        | 0.495               | 0.000              | Spillway #1              |
| 7,287.43  | 0.228        | 0.593               | 30.395             | 14.10 Peak Stage         |
| 7,288.00  | 0.247        | 0.725               | 71.329             |                          |

**Detailed Discharge Table**

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|-----------------------------------------|
| 7,283.00          | 0.000                       | 0.000                                   |
| 7,283.01          | 0.000                       | 0.000                                   |
| 7,284.00          | 0.000                       | 0.000                                   |
| 7,285.00          | 0.000                       | 0.000                                   |
| 7,286.00          | 0.000                       | 0.000                                   |
| 7,287.00          | 0.000                       | 0.000                                   |
| 7,288.00          | 71.329                      | 71.329                                  |

**Structure #8 (Riprap Channel)**

*Taylor Ditch 35+00 to TD-1 Stockpond*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 10.7      |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 30.99 cfs     |              |
| Depth:            | 0.25 ft       |              |
| Top Width:        | 13.50 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 3.19 sq ft    |              |
| Hydraulic Radius: | 0.235 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #7 (Null)

*Null at Confluence of Taylor/Taylor Trib*

### Structure #6 (Riprap Channel)

*Taylor Ditch 10+00 to 35+00*

### Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 7.1       |                      |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 34.97 cfs     |              |
| Depth:            | 0.33 ft       |              |
| Top Width:        | 13.97 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 4.25 sq ft    |              |

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Hydraulic Radius: | 0.302 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #5 (Null)

*Null At Confluence of Taylor/East Taylor Null at Confluence Taylor/East Taylor*

### Structure #4 (Riprap Channel)

*Taylor Ditch 0+00 to 10+00*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 6.9       |                      |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 52.28 cfs     |              |
| Depth:            | 0.45 ft       |              |
| Top Width:        | 14.72 ft      |              |
| Velocity*:        |               |              |
| X-Section Area:   | 6.06 sq ft    |              |
| Hydraulic Radius: | 0.407 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Null)

*Null Above East Taylor Pond*

### Structure #2 (Pond)

*East Taylor Pond*

## Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 6,944.00 ft |
| Initial Pool:      | 2.87 ac-ft  |

Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 10.00             | 18.00                | 122.00             | 4.00             | 0.0150      | 6,951.00           | 2                        |

Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 6,954.00      | 20.00             | 2.00:1         | 2.00:1          | 20.00             |

## Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 6,954.20 ft |
| Dewater Time:   | 0.76 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 6,930.00  | 0.001     | 0.000            | 0.000           |                    |
| 6,931.00  | 0.036     | 0.014            | 0.000           |                    |
| 6,932.00  | 0.076     | 0.069            | 0.000           |                    |
| 6,933.00  | 0.110     | 0.161            | 0.000           |                    |
| 6,934.00  | 0.134     | 0.283            | 0.000           |                    |
| 6,935.00  | 0.156     | 0.428            | 0.000           |                    |
| 6,936.00  | 0.178     | 0.595            | 0.000           |                    |
| 6,937.00  | 0.201     | 0.785            | 0.000           |                    |
| 6,938.00  | 0.226     | 0.998            | 0.000           |                    |
| 6,939.00  | 0.252     | 1.237            | 0.000           |                    |
| 6,940.00  | 0.280     | 1.504            | 0.000           |                    |
| 6,941.00  | 0.310     | 1.799            | 0.000           |                    |
| 6,942.00  | 0.340     | 2.123            | 0.000           |                    |
| 6,943.00  | 0.373     | 2.480            | 0.000           |                    |
| 6,944.00  | 0.409     | 2.871            | 0.000           |                    |
| 6,945.00  | 0.446     | 3.298            | 0.000           |                    |
| 6,946.00  | 0.486     | 3.764            | 0.000           |                    |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 6,947.00  | 0.527        | 4.270               | 0.000              |                          |
| 6,948.00  | 0.571        | 4.819               | 0.000              |                          |
| 6,949.00  | 0.615        | 5.412               | 0.000              |                          |
| 6,950.00  | 0.660        | 6.049               | 0.000              |                          |
| 6,951.00  | 0.706        | 6.732               | 0.000              | Spillway #1              |
| 6,952.00  | 0.754        | 7.462               | 8.509              | 7.80                     |
| 6,953.00  | 0.804        | 8.241               | 12.033             | 2.95                     |
| 6,954.00  | 0.857        | 9.072               | 14.738             | 4.20 Spillway #2         |
| 6,954.20  | 0.907        | 9.259               | 25.100             | 3.35 Peak Stage          |
| 6,955.00  | 0.975        | 9.987               | 65.418             |                          |
| 6,956.00  | 1.033        | 10.991              | 186.424            |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,930.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,931.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,932.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,933.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,934.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,935.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,936.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,937.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,938.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,939.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,940.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,941.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,942.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,943.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,944.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,945.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,946.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,947.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,948.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,949.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,950.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,951.00          | 0.000             | 0.000                       | 0.000                                   |
| 6,952.00          | 8.509             | 0.000                       | 8.509                                   |
| 6,953.00          | 12.033            | 0.000                       | 12.033                                  |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 6,954.00          | 14.738            | 0.000                       | 14.738                                  |
| 6,955.00          | 17.018            | 48.400                      | 65.418                                  |
| 6,956.00          | 19.026            | 167.398                     | 186.424                                 |

## Structure #1 (Null)

*Null Below East Taylor Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #17        | 1        | 0.100          | 0.003              | 0.000        | 0.000  | 80.000       | S   | 0.11                 | 0.005                 |
|            | <b>Σ</b> | <b>0.100</b>   |                    |              |        |              |     | <b>0.11</b>          | <b>0.005</b>          |
| #16        | 1        | 142.100        | 0.518              | 0.000        | 0.000  | 62.000       | M   | 11.30                | 2.700                 |
|            | 2        | 6.500          | 0.024              | 0.000        | 0.000  | 80.000       | F   | 7.43                 | 0.557                 |
|            | 3        | 5.900          | 0.074              | 0.000        | 0.000  | 62.000       | M   | 1.81                 | 0.140                 |
|            | <b>Σ</b> | <b>154.500</b> |                    |              |        |              |     | <b>13.25</b>         | <b>3.397</b>          |
| #15        | 1        | 28.500         | 0.142              | 0.000        | 0.000  | 62.000       | M   | 4.02                 | 0.552                 |
|            | 2        | 71.700         | 0.230              | 0.000        | 0.000  | 62.000       | M   | 8.83                 | 1.373                 |
|            | <b>Σ</b> | <b>254.700</b> |                    |              |        |              |     | <b>22.28</b>         | <b>5.321</b>          |
| <b>#14</b> | <b>Σ</b> | <b>254.700</b> |                    |              |        |              |     | <b>22.28</b>         | <b>5.321</b>          |
| #13        | 1        | 18.000         | 0.128              | 0.000        | 0.000  | 62.000       | M   | 2.54                 | 0.348                 |
|            | 2        | 64.700         | 0.349              | 0.000        | 0.000  | 62.000       | M   | 6.46                 | 1.233                 |
|            | 3        | 2.200          | 0.045              | 0.000        | 0.000  | 80.000       | F   | 2.52                 | 0.188                 |
|            | <b>Σ</b> | <b>339.600</b> |                    |              |        |              |     | <b>14.42</b>         | <b>5.681</b>          |
| #18        | 1        | 6.000          | 0.032              | 0.000        | 0.000  | 62.000       | M   | 1.84                 | 0.143                 |
|            | <b>Σ</b> | <b>6.000</b>   |                    |              |        |              |     | <b>1.84</b>          | <b>0.143</b>          |
| #12        | 1        | 25.800         | 0.125              | 0.000        | 0.000  | 47.000       | S   | 0.04                 | 0.024                 |
|            | 2        | 242.800        | 0.593              | 0.000        | 0.000  | 62.000       | M   | 17.81                | 4.613                 |
|            | 3        | 37.400         | 0.089              | 0.000        | 0.000  | 80.000       | F   | 42.76                | 3.206                 |
|            | 4        | 13.800         | 0.089              | 0.000        | 0.000  | 62.000       | M   | 4.24                 | 0.328                 |
|            | <b>Σ</b> | <b>319.800</b> |                    |              |        |              |     | <b>49.39</b>         | <b>8.171</b>          |
| <b>#11</b> | <b>Σ</b> | <b>319.800</b> |                    |              |        |              |     | <b>49.39</b>         | <b>8.171</b>          |
| #10        | 1        | 13.000         | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.03                 | 0.018                 |
|            | 2        | 43.900         | 0.100              | 0.000        | 0.000  | 62.000       | M   | 13.48                | 1.044                 |
|            | 3        | 66.100         | 0.229              | 0.000        | 0.000  | 62.000       | M   | 8.15                 | 1.266                 |
|            | <b>Σ</b> | <b>442.800</b> |                    |              |        |              |     | <b>31.46</b>         | <b>8.635</b>          |
| <b>#9</b>  | <b>Σ</b> | <b>442.800</b> |                    |              |        |              |     | <b>31.46</b>         | <b>8.635</b>          |
| #8         | 1        | 7.500          | 0.044              | 0.000        | 0.000  | 47.000       | S   | 0.02                 | 0.010                 |
|            | 2        | 9.700          | 0.060              | 0.000        | 0.000  | 62.000       | M   | 2.98                 | 0.231                 |
|            | 3        | 4.400          | 0.048              | 0.000        | 0.000  | 62.000       | M   | 1.35                 | 0.105                 |
|            | <b>Σ</b> | <b>464.400</b> |                    |              |        |              |     | <b>30.99</b>         | <b>8.484</b>          |
| <b>#7</b>  | <b>Σ</b> | <b>470.400</b> |                    |              |        |              |     | <b>31.24</b>         | <b>8.627</b>          |
| #6         | 1        | 19.000         | 0.070              | 0.000        | 0.000  | 47.000       | S   | 0.05                 | 0.026                 |

| Stru #    | SWS #    | SWS Area (ac)    | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|-----------|----------|------------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|           | 2        | 26.400           | 0.105              | 0.000        | 0.000  | 62.000       | M   | 8.11                 | 0.628                 |
|           | 3        | 36.600           | 0.184              | 0.000        | 0.000  | 62.000       | M   | 4.96                 | 0.704                 |
|           | <b>Σ</b> | <b>552.400</b>   |                    |              |        |              |     | <b>34.97</b>         | <b>9.984</b>          |
| <b>#5</b> | <b>Σ</b> | <b>892.000</b>   |                    |              |        |              |     | <b>41.15</b>         | <b>15.665</b>         |
| #4        | 1        | 7.900            | 0.053              | 0.000        | 0.000  | 80.000       | F   | 9.03                 | 0.677                 |
|           | 2        | 126.900          | 0.386              | 0.000        | 0.000  | 62.000       | M   | 11.97                | 2.409                 |
|           | 3        | 8.500            | 0.041              | 0.000        | 0.000  | 62.000       | M   | 2.61                 | 0.202                 |
|           | 4        | 2.600            | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>1,037.900</b> |                    |              |        |              |     | <b>52.28</b>         | <b>18.953</b>         |
| <b>#3</b> | <b>Σ</b> | <b>1,037.900</b> |                    |              |        |              |     | <b>52.28</b>         | <b>18.953</b>         |
| #2        | 1        | 0.700            | 0.006              | 0.000        | 0.000  | 61.000       | S   | 0.19                 | 0.011                 |
|           | 2        | 1.100            | 0.015              | 0.000        | 0.000  | 61.000       | S   | 0.30                 | 0.024                 |
|           | 3        | 9.100            | 0.104              | 0.000        | 0.000  | 62.000       | M   | 2.79                 | 0.216                 |
|           | <b>Σ</b> | <b>1,048.900</b> |                    |              |        |              |     | <b>53.17</b>         | <b>19.209</b>         |
| <b>#1</b> | <b>Σ</b> | <b>1,048.900</b> |                    |              |        |              |     | <b>25.10</b>         | <b>15.344</b>         |

## Subwatershed Time of Concentration Details:

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture        | 40.00     | 48.80            | 122.00            | 5.050          | 0.006        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.006</b> |
| #2        | 2        | 3. Short grass pasture        | 48.00     | 150.23           | 313.00            | 5.540          | 0.015        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.015</b> |
| #2        | 3        | 3. Short grass pasture        | 26.00     | 397.02           | 1,527.00          | 4.070          | 0.104        |
| <b>#2</b> | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.104</b> |
| #4        | 1        | 4. Cultivated, straight row   | 6.00      | 25.38            | 423.00            | 2.180          | 0.053        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.053</b> |
| #4        | 2        | 3. Short grass pasture        | 12.00     | 462.24           | 3,852.00          | 2.770          | 0.386        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.386</b> |
| #4        | 3        | 3. Short grass pasture        | 19.00     | 99.37            | 523.00            | 3.480          | 0.041        |
| <b>#4</b> | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.041</b> |
| #4        | 4        | 3. Short grass pasture        | 20.00     | 50.40            | 252.00            | 3.570          | 0.019        |
| <b>#4</b> | <b>4</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.019</b> |
| #6        | 1        | 3. Short grass pasture        | 18.00     | 154.08           | 856.00            | 3.390          | 0.070        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.070</b> |
| #6        | 2        | 3. Short grass pasture        | 15.00     | 175.35           | 1,169.00          | 3.090          | 0.105        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.105</b> |
| #6        | 3        | 3. Short grass pasture        | 13.00     | 248.04           | 1,908.00          | 2.880          | 0.184        |
| <b>#6</b> | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.184</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #8         | 1        | 3. Short grass pasture                                | 21.00     | 122.64           | 584.00            | 3.660          | 0.044        |
| <b>#8</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #8         | 2        | 3. Short grass pasture                                | 24.00     | 204.48           | 852.00            | 3.910          | 0.060        |
| <b>#8</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.060</b> |
| #8         | 3        | 3. Short grass pasture                                | 20.00     | 125.80           | 629.00            | 3.570          | 0.048        |
| <b>#8</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.048</b> |
| #10        | 1        | 3. Short grass pasture                                | 20.00     | 49.80            | 249.00            | 3.570          | 0.019        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #10        | 2        | 3. Short grass pasture                                | 17.00     | 202.98           | 1,194.00          | 3.290          | 0.100        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.100</b> |
| #10        | 3        | 3. Short grass pasture                                | 13.00     | 309.91           | 2,384.00          | 2.880          | 0.229        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.229</b> |
| #12        | 1        | 3. Short grass pasture                                | 9.00      | 97.38            | 1,082.00          | 2.400          | 0.125        |
| <b>#12</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #12        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 10.00     | 102.10           | 1,021.00          | 3.160          | 0.089        |
| <b>#12</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.089</b> |
| #12        | 4        | 3. Short grass pasture                                | 5.00      | 28.60            | 572.00            | 1.780          | 0.089        |
| <b>#12</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.089</b> |
| #13        | 1        | 3. Short grass pasture                                | 12.00     | 153.59           | 1,280.00          | 2.770          | 0.128        |
| <b>#13</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.128</b> |
| #13        | 2        | 3. Short grass pasture                                | 10.00     | 317.10           | 3,171.00          | 2.520          | 0.349        |
| <b>#13</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.349</b> |
| #13        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 2.00      | 4.64             | 232.00            | 1.410          | 0.045        |
| <b>#13</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.045</b> |
| #15        | 1        | 3. Short grass pasture                                | 8.40      | 99.62            | 1,186.00          | 2.310          | 0.142        |
| <b>#15</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.142</b> |
| #15        | 2        | 3. Short grass pasture                                | 8.00      | 150.23           | 1,878.00          | 2.260          | 0.230        |
| <b>#15</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.230</b> |
| #16        | 1        | 3. Short grass pasture                                | 12.00     | 620.64           | 5,172.00          | 2.770          | 0.518        |
| <b>#16</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.518</b> |
| #16        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 15.00     | 51.15            | 341.00            | 3.870          | 0.024        |
| <b>#16</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #16        | 3        | 3. Short grass pasture                                | 5.00      | 23.85            | 477.00            | 1.780          | 0.074        |
| <b>#16</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.074</b> |
| #17        | 1        | 3. Short grass pasture                                | 1.00      | 0.09             | 10.00             | 0.800          | 0.003        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.003</b> |
| #18        | 1        | 3. Short grass pasture                                | 26.00     | 124.53           | 479.00            | 4.070          | 0.032        |
| <b>#18</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.032</b> |

# **East Taylor Pond Watershed** **100 Year 24 Hour Storm Event**

## ***Terrace Ditch Configuration*** ***Post Mine***

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## ***General Information***

### ***Storm Information:***

|                 |                |
|-----------------|----------------|
| Storm Type:     | NRCS Type II   |
| Design Storm:   | 100 yr - 24 hr |
| Rainfall Depth: | 2.700 inches   |

***Structure Networking:***

| Type    | Stru<br># | (flows<br>into) | Stru<br># | Musk. K<br>(hrs) | Musk. X | Description         |
|---------|-----------|-----------------|-----------|------------------|---------|---------------------|
| Channel | #1        | ==>             | End       | 0.000            | 0.000   | 7975' Terrace Ditch |

|              |
|--------------|
| #1<br>Chan'l |
|--------------|

***Structure Summary:***

|    | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|----|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #1 | 50.100                                    | 50.100                                | 47.40                      | 4.14                                 |

**Structure Detail:****Structure #1 (Vegetated Channel)****7975' Terrace Ditch**

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 0.22                    |                         |                               | 5.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 47.40 cfs                             |                                      | 47.40 cfs                            |                                     |
| Depth:                    | 2.09 ft                               | 2.31 ft                              | 2.78 ft                              | 3.00 ft                             |
| Top Width:                | 9.39 ft                               | 10.38 ft                             | 12.52 ft                             | 13.51 ft                            |
| Velocity:                 | 4.84 fps                              |                                      | 2.72 fps                             |                                     |
| X-Section Area:           | 9.80 sq ft                            |                                      | 17.43 sq ft                          |                                     |
| Hydraulic Radius:         | 0.954 ft                              |                                      | 1.272 ft                             |                                     |
| Froude Number:            | 0.83                                  |                                      | 0.41                                 |                                     |
| Roughness<br>Coefficient: | 0.0366                                |                                      | 0.0787                               |                                     |

## ***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     | 50.100        | 0.139              | 0.000        | 0.000  | 80.000       | F   | 47.40                | 4.142                 |
| <b>Σ</b> |       | <b>50.100</b> |                    |              |        |              |     | <b>47.40</b>         | <b>4.142</b>          |

## ***Subwatershed Time of Concentration Details:***

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #1        | 1        | 3. Short grass pasture        | 8.50      | 99.53            | 1,171.00          | 2.330          | 0.139        |
| <b>#1</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.139</b> |

**Appendix Exh. 7-14S**

**Section 16 Pond  
Temporary and Permanent Channels**

## **Appendix Exh. 7-14S**

### **Section 16 Pond, Temporary, and Permanent Channels**

The location of the Section 16 Pond is presented on Map 12. The profiles of the associated permanent channels associated with the Section 16 Pond watershed are presented on Map 33. These channels consist of the Section 16 Fill Ditch and Trib F, and their design information is presented in this appendix. The as-built configuration for the Section 16 Pond is presented on Figure Exh. 7-14S-1, and Figure Exh. 7-14S-2 provides the breakdown of drainage areas and hydrologic conditions for this sediment pond in the post mining condition.

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used in sediment pond and post mine channel assumptions. Runoff curve numbers assigned to the undisturbed and reclaimed lands in various stages of reclamation have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD<sup>TM</sup>. For channels to be protected by a vegetative liner, the permissible velocities are also determined using SEDCAD<sup>TM</sup> routines.

#### **Section 16 Pond**

The following pages present the results of the SEDCAD<sup>TM</sup> models for the worst-case hydrologic conditions under the post mining condition. At this stage the oldest reclamation (most Phase III released) is on the eastern extent of the reclaimed Section 16 Pit, and the younger (topsoil and seeded) reclamation is the western reaches of the Section 16 Pond watershed.

The SEDCAD<sup>TM</sup> model herein provides the results of the 10 year 24 hour design storm and demonstrates the Section 16 Pond will meet the applicable settleable solids standard under this modeled storm event. The second SEDCAD<sup>TM</sup> model demonstrates that the Section 16 Pond emergency spillway elevation is capable of containing the 25 year 24 hour storm.

For the post mining case at the Section 16 Pond, the 10 year 24 hour storm produces 1.6 acre feet of runoff, and the settleable solids discharge is 0.0 ml/l as the entire storm event is contained within the pond. The 25 year 24 hour storm event peaks at the 7,753.0' elevation, which is below the emergency spill way elevation of 7,754.5.

#### **West and East Section 16 Ditches (Temporary)**

The West Section 16 Ditch is designed to be trapezoidal in cross section with a 2-foot bottom width, left side slope ratio of 1H:1V, a right side slopes ratio of 7H:1V, and depth of at least 0.5 feet. The West Section 16 Ditch is a vegetated channel.

The East Section 16 Ditch from station 0+00 to 45+00 is trapezoidal in cross section with a 2 foot bottom width, left side slope ratio of 1H:1V, a right side slopes ratio of 7H:1V, and depth of at least 0.5 feet. This segment is a vegetated channel.

The East Section 16 Ditch from station 45+00 to 63+57 is trapezoidal in cross section with a 10 foot bottom width, left side slope ratio of 4H:1V, right side slope ratio of 2H:1V, and a depth of at least 1.0 feet. This segment of the ditch is a vegetated channel.

The location of the East and West Section 16 Ditches can be found on Map 12.

### **Section 16 Permanent Channels**

The Section 16 watershed is comprised of two post-mining channels, the Section 16 Fill Ditch and Trib F respectively. The locations of both channels are presented on Map 12 and Figure Exh. 7-14S-2, and the channel profiles are presented on Map 33 and 33B.

The assumed hydrologic condition for both channels is the post mine condition when the entire Section watershed is reclaimed and reporting to the Section 16 Pond.

#### **Section 16 Fill Ditch**

The Section 16 Fill Ditch conveys a very small area of Section 16 reclamation areas into the South Collection Ditch ultimately reporting to the Prospect Pond drainage system.

The ditch is designed to meet the requirements of Rule 4.05.3 for drainages less than one square mile. The drainage area of this basin is about 12.4 acres, all of which is now Phase III released. The steepest portions have a slope of about 17.8 percent. The overall length of the channel is about 860 feet.

A SEDCAD<sup>TM</sup> model has been included which evaluates the peak flow for the 10 year, 24-hour storm event. The channel configurations for the 10 year, 24 hour storm event for the Section 16 Fill Ditch is summarized below.

| <b>Section 16 Fill Ditch</b> |                                |                              |                           |                        |                               |
|------------------------------|--------------------------------|------------------------------|---------------------------|------------------------|-------------------------------|
| <u>Station</u>               | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Erosion<br/>Protection</u> |
| Station 0+00<br>to 8+60      | 1.77                           | 17.8                         | Trapezoidal<br>12' bottom | 3H:1V                  | Riprap,<br>D50 = 12"          |

Because the flow is so small in this watershed, the SEDCAD<sup>TM</sup> demonstration had to use a triangular ditch (zero bottom width) with 3H:1V side slopes, but as construction dictates, the ditch may have a bottom width up to 12 feet based simply on the minimum width of a dozer blade.

A road traverses across the Section 16 Fill Ditch near station 1+85, which provides access to maintain power line infrastructure in the area. A culvert is installed and maintained in the Section 16 Fill Ditch, but it is not a Colowyo mining related structure. Please see Volume 1, Section 4.12 for a further discussion. The culvert is modeled even though it is not a Colowyo culvert to ensure it is sized appropriately.

Given that, the peak storm discharge of 1.77 cfs requires a minimum of one 12" culvert is necessary in the Section 16 Fill Ditch. However, one 24" culvert is installed, which will more than suffice for the flows generated by the Section 16 Fill Ditch.

#### *Trib F*

Trib F is constructed in reclamation areas adjacent to the South Taylor Pit and the Section 16 reclamation areas. Originally, this channel was modeled in accordance with Rule 4.05.3(3) for the 10 year 24 hour event. However, the post-mining watershed contributing to the channel is so small that SEDCAD<sup>TM</sup> cannot calculate actual flows when inputted into the model, and errors are noted for insufficient flows. Therefore, there is not any SEDCAD<sup>TM</sup> outputs contained in this append for Trib F. The channel is constructed as trapezoidal ditches, 12' bottom widths, 2H:1V side slopes, 4' of depth, and a rip rap lining with a D50 size of 12".

# **Section 16 Pond** **10 Year - 24 Hour Storm Event**

***Effluent Demonstration***  
***Post Mining***

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## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 10 yr - 24 hr |
| Rainfall Depth: | 1.800 inches  |

### ***Particle Size Distribution:***

| Size (mm) | Colowyo Particle Size |
|-----------|-----------------------|
| 4.7500    | 100.000%              |
| 0.0750    | 73.000%               |
| 0.0400    | 33.000%               |
| 0.0010    | 20.000%               |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                              |
|---------|--------|--------------|--------|---------------|---------|----------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below Section 16 Pond<br>Null Below Section 16 Pond |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Section 16 Pond                                          |
| Channel | #3     | ==>          | #2     | 0.000         | 0.000   | East Section 16 Ditch 0+00 to 13+15                      |
| Channel | #4     | ==>          | #2     | 0.000         | 0.000   | West Section 16 Ditch 0+00 to 45+00                      |
| Channel | #5     | ==>          | #4     | 0.000         | 0.000   | West Section 16 Ditch at 45+00                           |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | West Section 16 Ditch 45+00 to 63+57                     |



### ***Structure Summary:***

|              | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) | Sediment<br>(tons) | Peak<br>Sediment<br>Conc.<br>(mg/l) | Peak<br>Settleable<br>Conc.<br>(ml/l) | 24VW<br>(ml/l) |
|--------------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|--------------------|-------------------------------------|---------------------------------------|----------------|
| #6           | 34.600                                    | 34.600                                | 0.16                       | 0.09                                 | 0.0                | 412                                 | 0.23                                  | 0.18           |
| #5           | 15.800                                    | 50.400                                | 0.28                       | 0.15                                 | 0.1                | 390                                 | 0.22                                  | 0.17           |
| #4           | 147.400                                   | 197.800                               | 4.59                       | 0.78                                 | 7.9                | 36,417                              | 20.69                                 | 4.24           |
| #3           | 84.500                                    | 84.500                                | 8.95                       | 0.81                                 | 26.9               | 48,946                              | 26.04                                 | 12.77          |
| #2 In<br>Out | 1.900                                     | 284.200                               | 12.26                      | 1.59                                 | 34.8               | 45,956                              | 24.83                                 | 8.61           |
|              |                                           |                                       | 0.00                       | 0.00                                 | 34.8               | 0                                   | 0.00                                  | 0.00           |
| #1           | 0.000                                     | 284.200                               | 0.00                       | 0.00                                 | 34.8               | 1                                   | 0.00                                  | 0.00           |

## ***Particle Size Distribution(s) at Each Structure***

### ***Structure #6 (West Section 16 Ditch 45+00 to 63+57):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #5 (West Section 16 Ditch at 45+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #4 (West Section 16 Ditch 0+00 to 45+00):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.583%  |
| 0.0400    | 33.264%  |
| 0.0010    | 20.160%  |

### ***Structure #3 (East Section 16 Ditch 0+00 to 13+15):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 85.038%  |
| 0.0400    | 38.442%  |
| 0.0010    | 23.298%  |

### ***Structure #2 (Section 16 Pond):***

| Size (mm) | In       | Out    |
|-----------|----------|--------|
| 4.7500    | 100.000% | 0.000% |
| 0.0750    | 82.426%  | 0.000% |
| 0.0400    | 37.261%  | 0.000% |
| 0.0010    | 22.582%  | 0.000% |

## ***Structure #1:***

| Size (mm) | In/Out |
|-----------|--------|
| 4.7500    | 0.000% |
| 0.0750    | 0.000% |
| 0.0400    | 0.000% |
| 0.0010    | 0.000% |

## Structure Detail:

### Structure #6 (Vegetated Channel)

*West Section 16 Ditch 45+00 to 63+57*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 10.00             | 4.0:1                | 2.0:1                 | 3.0       | D, B               | 1.00                 |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 0.16 cfs                              |                                      | 0.16 cfs                             |                                     |
| Depth:                 | 0.07 ft                               | 1.07 ft                              | 0.23 ft                              | 1.23 ft                             |
| Top Width:             | 10.45 ft                              | 16.45 ft                             | 11.40 ft                             | 17.40 ft                            |
| Velocity:              | 0.22 fps                              |                                      | 0.07 fps                             |                                     |
| X-Section Area:        | 0.77 sq ft                            |                                      | 2.49 sq ft                           |                                     |
| Hydraulic Radius:      | 0.073 ft                              |                                      | 0.217 ft                             |                                     |
| Froude Number:         | 0.14                                  |                                      | 0.02                                 |                                     |
| Roughness Coefficient: | 0.2072                                |                                      | 1.4093                               |                                     |

### Structure #5 (Vegetated Channel)

*West Section 16 Ditch at 45+00*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.28 cfs                              |                                      | 0.28 cfs                             |                                     |
| Depth:                    | 0.18 ft                               |                                      | 0.46 ft                              |                                     |
| Top Width:                | 3.46 ft                               |                                      | 5.69 ft                              |                                     |
| Velocity:                 | 0.55 fps                              |                                      | 0.16 fps                             |                                     |
| X-Section Area:           | 0.50 sq ft                            |                                      | 1.77 sq ft                           |                                     |
| Hydraulic Radius:         | 0.142 ft                              |                                      | 0.305 ft                             |                                     |
| Froude Number:            | 0.26                                  |                                      | 0.05                                 |                                     |
| Roughness<br>Coefficient: | 0.1267                                |                                      | 0.7505                               |                                     |

### Structure #4 (Vegetated Channel)

*West Section 16 Ditch 0+00 to 45+00*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 2.00                 | 1.0:1                      | 7.0:1                       | 3.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 4.59 cfs                              |                                      | 4.59 cfs                             |                                     |
| Depth:                    | 0.55 ft                               |                                      | 0.99 ft                              |                                     |
| Top Width:                | 6.40 ft                               |                                      | 9.90 ft                              |                                     |
| Velocity:                 | 1.99 fps                              |                                      | 0.78 fps                             |                                     |
| X-Section Area:           | 2.31 sq ft                            |                                      | 5.88 sq ft                           |                                     |
| Hydraulic Radius:         | 0.353 ft                              |                                      | 0.580 ft                             |                                     |
| Froude Number:            | 0.58                                  |                                      | 0.18                                 |                                     |
| Roughness<br>Coefficient: | 0.0650                                |                                      | 0.2296                               |                                     |

### Structure #3 (Vegetated Channel)

*East Section 16 Ditch 0+00 to 13+15*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

## Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 8.95 cfs                              |                                      | 8.95 cfs                             |                                     |
| Depth:                 | 0.70 ft                               |                                      | 1.17 ft                              |                                     |
| Top Width:             | 7.62 ft                               |                                      | 11.39 ft                             |                                     |
| Velocity:              | 2.64 fps                              |                                      | 1.14 fps                             |                                     |
| X-Section Area:        | 3.38 sq ft                            |                                      | 7.86 sq ft                           |                                     |
| Hydraulic Radius:      | 0.434 ft                              |                                      | 0.673 ft                             |                                     |
| Froude Number:         | 0.70                                  |                                      | 0.24                                 |                                     |
| Roughness Coefficient: | 0.0559                                |                                      | 0.1740                               |                                     |

## Structure #2 (Pond)

### Section 16 Pond

#### Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,746.00 ft |
| Initial Pool:      | 1.22 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 20.00 %     |

*\*No sediment capacity defined*

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 12.00               | 9.20              | 12.00                | 121.00             | 8.00             | 0.0250      | 7,752.90           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,754.50      | 17.00             | 2.00:1         | 2.00:1          | 19.00             |

#### Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 7,749.92 ft |
| H'graph Detention Time: | 0.00 hrs    |

|                  |           |
|------------------|-----------|
| Pond Model:      | CSTRS     |
| Dewater Time:    | 0.00 days |
| Trap Efficiency: | 0.00 %    |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,740.18  | 0.010        | 0.000               | 0.000              | Top of Sed. Storage      |
| 7,740.68  | 0.035        | 0.011               | 0.000              |                          |
| 7,741.18  | 0.075        | 0.037               | 0.000              |                          |
| 7,741.68  | 0.130        | 0.088               | 0.000              |                          |
| 7,742.18  | 0.200        | 0.170               | 0.000              |                          |
| 7,742.68  | 0.219        | 0.275               | 0.000              |                          |
| 7,743.18  | 0.239        | 0.389               | 0.000              |                          |
| 7,743.68  | 0.260        | 0.514               | 0.000              |                          |
| 7,743.70  | 0.261        | 0.519               | 0.000              |                          |
| 7,744.18  | 0.280        | 0.649               | 0.000              |                          |
| 7,744.68  | 0.297        | 0.793               | 0.000              |                          |
| 7,745.18  | 0.314        | 0.946               | 0.000              |                          |
| 7,745.68  | 0.332        | 1.107               | 0.000              |                          |
| 7,746.00  | 0.343        | 1.215               | 0.000              |                          |
| 7,746.18  | 0.350        | 1.278               | 0.000              |                          |
| 7,746.68  | 0.365        | 1.456               | 0.000              |                          |
| 7,747.18  | 0.379        | 1.642               | 0.000              |                          |
| 7,747.68  | 0.395        | 1.836               | 0.000              |                          |
| 7,748.18  | 0.410        | 2.037               | 0.000              |                          |
| 7,748.68  | 0.427        | 2.246               | 0.000              |                          |
| 7,749.18  | 0.444        | 2.464               | 0.000              |                          |
| 7,749.68  | 0.462        | 2.690               | 0.000              |                          |
| 7,749.92  | 0.471        | 2.803               | 0.000              | 0.00 Peak Stage          |
| 7,750.18  | 0.480        | 2.926               | 0.000              |                          |
| 7,750.68  | 0.499        | 3.171               | 0.000              |                          |
| 7,751.18  | 0.519        | 3.425               | 0.000              |                          |
| 7,751.68  | 0.539        | 3.690               | 0.000              |                          |
| 7,752.18  | 0.560        | 3.965               | 0.000              |                          |
| 7,752.68  | 0.580        | 4.250               | 0.000              |                          |
| 7,752.90  | 0.588        | 4.378               | 0.000              | Spillway #1              |
| 7,753.18  | 0.599        | 4.544               | 1.445              |                          |
| 7,753.68  | 0.620        | 4.849               | 3.340              |                          |
| 7,754.18  | 0.640        | 5.164               | 4.279              |                          |
| 7,754.50  | 0.647        | 5.370               | 4.784              | Spillway #2              |
| 7,754.68  | 0.650        | 5.487               | 10.402             |                          |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,755.14  | 0.660        | 5.788               | 24.690             |                          |
| 7,755.18  | 0.660        | 5.814               | 24.740             |                          |
| 7,755.68  | 0.666        | 6.146               | 63.014             |                          |
| 7,756.00  | 0.670        | 6.360               | 105.193            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,740.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,740.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,741.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,741.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,742.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,742.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,743.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,743.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,743.70          | 0.000             | 0.000                       | 0.000                                   |
| 7,744.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,744.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,745.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,745.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,746.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,746.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,746.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,747.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,747.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,748.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,748.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,749.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,749.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,750.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,750.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,751.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,751.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,752.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,752.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,752.90          | 0.000             | 0.000                       | 0.000                                   |
| 7,753.18          | 1.445             | 0.000                       | 1.445                                   |
| 7,753.68          | 3.340             | 0.000                       | 3.340                                   |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,754.18          | 4.279             | 0.000                       | 4.279                                   |
| 7,754.50          | 4.784             | 0.000                       | 4.784                                   |
| 7,754.68          | 5.046             | 5.356                       | 10.402                                  |
| 7,755.14          | 5.660             | 19.030                      | 24.690                                  |
| 7,755.18          | 5.711             | 19.030                      | 24.740                                  |
| 7,755.68          | 6.306             | 56.708                      | 63.014                                  |
| 7,756.00          | 6.658             | 98.534                      | 105.193                                 |

## Structure #1 (Null)

*Null Below Section 16 Pond*

*Null Below Section 16 Pond*

### 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) |
|--------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #6     | 1        | 12.800         | 0.031              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 21.800         | 0.086              | 0.000        | 0.000  | 62.000       | M   | 0.16                 | 0.089                 |
|        | <b>Σ</b> | <b>34.600</b>  |                    |              |        |              |     | <b>0.16</b>          | <b>0.089</b>          |
| #5     | 1        | 1.100          | 0.016              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 14.700         | 0.044              | 0.000        | 0.000  | 62.000       | M   | 0.11                 | 0.060                 |
|        | <b>Σ</b> | <b>50.400</b>  |                    |              |        |              |     | <b>0.28</b>          | <b>0.149</b>          |
| #4     | 1        | 28.000         | 0.081              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 5.400          | 0.071              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 3        | 15.700         | 0.043              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 4        | 89.400         | 0.125              | 0.000        | 0.000  | 62.000       | M   | 0.44                 | 0.298                 |
|        | 5        | 8.900          | 0.092              | 0.000        | 0.000  | 80.000       | F   | 4.59                 | 0.329                 |
|        | <b>Σ</b> | <b>197.800</b> |                    |              |        |              |     | <b>4.59</b>          | <b>0.776</b>          |
| #3     | 1        | 22.800         | 0.178              | 0.000        | 0.000  | 80.000       | F   | 8.95                 | 0.812                 |
|        | 2        | 59.000         | 0.208              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 3        | 2.700          | 0.024              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | <b>Σ</b> | <b>84.500</b>  |                    |              |        |              |     | <b>8.95</b>          | <b>0.812</b>          |
| #2     | 1        | 1.000          | 0.050              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 0.900          | 0.046              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | <b>Σ</b> | <b>284.200</b> |                    |              |        |              |     | <b>12.26</b>         | <b>1.588</b>          |
| #1     | <b>Σ</b> | <b>284.200</b> |                    |              |        |              |     | <b>0.00</b>          | <b>0.000</b>          |

### Subwatershed Sedimentology Detail:

| Stru # | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l) |
|--------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|-------------|
| #6     | 1        | 0.300  | 200.00 | 14.60 | 0.0800 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | 2        | 0.300  | 400.00 | 11.00 | 0.0100 | 0.3800 | 1    | 0.0             | 412                        | 0.23                        | 0.18        |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>412</b>                 | <b>0.23</b>                 | <b>0.18</b> |
| #5     | 1        | 0.300  | 100.00 | 13.90 | 0.0800 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | 2        | 0.300  | 200.00 | 14.00 | 0.0100 | 0.3800 | 1    | 0.0             | 358                        | 0.20                        | 0.15        |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>0.1</b>      | <b>390</b>                 | <b>0.22</b>                 | <b>0.17</b> |
| #4     | 1        | 0.300  | 400.00 | 21.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | 2        | 0.300  | 200.00 | 8.40  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |

| Stru # | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)  |
|--------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|--------------|
|        | 3        | 0.300  | 200.00 | 15.40 | 0.0800 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|        | 4        | 0.300  | 400.00 | 16.00 | 0.0100 | 0.3800 | 1    | 0.2             | 694                        | 0.35                        | 0.30         |
|        | 5        | 0.300  | 250.00 | 4.00  | 0.8000 | 0.3800 | 1    | 7.6             | 36,417                     | 20.76                       | 9.63         |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>7.9</b>      | <b>36,417</b>              | <b>20.69</b>                | <b>4.24</b>  |
| #3     | 1        | 0.300  | 400.00 | 4.60  | 0.7000 | 0.3800 | 1    | 26.9            | 48,946                     | 26.04                       | 12.77        |
|        | 2        | 0.300  | 400.00 | 12.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|        | 3        | 0.300  | 200.00 | 10.50 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>26.9</b>     | <b>48,946</b>              | <b>26.04</b>                | <b>12.77</b> |
| #2     | 1        | 0.320  | 200.00 | 10.60 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|        | 2        | 0.320  | 200.00 | 6.60  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>34.8</b>     | <b>45,956</b>              | <b>24.83</b>                | <b>8.61</b>  |
| #1     | <b>Σ</b> |        |        |       |        |        |      | <b>34.8</b>     | <b>1</b>                   | <b>0.00</b>                 | <b>0.00</b>  |

## Subwatershed Time of Concentration Details:

| Stru # | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|--------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2     | 1        | 3. Short grass pasture                                | 10.60     | 50.13            | 473.00            | 2.600          | 0.050        |
| #2     | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #2     | 2        | 3. Short grass pasture                                | 6.90      | 24.15            | 350.00            | 2.100          | 0.046        |
| #2     | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.046</b> |
| #3     | 1        | 3. Short grass pasture                                | 4.60      | 50.55            | 1,099.00          | 1.710          | 0.178        |
| #3     | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.178</b> |
| #3     | 2        | 3. Short grass pasture                                | 12.00     | 249.60           | 2,080.00          | 2.770          | 0.208        |
| #3     | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.208</b> |
| #3     | 3        | 3. Short grass pasture                                | 10.50     | 24.15            | 230.00            | 2.590          | 0.024        |
| #3     | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #4     | 1        | 3. Short grass pasture                                | 12.00     | 195.00           | 1,625.00          | 2.770          | 0.162        |
| #4     | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.081</b> |
| #4     | 2        | 3. Short grass pasture                                | 21.00     | 224.70           | 1,070.00          | 3.660          | 0.081        |
| #4     | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.071</b> |
| #4     | 3        | 3. Short grass pasture                                | 8.40      | 49.89            | 594.00            | 2.310          | 0.071        |
| #4     | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.043</b> |
| #4     | 4        | 3. Short grass pasture                                | 16.00     | 231.04           | 1,444.00          | 3.200          | 0.125        |
| #4     | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #4     | 5        | 5. Nearly bare and untilled, and alluvial valley fans | 4.00      | 26.76            | 669.00            | 2.000          | 0.092        |
| #4     | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.092</b> |
| #5     | 1        | 3. Short grass pasture                                | 2.00      | 6.70             | 335.00            | 1.130          | 0.082        |
| #5     | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.016</b> |

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #5        | 2        | 3. Short grass pasture        | 14.00     | 66.50            | 475.00            | 2.990          | 0.044        |
| <b>#5</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.044</b> |
| #6        | 1        | 3. Short grass pasture        | 1.50      | 1.50             | 100.00            | 0.970          | 0.028        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.031</b> |
| #6        | 2        | 3. Short grass pasture        | 11.00     | 90.86            | 826.00            | 2.650          | 0.086        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.086</b> |

## ***Subwatershed Muskingum Routing Details:***

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #5        | 2        | 8. Large gullies, diversions, and low flowing streams | 14.50     | 89.46            | 617.00            | 11.420         | 0.015        |
| <b>#5</b> | <b>2</b> | <b>Muskingum K:</b>                                   |           |                  |                   |                | <b>0.000</b> |

# **Section 16 Pond** **25 Year - 24 Hour Storm Event**

***Emergency Spillway Demonstration***  
***Post Mining***

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.  
1100 West 116th Avenue  
Westminster, CO 80234

Phone: (970) 824-1232  
Email: [ttennyson@tristategt.org](mailto:ttennyson@tristategt.org)

## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 25 yr - 24 hr |
| Rainfall Depth: | 2.300 inches  |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                                              |
|---------|--------|--------------|--------|---------------|---------|----------------------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below Section 16 Pond<br>Null Below Section 16 Pond |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Section 16 Pond                                          |
| Channel | #3     | ==>          | #2     | 0.000         | 0.000   | East Section 16 Ditch 0+00 to 13+15                      |
| Channel | #4     | ==>          | #2     | 0.000         | 0.000   | West Section 16 Ditch 0+00 to 45+00                      |
| Channel | #5     | ==>          | #4     | 0.000         | 0.000   | West Section 16 Ditch at 45+00                           |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | West Section 16 Ditch 45+00 to 63+57                     |



## ***Structure Summary:***

|              | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|--------------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #6           | 34.600                                    | 34.600                                | 3.01                       | 0.29                                 |
| #5           | 15.800                                    | 50.400                                | 5.04                       | 0.49                                 |
| #4           | 147.400                                   | 197.800                               | 13.57                      | 2.01                                 |
| #3           | 84.500                                    | 84.500                                | 15.50                      | 1.38                                 |
| #2 In<br>Out | 1.900                                     | 284.200                               | 27.64                      | 3.39                                 |
|              |                                           |                                       | 1.00                       | 0.23                                 |
| #1           | 0.000                                     | 284.200                               | 1.00                       | 0.23                                 |

## Structure Detail:

### Structure #6 (Vegetated Channel)

West Section 16 Ditch 45+00 to 63+57

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 10.00             | 4.0:1                | 2.0:1                 | 3.0       | D, B               | 1.00                 |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 3.01 cfs                        |                                | 3.01 cfs                       |                               |
| Depth:                 | 0.25 ft                         | 1.25 ft                        | 0.55 ft                        | 1.55 ft                       |
| Top Width:             | 11.51 ft                        | 17.51 ft                       | 13.29 ft                       | 19.29 ft                      |
| Velocity:              | 1.11 fps                        |                                | 0.47 fps                       |                               |
| X-Section Area:        | 2.71 sq ft                      |                                | 6.39 sq ft                     |                               |
| Hydraulic Radius:      | 0.234 ft                        |                                | 0.475 ft                       |                               |
| Froude Number:         | 0.40                            |                                | 0.12                           |                               |
| Roughness Coefficient: | 0.0880                          |                                | 0.3327                         |                               |

### Structure #5 (Vegetated Channel)

West Section 16 Ditch at 45+00

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 5.04 cfs                              |                                      | 5.04 cfs                             |                                     |
| Depth:                    | 0.57 ft                               |                                      | 1.01 ft                              |                                     |
| Top Width:                | 6.56 ft                               |                                      | 10.10 ft                             |                                     |
| Velocity:                 | 2.07 fps                              |                                      | 0.82 fps                             |                                     |
| X-Section Area:           | 2.44 sq ft                            |                                      | 6.12 sq ft                           |                                     |
| Hydraulic Radius:         | 0.364 ft                              |                                      | 0.592 ft                             |                                     |
| Froude Number:            | 0.60                                  |                                      | 0.19                                 |                                     |
| Roughness<br>Coefficient: | 0.0636                                |                                      | 0.2207                               |                                     |

### Structure #4 (Vegetated Channel)

*West Section 16 Ditch 0+00 to 45+00*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 2.00                 | 1.0:1                      | 7.0:1                       | 3.0       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 13.57 cfs                             |                                      | 13.57 cfs                            |                                     |
| Depth:                    | 0.82 ft                               |                                      | 1.31 ft                              |                                     |
| Top Width:                | 8.54 ft                               |                                      | 12.44 ft                             |                                     |
| Velocity:                 | 3.15 fps                              |                                      | 1.44 fps                             |                                     |
| X-Section Area:           | 4.30 sq ft                            |                                      | 9.42 sq ft                           |                                     |
| Hydraulic Radius:         | 0.493 ft                              |                                      | 0.738 ft                             |                                     |
| Froude Number:            | 0.78                                  |                                      | 0.29                                 |                                     |
| Roughness<br>Coefficient: | 0.0510                                |                                      | 0.1464                               |                                     |

### Structure #3 (Vegetated Channel)

*East Section 16 Ditch 0+00 to 13+15*

Trapezoidal Vegetated Channel Inputs:

Material: Tall fescue

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 2.00              | 1.0:1                | 7.0:1                 | 3.0       | D, B               |                      |                      |                         | 7.0                     |

## Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 15.50 cfs                             |                                      | 15.50 cfs                            |                                     |
| Depth:                 | 0.86 ft                               |                                      | 1.35 ft                              |                                     |
| Top Width:             | 8.85 ft                               |                                      | 12.80 ft                             |                                     |
| Velocity:              | 3.34 fps                              |                                      | 1.55 fps                             |                                     |
| X-Section Area:        | 4.64 sq ft                            |                                      | 9.99 sq ft                           |                                     |
| Hydraulic Radius:      | 0.513 ft                              |                                      | 0.761 ft                             |                                     |
| Froude Number:         | 0.81                                  |                                      | 0.31                                 |                                     |
| Roughness Coefficient: | 0.0495                                |                                      | 0.1386                               |                                     |

## Structure #2 (Pond)

### Section 16 Pond

#### Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,746.00 ft |
| Initial Pool:      | 1.22 ac-ft  |

#### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 12.00               | 9.20              | 12.00                | 121.00             | 8.00             | 0.0250      | 7,752.90           | 2                        |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,754.50      | 17.00             | 2.00:1         | 2.00:1          | 19.00             |

#### Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,753.09 ft |
| Dewater Time:   | 0.32 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

#### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,740.18  | 0.010        | 0.000               | 0.000              |                          |
| 7,740.68  | 0.035        | 0.011               | 0.000              |                          |
| 7,741.18  | 0.075        | 0.037               | 0.000              |                          |
| 7,741.68  | 0.130        | 0.088               | 0.000              |                          |
| 7,742.18  | 0.200        | 0.170               | 0.000              |                          |
| 7,742.68  | 0.219        | 0.275               | 0.000              |                          |
| 7,743.18  | 0.239        | 0.389               | 0.000              |                          |
| 7,743.68  | 0.260        | 0.514               | 0.000              |                          |
| 7,743.70  | 0.261        | 0.519               | 0.000              |                          |
| 7,744.18  | 0.280        | 0.649               | 0.000              |                          |
| 7,744.68  | 0.297        | 0.793               | 0.000              |                          |
| 7,745.18  | 0.314        | 0.946               | 0.000              |                          |
| 7,745.68  | 0.332        | 1.107               | 0.000              |                          |
| 7,746.00  | 0.343        | 1.215               | 0.000              |                          |
| 7,746.18  | 0.350        | 1.278               | 0.000              |                          |
| 7,746.68  | 0.365        | 1.456               | 0.000              |                          |
| 7,747.18  | 0.379        | 1.642               | 0.000              |                          |
| 7,747.68  | 0.395        | 1.836               | 0.000              |                          |
| 7,748.18  | 0.410        | 2.037               | 0.000              |                          |
| 7,748.68  | 0.427        | 2.246               | 0.000              |                          |
| 7,749.18  | 0.444        | 2.464               | 0.000              |                          |
| 7,749.68  | 0.462        | 2.690               | 0.000              |                          |
| 7,750.18  | 0.480        | 2.926               | 0.000              |                          |
| 7,750.68  | 0.499        | 3.171               | 0.000              |                          |
| 7,751.18  | 0.519        | 3.425               | 0.000              |                          |
| 7,751.68  | 0.539        | 3.690               | 0.000              |                          |
| 7,752.18  | 0.560        | 3.965               | 0.000              |                          |
| 7,752.68  | 0.580        | 4.250               | 0.000              |                          |
| 7,752.90  | 0.588        | 4.378               | 0.000              | Spillway #1              |
| 7,753.09  | 0.596        | 4.494               | 1.003              | 7.60 Peak Stage          |
| 7,753.18  | 0.599        | 4.544               | 1.445              |                          |
| 7,753.68  | 0.620        | 4.849               | 3.340              |                          |
| 7,754.18  | 0.640        | 5.164               | 4.279              |                          |
| 7,754.50  | 0.647        | 5.370               | 4.784              | Spillway #2              |
| 7,754.68  | 0.650        | 5.487               | 10.402             |                          |
| 7,755.14  | 0.660        | 5.788               | 24.690             |                          |
| 7,755.18  | 0.660        | 5.814               | 24.740             |                          |
| 7,755.68  | 0.666        | 6.146               | 63.014             |                          |
| 7,756.00  | 0.670        | 6.360               | 105.193            |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,740.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,740.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,741.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,741.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,742.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,742.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,743.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,743.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,743.70          | 0.000             | 0.000                       | 0.000                                   |
| 7,744.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,744.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,745.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,745.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,746.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,746.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,746.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,747.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,747.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,748.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,748.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,749.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,749.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,750.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,750.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,751.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,751.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,752.18          | 0.000             | 0.000                       | 0.000                                   |
| 7,752.68          | 0.000             | 0.000                       | 0.000                                   |
| 7,752.90          | 0.000             | 0.000                       | 0.000                                   |
| 7,753.18          | 1.445             | 0.000                       | 1.445                                   |
| 7,753.68          | 3.340             | 0.000                       | 3.340                                   |
| 7,754.18          | 4.279             | 0.000                       | 4.279                                   |
| 7,754.50          | 4.784             | 0.000                       | 4.784                                   |
| 7,754.68          | 5.046             | 5.356                       | 10.402                                  |
| 7,755.14          | 5.660             | 19.030                      | 24.690                                  |
| 7,755.18          | 5.711             | 19.030                      | 24.740                                  |
| 7,755.68          | 6.306             | 56.708                      | 63.014                                  |
| 7,756.00          | 6.659             | 98.534                      | 105.193                                 |

Structure #1 (Null)

*Null Below Section 16 Pond*

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*Null Below Section 16 Pond*

### 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) |
|--------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #6     | 1        | 12.800         | 0.031              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 21.800         | 0.086              | 0.000        | 0.000  | 62.000       | M   | 3.01                 | 0.290                 |
|        | <b>Σ</b> | <b>34.600</b>  |                    |              |        |              |     | <b>3.01</b>          | <b>0.290</b>          |
| #5     | 1        | 1.100          | 0.016              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 14.700         | 0.044              | 0.000        | 0.000  | 62.000       | M   | 2.03                 | 0.196                 |
|        | <b>Σ</b> | <b>50.400</b>  |                    |              |        |              |     | <b>5.04</b>          | <b>0.486</b>          |
| #4     | 1        | 28.000         | 0.081              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 5.400          | 0.071              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 3        | 15.700         | 0.043              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 4        | 89.400         | 0.125              | 0.000        | 0.000  | 62.000       | M   | 4.76                 | 0.970                 |
|        | 5        | 8.900          | 0.092              | 0.000        | 0.000  | 80.000       | F   | 7.59                 | 0.558                 |
|        | <b>Σ</b> | <b>197.800</b> |                    |              |        |              |     | <b>13.57</b>         | <b>2.014</b>          |
| #3     | 1        | 22.800         | 0.178              | 0.000        | 0.000  | 80.000       | F   | 15.50                | 1.376                 |
|        | 2        | 59.000         | 0.208              | 0.000        | 0.000  | 47.000       | S   | 0.01                 | 0.000                 |
|        | 3        | 2.700          | 0.024              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | <b>Σ</b> | <b>84.500</b>  |                    |              |        |              |     | <b>15.50</b>         | <b>1.376</b>          |
| #2     | 1        | 1.000          | 0.050              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 0.900          | 0.046              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | <b>Σ</b> | <b>284.200</b> |                    |              |        |              |     | <b>27.64</b>         | <b>3.390</b>          |
| #1     | <b>Σ</b> | <b>284.200</b> |                    |              |        |              |     | <b>1.00</b>          | <b>0.226</b>          |

### Subwatershed Time of Concentration Details:

| Stru # | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|--------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2     | 1        | 3. Short grass pasture        | 10.60     | 50.13            | 473.00            | 2.600          | 0.050        |
| #2     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.050</b> |
| #2     | 2        | 3. Short grass pasture        | 6.90      | 24.15            | 350.00            | 2.100          | 0.046        |
| #2     | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.046</b> |
| #3     | 1        | 3. Short grass pasture        | 4.60      | 50.55            | 1,099.00          | 1.710          | 0.178        |
| #3     | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.178</b> |
| #3     | 2        | 3. Short grass pasture        | 12.00     | 249.60           | 2,080.00          | 2.770          | 0.208        |
| #3     | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.208</b> |
| #3     | 3        | 3. Short grass pasture        | 10.50     | 24.15            | 230.00            | 2.590          | 0.024        |
| #3     | <b>3</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.024</b> |
| #4     | 1        | 3. Short grass pasture        | 12.00     | 195.00           | 1,625.00          | 2.770          | 0.162        |

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.081</b> |
| #4        | 2        | 3. Short grass pasture                                | 21.00     | 224.70           | 1,070.00          | 3.660          | 0.081        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.071</b> |
| #4        | 3        | 3. Short grass pasture                                | 8.40      | 49.89            | 594.00            | 2.310          | 0.071        |
| <b>#4</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.043</b> |
| #4        | 4        | 3. Short grass pasture                                | 16.00     | 231.04           | 1,444.00          | 3.200          | 0.125        |
| <b>#4</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.125</b> |
| #4        | 5        | 5. Nearly bare and untilled, and alluvial valley fans | 4.00      | 26.76            | 669.00            | 2.000          | 0.092        |
| <b>#4</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.092</b> |
| #5        | 1        | 3. Short grass pasture                                | 2.00      | 6.70             | 335.00            | 1.130          | 0.082        |
| <b>#5</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.016</b> |
| #5        | 2        | 3. Short grass pasture                                | 14.00     | 66.50            | 475.00            | 2.990          | 0.044        |
| <b>#5</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #6        | 1        | 3. Short grass pasture                                | 1.50      | 1.50             | 100.00            | 0.970          | 0.028        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.031</b> |
| #6        | 2        | 3. Short grass pasture                                | 11.00     | 90.86            | 826.00            | 2.650          | 0.086        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.086</b> |

## ***Subwatershed Muskingum Routing Details:***

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #5        | 2        | 8. Large gullies, diversions, and low flowing streams | 14.50     | 89.46            | 617.00            | 11.420         | 0.015        |
| <b>#5</b> | <b>2</b> | <b>Muskingum K:</b>                                   |           |                  |                   |                | <b>0.000</b> |

# **Section 16 Fill Ditch** **10 Year 24 Hour Storm Event**

***Permanent Channel***  
***Post Mine***

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.  
1100 West 116th Avenue  
Westminster, CO 80234

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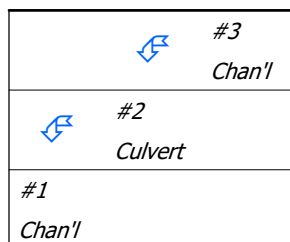
## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 10 yr - 24 hr |
| Rainfall Depth: | 1.800 inches  |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                            |
|---------|--------|--------------|--------|---------------|---------|----------------------------------------|
| Channel | #1     | ==>          | End    | 0.000         | 0.000   | Section 16 Fill Ditch Sta 0 to 1+85    |
| Culvert | #2     | ==>          | #1     | 0.000         | 0.000   | Culvert                                |
| Channel | #3     | ==>          | #2     | 0.000         | 0.000   | Section 16 Fill Ditch Sta 1+85 to 8+60 |



## ***Structure Summary:***

|    | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|----|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #3 | 11.400                                    | 11.400                                | 1.77                       | 0.20                                 |
| #2 | 0.000                                     | 11.400                                | 1.77                       | 0.20                                 |
| #1 | 1.000                                     | 12.400                                | 1.77                       | 0.20                                 |

## Structure Detail:

### Structure #3 (Riprap Channel)

Section 16 Fill Ditch Sta 1+85 to 8+60

Triangular Riprap Channel Inputs:

#### Material: Riprap

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 3.0:1                      | 3.0:1                       | 17.8      |                         |                         |                               |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.77 cfs      |              |
| Depth:            | 0.12 ft       |              |
| Top Width:        | 0.74 ft       |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.05 sq ft    |              |
| Hydraulic Radius: | 0.058 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 4.00 in       |              |
| D50:              | 12.00 in      |              |
| Dmax:             | 15.00 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #2 (Culvert)

#### *Culvert*

Culvert Inputs:

| Length (ft) | Slope (%) | Manning's n | Max.<br>Headwater<br>(ft) | Tailwater<br>(ft) | Entrance<br>Loss Coef.<br>(Ke) |
|-------------|-----------|-------------|---------------------------|-------------------|--------------------------------|
| 30.00       | 17.80     | 0.0150      | 1.00                      | 0.00              | 0.90                           |

Culvert Results:

Design Discharge = 1.77 cfs

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Structure #1 (Riprap Channel)

*Section 16 Fill Ditch Sta 0 to 1+85*

Triangular Riprap Channel Inputs:

Material: Riprap

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 3.0:1                      | 3.0:1                       | 17.8      |                         |                         |                               |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 1.77 cfs      |              |
| Depth:            | 0.12 ft       |              |
| Top Width:        | 0.74 ft       |              |
| Velocity*:        |               |              |
| X-Section Area:   | 0.05 sq ft    |              |
| Hydraulic Radius: | 0.058 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 4.00 in       |              |
| D50:              | 12.00 in      |              |
| Dmax:             | 15.00 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### ***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) |
|-----------|----------|---------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #3        | 1        | 11.400        | 0.150              | 0.000        | 0.000  | 74.000       | M   | 1.77                 | 0.202                 |
|           | <b>Σ</b> | <b>11.400</b> |                    |              |        |              |     | <b>1.77</b>          | <b>0.202</b>          |
| <b>#2</b> | <b>Σ</b> | <b>11.400</b> |                    |              |        |              |     | <b>1.77</b>          | <b>0.202</b>          |
| #1        | 1        | 1.000         | 0.004              | 0.000        | 0.000  | 47.000       | M   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>12.400</b> |                    |              |        |              |     | <b>1.77</b>          | <b>0.202</b>          |

### ***Subwatershed Time of Concentration Details:***

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #1        | 1        | 8. Large gullies, diversions, and low flowing streams | 17.80     | 32.92            | 185.00            | 12.650         | 0.004        |
| <b>#1</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.004</b> |
| #3        | 1        | 3. Short grass pasture                                | 16.30     | 261.94           | 1,607.00          | 3.220          | 0.138        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 17.80     | 104.11           | 584.94            | 12.650         | 0.012        |
| <b>#3</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.150</b> |

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# RULE 4 PERFORMANCE STANDARDS

## 4.05.14 – 4.05.18 Various Topics

These sections are addressed in the Volume 1.

## 4.06 TOPSOIL

The topsoil removal, storage, and redistribution plan for the disturbed area associated with the Lower Wilson and South Taylor mining areas will follow the procedures described in Section 4.06 in Volume 1 and as described in Section 2.05.3 (5) and 2.05.4 (2) (d) of this Volume (Volume 12)..

## 4.07 SEALING OF DRILLED HOLES AND UNDERGROUND OPENINGS

Drill holes and underground openings will be sealed in accordance with the procedures outlined in the Section 4.07 in Volume 1.

## 4.08 USE OF EXPLOSIVES

Explosives will be used for blasting in accordance with the procedures and specifications presented in Volume 1, Section 4.08.. Map 26A presents distances to various structures of possible concern surrounding the mining area. Only Section 4.08.2 has changed from Volume 1; see Sections 4.08.1 and 4.08.3 through 4.08.6, in Volume 1.

### 4.08.2 Pre-Blast Survey

In accordance with Rule 4.08.2(1), pre-blast surveys have been offered to owners of all structures within one-half mile of the permit area. Pre-blast surveys were conducted on residential structures located at 6647 and 7072 Moffat County Road 51, various associated groundwater supply wells, and eleven power pole foundations located along the ridge between Wilson and Taylor Creeks. Copies of the surveys are included in Exhibit 14, Item 4.

## 4.09 DISPOSAL OF EXCESS SPOIL

Spoil removed from the South Taylor pit will be stockpiled as shown on Maps 45 and 20B. Colowyo expects a 20% swell of excavated materials; therefore, part of the material stockpiled in the East and West Taylor Fills will remain at the conclusion of the project as shown on Map 19. Placement will occur as described in previous sections of this volume and in Volume 1.

Design of the two (East Taylor and West Taylor) fills associated with the South Taylor Mine plan are provided in Exhibit 23B. The East Taylor Fill will contain approximately 26.6 million yards of temporary out-of-pit spoil and approximately 7.5 million yards of permanent out-of-pit spoil. The West Taylor Fill will contain approximately 10.9 million yards of temporary out-of-pit spoil and approximately 22.6 million yards of permanent out-of-pit spoil. Both fills will be regraded in accordance with the approved post mine topography shown on Map 19. The final configuration of the fills is designed to minimize erosion. This takes into account a number of the components of the other fill piles at the mine which have proven successful. The final outslope will not exceed 3h:1v.

| Fill Name        | Temporary Volume       | Permanent Volume       |
|------------------|------------------------|------------------------|
| East Taylor Fill | 26,663,608 Cubic Yards | 7,511,137 Cubic Yards  |
| West Taylor Fill | 10,993,667 Cubic Yards | 22,609,016 Cubic Yards |

## RULE 4 PERFORMANCE STANDARDS

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Designed terrace ditches will be constructed at approximately 100 foot vertical increments. Terrace ditches will be backsloped to direct runoff against the face to prevent flows from overflowing the edge of the ditch. These terrace ditches will direct surface runoff perpendicular to the face into a permanent drainage channel designed to pass safely the runoff from a 100 year, 24 hour precipitation event. Terrace ditches are shown on Map 12 and design information is provided in Exhibit 7, Item 20, Parts A and B.

Reclamation, specifically topsoil replacement, seeding etc. will be implemented consistent with the Section 2.05 of the permit.

### CONSTRUCTION PLAN

All available topsoil will be removed and either stockpiled for later use or direct haul replaced to a reclaimed area.

Due to the fact that the valley fill locations are in close proximity to the initial boxcut area means the entire footprint of these fills must be stripped of topsoil. As described in further detail in this submittal under Section 2.05.3(1); “The entire seam sequence from the top overburden through to the bottom G8 seam, which resides in the area of the initial boxcut, will be placed in the valley fill locations; this will allow Colowyo enough spoil room to reach the desired mining depth.”

It is anticipated the valley fill drains and associated lateral drains will be constructed as one project during the first two years of operation in the South Taylor operation for practical purposes and as a necessary step in preparation of the area for full scale mining.

Channels constructed along the outside of the valley fills (perimeter relief drains) will be built immediately after the logical completion of each terrace ditch across the faces of the fills, which obviously cannot be completed until such a time as the fills themselves develop and are constructed to meet PMT compliance. This activity will be logically sequential in that they will be developed from the bottom up.

Colowyo will follow the Shannon & Wilson recommendation for excavation as described in Exhibit 23B.

A controlled underdrain in accordance with the Shannon & Wilson recommendations will be placed in the natural drainage bottom from the head to the top of the fill, The harder, available sandstones obtained from the mining operation will be selectively handled and placed in at least a 24 foot wide by 8 foot high configuration to serve as the underdrain before covered by spoil material. The natural spoil sorting which will occur by utilizing the thicker lifts recommended by Shannon & Wilson will be sufficient to protect the drain from clogging above the geotextile fabric.

Lift thicknesses up to 100 feet thick is acceptable and will be utilized to construct the fill. This method of spoil placement also enhances the construction of a free draining layer of spoil material at the base of the fill. Experience at Colowyo provides evidence that the natural sorting process which occurs while dumping in higher lifts is sufficient to create this drain. Inspection and documentation of this natural sorting is recommended and will be conducted by Colowyo. See the Inspection Plan section for additional details.

### INSPECTION PLAN

During construction of the East Taylor and West Taylor Fills, Colowyo will provide the following information in certified reports as required by Rule 4.09.1(11).

**Exhibit 7 Item 20**  
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**Part B, West Taylor Pond and Channels**

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| West Taylor Pond Narrative Summary.....                    | Exh. 7-20B-1 |
| Figure Exh. 7-20B-1 West Taylor Pond As-Built              |              |
| Figure Exh. 7-20B-2 West Taylor Pond Watersheds            |              |
| SEDCAD Model, West Taylor Pond 10 Year, 24 Hour Event      |              |
| SEDCAD Model, West Taylor Pond 25 Year, 24 Hour Event      |              |
| SEDCAD Model, West Taylor Channels 100 Year, 24 Hour Event |              |

**Part F, Geotechnical Investigations, South Taylor Sediment Ponds ..... Exh. 7-20F-1**

## **Exhibit 7, Item 20, Part A**

### **Section 28 Pond and Channels**

The location of the Section 28 Pond is presented on Map 12. The profile of the associated permanent channel (Trib D) associated with the Section 28 Pond watershed is presented on Map 33B. The design information for Trib D is also presented in this exhibit. The as-built configuration for the Section 28 Pond is presented on Figure Exh. 7-20A-1, and Figure Exh. 720A-2 provides the breakdown of drainage areas and hydrologic conditions for this sediment pond in the post mining condition.

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used in sediment pond and post mine channel assumptions. Runoff curve numbers assigned to the undisturbed and reclaimed lands in various stages of reclamation have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD<sup>TM</sup>. For channels to be protected by a vegetative liner, the permissible velocities are also determined using SEDCAD<sup>TM</sup> routines.

#### **Section 28 Pond**

The following pages present the results of the SEDCAD<sup>TM</sup> models for the worst-case hydrologic conditions under the post mining condition. At this stage all the reclamation parcels are three plus years old and reclamation is the northern and northwest reaches of the Section 28 Pond watershed.

The SEDCAD<sup>TM</sup> model herein provides the results of the 10 year 24 hour design storm and demonstrates the Section 28 Pond will meet the applicable settleable solids standard under this modeled storm event. The second SEDCAD<sup>TM</sup> model demonstrates that the Section 28 Pond emergency spillway elevation is capable of containing the 25 year 24 hour storm.

The final post mining topographic surface and the final locations of the permanent drainage channel as presented on Map 12 were used to model the watershed for the post-mining condition.

In summary, the post mining case at the Section 28 Pond, the 10 year 24 hour storm produces 0.98 acre feet of runoff, and the pond contains the entire storm event. The 25 year 24 hour storm is also completely contained within the pond.

#### **Temporary Conveyance Channels**

For the Section 28 Pond, two temporary channels will be needed. These are the Section 28 and Section 29 Ditches as presented on Map 41A.

Design and construction of these ditches will be similar to the existing side channel ditches, which are currently in place at the Colowyo. As shown on the Figure Exh. 7-20A-1, the runoff from the Section 29 collector ditch is contributory to the Section 28 ditch. Given the size of the

drainage area involved for both ditches, the 10 year - 24 hour event as described by Rule 4.05.3 is the appropriate design basis.

Both ditches are designed to be trapezoidal in cross section with a 12 foot bottom width and 2H:1V sideslopes and a total depth of not less than 4.0 feet. As shown in the 10 year, 24 hour SEDCAD analysis in Exhibit 7, Item 20, Part A, no erosion protection is necessary for Section 28 and 29 Ditches, and the SEDCAD model confirms the trapezoidal design parameters presented here.

### **Permanent Post Mine Channel**

The Section 28 watershed has of one post-mining channel. The location of this channel is presented on Map 12 and Figure Exh. 7-20A-2. The channel profile is presented on Map 33B.

The assumed hydrologic condition for all this channels is the post mine condition when the entire Section 28 watershed is reclaimed and reporting to the Section 28 Pond.

The area contributory to Trib D is less than one square mile, making the appropriate storm event the 10 year, 24 hour event as specified in Rule 4.05.3.

The channel configurations for the 10 year, 24 hour storm event for Trib D is summarize below:

#### **Post Mine Channel**

| <u>Station</u> | <u>Peak Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
|----------------|----------------------------|------------------------------|---------------------------|------------------------|-------------------------------------|-------------------------------|
| Trib D         | 2.9                        | 20                           | Trapezoidal<br>12' bottom | 2H:1V                  | 2.0                                 | Riprap,<br>D50 = 6"           |

# **Section 28 Pond** **10 Yr - 24 Hr Storm Event**

***Effluent Demonstration***  
***Post Mining***

Tony Tennyson

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## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 10 yr - 24 hr |
| Rainfall Depth: | 1.800 inches  |

### ***Particle Size Distribution:***

| Size (mm) | Colowyo Particle Size |
|-----------|-----------------------|
| 4.7500    | 100.000%              |
| 0.0750    | 73.000%               |
| 0.0400    | 33.000%               |
| 0.0010    | 20.000%               |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                  |
|---------|--------|--------------|--------|---------------|---------|------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Outflow from Section 28 Pond |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Section 28 Pond              |
| Channel | #3     | ==>          | #2     | 0.000         | 0.000   | Natural Channel to Pond      |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Trib D                       |
| Channel | #5     | ==>          | #2     | 0.000         | 0.000   | Section 28 Ditch             |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Section 29 Ditch             |



### ***Structure Summary:***

|              | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) | Sediment<br>(tons) | Peak<br>Sediment<br>Conc.<br>(mg/l) | Peak<br>Settleable<br>Conc.<br>(ml/l) | 24VW<br>(ml/l) |
|--------------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|--------------------|-------------------------------------|---------------------------------------|----------------|
| #6           | 13.300                                    | 13.300                                | 0.05                       | 0.03                                 | 0.0                | 387                                 | 0.22                                  | 0.17           |
| #5           | 45.100                                    | 58.400                                | 2.88                       | 0.32                                 | 1.9                | 10,410                              | 5.38                                  | 2.24           |
| #4           | 9.700                                     | 9.700                                 | 2.90                       | 0.21                                 | 1.5                | 12,380                              | 7.06                                  | 2.89           |
| #3           | 244.100                                   | 253.800                               | 8.93                       | 0.66                                 | 5.1                | 14,157                              | 8.07                                  | 3.28           |
| #2 In<br>Out | 0.000                                     | 312.200                               | 10.96                      | 0.98                                 | 7.1                | 13,157                              | 7.31                                  | 2.94           |
|              |                                           |                                       | 0.00                       | 0.00                                 | 7.1                | 0                                   | 0.00                                  | 0.00           |
| #1           | 4.300                                     | 316.500                               | 0.03                       | 0.02                                 | 7.1                | 223                                 | 0.18                                  | 0.14           |

## ***Particle Size Distribution(s) at Each Structure***

### ***Structure #6 (Section 29 Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #5 (Section 28 Ditch ):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 89.872%  |
| 0.0400    | 40.627%  |
| 0.0010    | 24.623%  |

### ***Structure #4 (Trib D):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #3 (Natural Channel to Pond):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #2 (Section 28 Pond):***

| Size (mm) | In       | Out    |
|-----------|----------|--------|
| 4.7500    | 100.000% | 0.000% |
| 0.0750    | 77.555%  | 0.000% |
| 0.0400    | 35.059%  | 0.000% |
| 0.0010    | 21.248%  | 0.000% |

## ***Structure #1:***

| Size (mm) | In/Out |
|-----------|--------|
| 4.7500    | 0.057% |
| 0.0750    | 0.042% |
| 0.0400    | 0.019% |
| 0.0010    | 0.011% |

***Structure Detail:******Structure #6 (Erodible Channel)******Section 29 Ditch***

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Manning's n | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|-------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 2.0:1                | 1.0:1                 | 2.0       | 0.0250      |                      |                      |                         | 6.0                     |

Erodible Channel Results:

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 0.05 cfs      |              |
| Depth:            | 0.01 ft       |              |
| Top Width:        | 12.03 ft      |              |
| Velocity:         | 0.39 fps      |              |
| X-Section Area:   | 0.12 sq ft    |              |
| Hydraulic Radius: | 0.010 ft      |              |
| Froude Number:    | 0.69          |              |

***Structure #5 (Erodible Channel)******Section 28 Ditch***

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Manning's n | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|-------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 2.0:1                | 2.0:1                 | 16.0      | 0.0250      |                      |                      |                         | 6.0                     |

Erodible Channel Results:

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 2.88 cfs      |              |
| Depth:            | 0.06 ft       |              |
| Top Width:        | 12.25 ft      |              |
| Velocity:         | 3.75 fps      |              |
| X-Section Area:   | 0.76 sq ft    |              |
| Hydraulic Radius: | 0.062 ft      |              |
| Froude Number:    | 2.64          |              |

### Structure #4 (Riprap Channel)

*Trib D*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 2.0:1                | 2.0:1                 | 20.0      | 1.97                 |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 2.90 cfs      |              |
| Depth:            | 0.03 ft       | 2.00 ft      |
| Top Width:        | 12.12 ft      | 20.00 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 0.36 sq ft    |              |
| Hydraulic Radius: | 0.029 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Erodible Channel)

*Natural Channel to Pond*

Parabolic Erodible Channel Inputs:

#### Material: Shales and hardpans

| Slope (%) | Manning's n | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-----------|-------------|----------------------|----------------------|-------------------------|-------------------------|
| 25.0      | 0.0250      |                      |                      |                         | 6.0                     |

Erodible Channel Results:

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 8.93 cfs      |              |
| Depth:            | 0.51 ft       |              |
| Top Width:        | 2.03 ft       |              |

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Velocity:         | 13.04 fps     |              |
| X-Section Area:   | 0.68 sq ft    |              |
| Hydraulic Radius: | 0.290 ft      |              |
| Froude Number:    | 3.95          |              |

## Structure #2 (Pond)

### Section 28 Pond

#### Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,056.01 ft |
| Initial Pool:      | 0.00 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 20.00 %     |

*\*No sediment capacity defined*

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 6.60              | 18.00                | 150.00             | 2.00             | 0.0150      | 7,069.60           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,077.00      | 30.00             | 2.00:1         | 2.00:1          | 30.00             |

#### Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 7,061.54 ft |
| H'graph Detention Time: | 0.00 hrs    |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 0.00 days   |
| Trap Efficiency:        | 0.00 %      |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs)  |
|-----------|-----------|------------------|-----------------|---------------------|
| 7,056.00  | 0.050     | 0.000            | 0.000           | Top of Sed. Storage |
| 7,056.01  | 0.051     | 0.000            | 0.000           |                     |
| 7,057.00  | 0.150     | 0.096            | 0.000           |                     |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,058.00  | 0.165        | 0.253               | 0.000              |                          |
| 7,059.00  | 0.187        | 0.429               | 0.000              |                          |
| 7,060.00  | 0.209        | 0.627               | 0.000              |                          |
| 7,061.00  | 0.231        | 0.847               | 0.000              |                          |
| 7,061.54  | 0.244        | 0.978               | 0.000              | 0.00 Peak Stage          |
| 7,062.00  | 0.254        | 1.089               | 0.000              |                          |
| 7,063.00  | 0.279        | 1.356               | 0.000              |                          |
| 7,064.00  | 0.304        | 1.647               | 0.000              |                          |
| 7,065.00  | 0.330        | 1.964               | 0.000              |                          |
| 7,066.00  | 0.357        | 2.307               | 0.000              |                          |
| 7,067.00  | 0.385        | 2.678               | 0.000              |                          |
| 7,068.00  | 0.415        | 3.078               | 0.000              |                          |
| 7,069.00  | 0.445        | 3.508               | 0.000              |                          |
| 7,069.60  | 0.464        | 3.781               | 0.000              | Spillway #1              |
| 7,070.00  | 0.476        | 3.969               | 3.694              |                          |
| 7,071.00  | 0.509        | 4.461               | 10.067             |                          |
| 7,072.00  | 0.542        | 4.986               | 13.181             |                          |
| 7,073.00  | 0.577        | 5.546               | 15.689             |                          |
| 7,074.00  | 0.613        | 6.141               | 17.848             |                          |
| 7,075.00  | 0.649        | 6.772               | 19.772             |                          |
| 7,076.00  | 0.693        | 7.443               | 21.526             |                          |
| 7,077.00  | 0.739        | 8.158               | 23.146             | Spillway #2              |
| 7,078.00  | 0.768        | 8.912               | 89.045             |                          |
| 7,079.00  | 0.822        | 9.707               | 250.137            |                          |
| 7,080.00  | 0.876        | 10.556              | 486.888            |                          |
| 7,081.00  | 0.925        | 11.456              | 796.613            |                          |
| 7,082.00  | 0.975        | 12.406              | 1,173.617          |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,056.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,056.01          | 0.000             | 0.000                       | 0.000                                   |
| 7,057.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,058.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,059.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,060.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,061.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,062.00          | 0.000             | 0.000                       | 0.000                                   |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,063.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,064.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,065.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,066.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,067.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,068.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,069.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,069.60          | 0.000             | 0.000                       | 0.000                                   |
| 7,070.00          | 3.694             | 0.000                       | 3.694                                   |
| 7,071.00          | 10.067            | 0.000                       | 10.067                                  |
| 7,072.00          | 13.181            | 0.000                       | 13.181                                  |
| 7,073.00          | 15.689            | 0.000                       | 15.689                                  |
| 7,074.00          | 17.848            | 0.000                       | 17.848                                  |
| 7,075.00          | 19.772            | 0.000                       | 19.772                                  |
| 7,076.00          | 21.526            | 0.000                       | 21.526                                  |
| 7,077.00          | 23.146            | 0.000                       | 23.146                                  |
| 7,078.00          | 24.280            | 64.765                      | 89.045                                  |
| 7,079.00          | 24.946            | 225.191                     | 250.137                                 |
| 7,080.00          | 25.594            | 461.294                     | 486.888                                 |
| 7,081.00          | 26.226            | 770.387                     | 796.613                                 |
| 7,082.00          | 26.843            | 1,146.774                   | 1,173.617                               |

Structure #1 (Null)

*Outflow from Section 28 Pond*

### 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) |
|--------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #6     | 1        | 7.100          | 0.039              | 0.000        | 0.000  | 62.000       | M   | 0.05                 | 0.029                 |
|        | 2        | 6.200          | 0.015              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | <b>Σ</b> | <b>13.300</b>  |                    |              |        |              |     | <b>0.05</b>          | <b>0.029</b>          |
| #5     | 1        | 31.100         | 0.103              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 14.000         | 0.140              | 0.000        | 0.000  | 74.000       | F   | 2.88                 | 0.294                 |
|        | <b>Σ</b> | <b>58.400</b>  |                    |              |        |              |     | <b>2.88</b>          | <b>0.322</b>          |
| #4     | 1        | 3.900          | 0.005              | 0.000        | 0.000  | 74.000       | F   | 1.17                 | 0.085                 |
|        | 2        | 5.800          | 0.017              | 0.000        | 0.000  | 74.000       | F   | 1.73                 | 0.126                 |
|        | <b>Σ</b> | <b>9.700</b>   |                    |              |        |              |     | <b>2.90</b>          | <b>0.211</b>          |
| #3     | 1        | 221.300        | 0.076              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2        | 2.600          | 0.021              | 0.000        | 0.000  | 62.000       | F   | 0.02                 | 0.006                 |
|        | 3        | 10.000         | 0.015              | 0.000        | 0.000  | 74.000       | F   | 2.99                 | 0.217                 |
|        | 4        | 10.200         | 0.069              | 0.000        | 0.000  | 74.000       | F   | 3.05                 | 0.222                 |
|        | <b>Σ</b> | <b>253.800</b> |                    |              |        |              |     | <b>8.93</b>          | <b>0.656</b>          |
| #2     | <b>Σ</b> | <b>312.200</b> |                    |              |        |              |     | <b>10.96</b>         | <b>0.978</b>          |
| #1     | 1        | 4.300          | 0.015              | 0.000        | 0.000  | 62.000       | F   | 0.03                 | 0.018                 |
|        | <b>Σ</b> | <b>316.500</b> |                    |              |        |              |     | <b>0.03</b>          | <b>0.018</b>          |

### Subwatershed Sedimentology Detail:

| Stru # | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l) |
|--------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|-------------|
| #6     | 1        | 0.300  | 200.00 | 16.00 | 0.0100 | 0.3800 | 1    | 0.0             | 387                        | 0.22                        | 0.17        |
|        | 2        | 0.300  | 100.00 | 22.80 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>387</b>                 | <b>0.22</b>                 | <b>0.17</b> |
| #5     | 1        | 0.300  | 400.00 | 8.60  | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | 2        | 0.300  | 400.00 | 9.90  | 0.0700 | 0.3800 | 1    | 1.9             | 10,410                     | 5.38                        | 2.44        |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>1.9</b>      | <b>10,410</b>              | <b>5.38</b>                 | <b>2.24</b> |
| #4     | 1        | 0.300  | 150.00 | 18.20 | 0.0700 | 0.3800 | 1    | 0.8             | 17,097                     | 9.74                        | 4.00        |
|        | 2        | 0.300  | 100.00 | 13.50 | 0.0700 | 0.3580 | 1    | 0.6             | 9,197                      | 5.24                        | 2.15        |
|        | <b>Σ</b> |        |        |       |        |        |      | <b>1.5</b>      | <b>12,380</b>              | <b>7.06</b>                 | <b>2.89</b> |
| #3     | 1        | 0.300  | 400.00 | 23.70 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00        |
|        | 2        | 0.300  | 200.00 | 18.50 | 0.0100 | 0.3800 | 1    | 0.0             | 624                        | 0.36                        | 0.29        |

| Stru #    | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l) |
|-----------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|-------------|
|           | 3        | 0.300  | 100.00 | 14.40 | 0.0700 | 0.3800 | 1    | 1.4             | 11,308                     | 6.44                        | 2.64        |
|           | 4        | 0.300  | 400.00 | 11.20 | 0.0700 | 0.3800 | 1    | 2.3             | 18,630                     | 10.62                       | 4.36        |
|           | <b>Σ</b> |        |        |       |        |        |      | <b>5.1</b>      | <b>14,157</b>              | <b>8.07</b>                 | <b>3.28</b> |
| <b>#2</b> | <b>Σ</b> |        |        |       |        |        |      | <b>7.1</b>      | <b>13,157</b>              | <b>7.31</b>                 | <b>2.94</b> |
| #1        | 1        | 0.300  | 100.00 | 15.00 | 0.0100 | 0.3800 | 1    | 0.0             | 223                        | 0.13                        | 0.10        |
|           | <b>Σ</b> |        |        |       |        |        |      | <b>7.1</b>      | <b>223</b>                 | <b>0.18</b>                 | <b>0.14</b> |

## Subwatershed Time of Concentration Details:

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #1        | 1        | 3. Short grass pasture                                | 15.00     | 25.05            | 167.00            | 3.090          | 0.015        |
| <b>#1</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #3        | 1        | 8. Large gullies, diversions, and low flowing streams | 23.70     | 948.71           | 4,003.00          | 14.600         | 0.076        |
| <b>#3</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.076</b> |
| #3        | 2        | 3. Short grass pasture                                | 18.50     | 49.95            | 270.00            | 3.440          | 0.021        |
| <b>#3</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #3        | 3        | 3. Short grass pasture                                | 14.40     | 24.91            | 173.00            | 3.030          | 0.015        |
| <b>#3</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #3        | 4        | 3. Short grass pasture                                | 11.20     | 75.26            | 672.00            | 2.670          | 0.069        |
| <b>#3</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.069</b> |
| #4        | 1        | 8. Large gullies, diversions, and low flowing streams | 18.20     | 50.05            | 275.00            | 12.790         | 0.005        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.005</b> |
| #4        | 2        | 3. Short grass pasture                                | 13.50     | 25.11            | 186.00            | 2.930          | 0.017        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.017</b> |
| #5        | 1        | 3. Short grass pasture                                | 8.60      | 74.90            | 871.00            | 2.340          | 0.103        |
| <b>#5</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.103</b> |
| #5        | 2        | 3. Short grass pasture                                | 9.90      | 125.43           | 1,267.00          | 2.510          | 0.140        |
| <b>#5</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.140</b> |
| #6        | 1        | 3. Short grass pasture                                | 16.00     | 73.60            | 460.00            | 3.200          | 0.039        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.039</b> |
| #6        | 2        | 3. Short grass pasture                                | 22.80     | 49.93            | 219.00            | 3.810          | 0.015        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |

# **Section 28 Pond** **25 Yr - 24 Hr Storm Event**

***Emergency Spillway Demonstration***  
***Post Mining***

Tony Tennyson

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## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 25 yr - 24 hr |
| Rainfall Depth: | 2.300 inches  |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                  |
|---------|--------|--------------|--------|---------------|---------|------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Outflow from Section 28 Pond |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | Section 28 Pond              |
| Channel | #3     | ==>          | #2     | 0.000         | 0.000   | Natural Channel to Pond      |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | Trib D                       |
| Channel | #5     | ==>          | #2     | 0.000         | 0.000   | Section 28 Ditch             |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Section 29 Ditch             |



## ***Structure Summary:***

|       | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|-------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #6    | 13.300                                    | 13.300                                | 0.98                       | 0.09                                 |
| #5    | 45.100                                    | 58.400                                | 6.41                       | 0.66                                 |
| #4    | 9.700                                     | 9.700                                 | 5.64                       | 0.40                                 |
| #3    | 244.100                                   | 253.800                               | 17.73                      | 1.28                                 |
| #2 In | 0.000                                     | 312.200                               | 23.78                      | 1.94                                 |
| Out   |                                           |                                       | 0.00                       | 0.00                                 |
| #1    | 4.300                                     | 316.500                               | 0.59                       | 0.06                                 |

**Structure Detail:****Structure #6 (Erodible Channel)****Section 29 Ditch**

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Manning's n | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|-------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 2.0:1                | 1.0:1                 | 2.0       | 0.0250      |                      |                      |                         | 6.0                     |

Erodible Channel Results:

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 0.98 cfs      |              |
| Depth:            | 0.06 ft       |              |
| Top Width:        | 12.19 ft      |              |
| Velocity:         | 1.31 fps      |              |
| X-Section Area:   | 0.75 sq ft    |              |
| Hydraulic Radius: | 0.061 ft      |              |
| Froude Number:    | 0.93          |              |

**Structure #5 (Erodible Channel)****Section 28 Ditch**

Trapezoidal Erodible Channel Inputs:

Material: Shales and hardpans

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Manning's n | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|-------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 2.0:1                | 2.0:1                 | 16.0      | 0.0250      |                      |                      |                         | 6.0                     |

Erodible Channel Results:

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 6.41 cfs      |              |
| Depth:            | 0.10 ft       |              |
| Top Width:        | 12.41 ft      |              |
| Velocity:         | 5.14 fps      |              |
| X-Section Area:   | 1.25 sq ft    |              |
| Hydraulic Radius: | 0.100 ft      |              |

| w/o Freeboard  | w/ Freeboard |
|----------------|--------------|
| Froude Number: | 2.86         |

### Structure #4 (Riprap Channel)

*Trib D*

Trapezoidal Riprap Channel Inputs:

#### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 2.0:1                | 2.0:1                 | 20.0      | 1.95                 |                      |                         |

Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

| w/o Freeboard     | w/ Freeboard      |
|-------------------|-------------------|
| Design Discharge: | 5.64 cfs          |
| Depth:            | 0.05 ft 2.00 ft   |
| Top Width:        | 12.19 ft 19.99 ft |
| Velocity*:        |                   |
| X-Section Area:   | 0.56 sq ft        |
| Hydraulic Radius: | 0.046 ft          |
| Froude Number*:   |                   |
| Manning's n*:     |                   |
| Dmin:             | 2.00 in           |
| D50:              | 6.00 in           |
| Dmax:             | 7.50 in           |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Erodible Channel)

*Natural Channel to Pond*

Parabolic Erodible Channel Inputs:

#### Material: Shales and hardpans

| Slope (%) | Manning's n | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-----------|-------------|----------------------|----------------------|-------------------------|-------------------------|
| 25.0      | 0.0250      |                      |                      |                         | 6.0                     |

Erodible Channel Results:

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 17.73 cfs     |              |
| Depth:            | 0.66 ft       |              |
| Top Width:        | 2.62 ft       |              |
| Velocity:         | 15.48 fps     |              |
| X-Section Area:   | 1.15 sq ft    |              |
| Hydraulic Radius: | 0.374 ft      |              |
| Froude Number:    | 4.13          |              |

## Structure #2 (Pond)

### Section 28 Pond

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,056.01 ft |
| Initial Pool:      | 0.00 ac-ft  |

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 6.60              | 18.00                | 150.00             | 2.00             | 0.0150      | 7,069.60           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,077.00      | 30.00             | 2.00:1         | 2.00:1          | 30.00             |

Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,064.91 ft |
| Dewater Time:   | 0.00 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 7,056.00  | 0.050     | 0.000            | 0.000           |                    |
| 7,056.01  | 0.051     | 0.000            | 0.000           |                    |
| 7,057.00  | 0.150     | 0.096            | 0.000           |                    |
| 7,058.00  | 0.165     | 0.253            | 0.000           |                    |
| 7,059.00  | 0.187     | 0.429            | 0.000           |                    |
| 7,060.00  | 0.209     | 0.627            | 0.000           |                    |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,061.00  | 0.231        | 0.847               | 0.000              |                          |
| 7,062.00  | 0.254        | 1.089               | 0.000              |                          |
| 7,063.00  | 0.279        | 1.356               | 0.000              |                          |
| 7,064.00  | 0.304        | 1.647               | 0.000              |                          |
| 7,064.91  | 0.328        | 1.935               | 0.000              | 0.00 Peak Stage          |
| 7,065.00  | 0.330        | 1.964               | 0.000              |                          |
| 7,066.00  | 0.357        | 2.307               | 0.000              |                          |
| 7,067.00  | 0.385        | 2.678               | 0.000              |                          |
| 7,068.00  | 0.415        | 3.078               | 0.000              |                          |
| 7,069.00  | 0.445        | 3.508               | 0.000              |                          |
| 7,069.60  | 0.464        | 3.781               | 0.000              | Spillway #1              |
| 7,070.00  | 0.476        | 3.969               | 3.694              |                          |
| 7,071.00  | 0.509        | 4.461               | 10.067             |                          |
| 7,072.00  | 0.542        | 4.986               | 13.181             |                          |
| 7,073.00  | 0.577        | 5.546               | 15.689             |                          |
| 7,074.00  | 0.613        | 6.141               | 17.848             |                          |
| 7,075.00  | 0.649        | 6.772               | 19.772             |                          |
| 7,076.00  | 0.693        | 7.443               | 21.526             |                          |
| 7,077.00  | 0.739        | 8.158               | 23.146             | Spillway #2              |
| 7,078.00  | 0.768        | 8.912               | 89.045             |                          |
| 7,079.00  | 0.822        | 9.707               | 250.137            |                          |
| 7,080.00  | 0.876        | 10.556              | 486.888            |                          |
| 7,081.00  | 0.925        | 11.456              | 796.613            |                          |
| 7,082.00  | 0.975        | 12.406              | 1,173.617          |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,056.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,056.01          | 0.000             | 0.000                       | 0.000                                   |
| 7,057.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,058.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,059.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,060.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,061.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,062.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,063.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,064.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,065.00          | 0.000             | 0.000                       | 0.000                                   |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,066.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,067.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,068.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,069.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,069.60          | 0.000             | 0.000                       | 0.000                                   |
| 7,070.00          | 3.694             | 0.000                       | 3.694                                   |
| 7,071.00          | 10.067            | 0.000                       | 10.067                                  |
| 7,072.00          | 13.181            | 0.000                       | 13.181                                  |
| 7,073.00          | 15.689            | 0.000                       | 15.689                                  |
| 7,074.00          | 17.848            | 0.000                       | 17.848                                  |
| 7,075.00          | 19.772            | 0.000                       | 19.772                                  |
| 7,076.00          | 21.526            | 0.000                       | 21.526                                  |
| 7,077.00          | 23.146            | 0.000                       | 23.146                                  |
| 7,078.00          | 24.280            | 64.765                      | 89.045                                  |
| 7,079.00          | 24.946            | 225.191                     | 250.137                                 |
| 7,080.00          | 25.594            | 461.294                     | 486.888                                 |
| 7,081.00          | 26.226            | 770.387                     | 796.613                                 |
| 7,082.00          | 26.843            | 1,146.774                   | 1,173.617                               |

Structure #1 (Null)

*Outflow from Section 28 Pond*

***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) |
|-----------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #6        | 1        | 7.100          | 0.039              | 0.000        | 0.000  | 62.000       | M   | 0.98                 | 0.095                 |
|           | 2        | 6.200          | 0.015              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>13.300</b>  |                    |              |        |              |     | <b>0.98</b>          | <b>0.095</b>          |
| #5        | 1        | 31.100         | 0.103              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 2        | 14.000         | 0.140              | 0.000        | 0.000  | 74.000       | F   | 6.17                 | 0.561                 |
|           | <b>Σ</b> | <b>58.400</b>  |                    |              |        |              |     | <b>6.41</b>          | <b>0.656</b>          |
| #4        | 1        | 3.900          | 0.005              | 0.000        | 0.000  | 74.000       | F   | 2.27                 | 0.162                 |
|           | 2        | 5.800          | 0.017              | 0.000        | 0.000  | 74.000       | F   | 3.37                 | 0.241                 |
|           | <b>Σ</b> | <b>9.700</b>   |                    |              |        |              |     | <b>5.64</b>          | <b>0.403</b>          |
| #3        | 1        | 221.300        | 0.076              | 0.000        | 0.000  | 47.000       | S   | 0.05                 | 0.003                 |
|           | 2        | 2.600          | 0.021              | 0.000        | 0.000  | 62.000       | F   | 0.36                 | 0.035                 |
|           | 3        | 10.000         | 0.015              | 0.000        | 0.000  | 74.000       | F   | 5.81                 | 0.415                 |
|           | 4        | 10.200         | 0.069              | 0.000        | 0.000  | 74.000       | F   | 5.93                 | 0.424                 |
|           | <b>Σ</b> | <b>253.800</b> |                    |              |        |              |     | <b>17.73</b>         | <b>1.280</b>          |
| <b>#2</b> | <b>Σ</b> | <b>312.200</b> |                    |              |        |              |     | <b>23.78</b>         | <b>1.935</b>          |
| #1        | 1        | 4.300          | 0.015              | 0.000        | 0.000  | 62.000       | F   | 0.59                 | 0.057                 |
|           | <b>Σ</b> | <b>316.500</b> |                    |              |        |              |     | <b>0.59</b>          | <b>0.057</b>          |

***Subwatershed Time of Concentration Details:***

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #1        | 1        | 3. Short grass pasture                                | 15.00     | 25.05            | 167.00            | 3.090          | 0.015        |
| <b>#1</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #3        | 1        | 8. Large gullies, diversions, and low flowing streams | 23.70     | 948.71           | 4,003.00          | 14.600         | 0.076        |
| <b>#3</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.076</b> |
| #3        | 2        | 3. Short grass pasture                                | 18.50     | 49.95            | 270.00            | 3.440          | 0.021        |
| <b>#3</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #3        | 3        | 3. Short grass pasture                                | 14.40     | 24.91            | 173.00            | 3.030          | 0.015        |
| <b>#3</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #3        | 4        | 3. Short grass pasture                                | 11.20     | 75.26            | 672.00            | 2.670          | 0.069        |
| <b>#3</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.069</b> |
| #4        | 1        | 8. Large gullies, diversions, and low flowing streams | 18.20     | 50.05            | 275.00            | 12.790         | 0.005        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.005</b> |
| #4        | 2        | 3. Short grass pasture                                | 13.50     | 25.11            | 186.00            | 2.930          | 0.017        |

| Stru #    | SWS #    | Land Flow Condition           | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------|-----------|------------------|-------------------|----------------|--------------|
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.017</b> |
| #5        | 1        | 3. Short grass pasture        | 8.60      | 74.90            | 871.00            | 2.340          | 0.103        |
| <b>#5</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.103</b> |
| #5        | 2        | 3. Short grass pasture        | 9.90      | 125.43           | 1,267.00          | 2.510          | 0.140        |
| <b>#5</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.140</b> |
| #6        | 1        | 3. Short grass pasture        | 16.00     | 73.60            | 460.00            | 3.200          | 0.039        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.039</b> |
| #6        | 2        | 3. Short grass pasture        | 22.80     | 49.93            | 219.00            | 3.810          | 0.015        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b> |           |                  |                   |                | <b>0.015</b> |

## **Exhibit 7, Item 20, Part B**

### **West Taylor Pond and Channels**

The location of the West Taylor Pond is presented on Map 12. The profiles of the associated permanent channels associated with the West Taylor Pond watershed are presented on Map 33B. These channels consist of the West Fork Taylor Ditch, East Fork Taylor Ditch, Trib 1 through Trib 6 ditches and the terrace ditches that will be constructed across the West Taylor Fill. The permanent channel design information for all channels is presented in this exhibit. The as-built configuration for the West Taylor Pond is presented on Figure Exh. 7-20C-1, and Figure Exh. 720C-2 provides the breakdown of drainage areas and hydrologic conditions for this sediment pond in the post mining condition.

Exhibit 7, Item 14 in Volume 2D describes the hydrologic methodology used in sediment pond and post mine channel assumptions. Runoff curve numbers assigned to the undisturbed and reclaimed lands in various stages of reclamation have been selected in accordance with Table 1 in the Introductory Text for Exhibit 7 in Volume 2D. For channels protected by a riprap liner, selection of minimum riprap size is done using the Simons/OSM method in SEDCAD<sup>TM</sup>. For channels to be protected by a vegetative liner, the permissible velocities are also determined using SEDCAD<sup>TM</sup> routines.

### **West Taylor Pond**

The following pages present the results of the SEDCAD<sup>TM</sup> models for the worst-case hydrologic conditions under the post mining condition. At this stage the oldest reclamation is on the eastern and southern extent of the reclaimed South Taylor Pit, and the younger (topsoil and seeded) reclamation is the northern reaches of the West Taylor Pond watershed very near the West Taylor Pond.

The SEDCAD<sup>TM</sup> model herein provides the results of the 10 year 24 hour design storm and demonstrates the West Taylor Pond will meet the applicable settleable solids standard under this modeled storm event. The second SEDCAD<sup>TM</sup> model demonstrates that the West Taylor Pond emergency spillway elevation is capable of containing the 25 year 24 hour storm.

The final post mining topographic surface and the final locations of the permanent drainage channels as presented on Map 12 were used to model the watershed for the post-mining condition. Four in-stream stock ponds (WFSP-1, WFSP-2, EFSP-1, and, EFSP-2) are included in the permanent channels to decrease peak flows from the modeled storm events, and to provide a water source to support the post-mining land use. A typical design for of each stock pond in the West Taylor Pond watershed are provided on Figure 2.05-6 in Volume 1. However, depending on the ground conditions encountered during reclamation, these stockponds may be constructed similar to ETD-1 (please see Figure Exh. 7-20ET-3) in the East Taylor watershed.

In summary, the post mining case at the West Taylor Pond, the 10 year 24 hour storm produces 5.10 acre feet of runoff, and the settleable solids discharge is 0.0 ml/l. The 25 year 24 hour storm event peaks at the 7,473.72' elevation, which is well below the emergency spill way elevation of 7,475.0'.

### **Permanent Post Mine Channels**

The West Taylor watershed is comprised of two primary post-mining channels and six tributaries channels. Both of the primary channels convey the post mining surface water flows to the West Taylor Pond, while the six tributaries channels route water to both primary post mining channels. The locations of both the primary and tributary channels are presented on Map 12 and Figure Exh. 7-20C-2. The channel profiles are presented on Map 33B.

The assumed hydrologic condition for all three channels is the post mine condition when the entire West Taylor watershed is reclaimed and reporting to the West Taylor Pond.

#### **West and East Fork Taylor Ditch**

The area contributory to each permanent primary channel is less than one square mile, making the appropriate storm event the 10 year, 24 hour event as specified in Rule 4.05.3. However, portions of these channels pass over permanent fills, so the correct storm event required by Rule 4.09.2 becomes the 100 year, 24 hour event. For simplicity, both primary channels are modeled to this larger event.

The upper segments of the primary channels are flat enough that a vegetative liner will provide sufficient erosion protection, even for the 100 year flow. However, both channels below the lower stock ponds require riprap lining to ensure long-term stability.

A SEDCAD model has been included below which evaluates the peak flow and total runoff volume for each of the channel segments for the 100 year, 24-hour storm event. The channel configurations for the 100 year, 24 hour storm event for both primary channels are described on the tables below.

**East Fork Taylor Ditch**

| <u>Station</u>           | <u>Peak Flow<br/>(CFS)</u> | <u>Average<br/>Slope (%)</u> | <u>Channel<br/>Type</u>   | <u>Side<br/>Slopes</u> | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
|--------------------------|----------------------------|------------------------------|---------------------------|------------------------|-------------------------------------|-------------------------------|
| Station 0+00 to EFSP-1   | 101.31                     | 25                           | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Riprap,<br>D50 = 18"          |
| EFSP-1 to EFSP-2         | 125.52                     | 1.5                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Vegetation                    |
| EFSP-2 to Station 124+03 | 26.40                      | 4.7                          | Trapezoidal<br>12' bottom | 3H:1V                  | 4.0                                 | Vegetation                    |

### **West Fork Taylor Ditch**

| <u>Station</u>          | <u>Peak Flow (CFS)</u> | <u>Average Slope (%)</u> | <u>Channel Type</u>    | <u>Side Slopes</u> | <u>Minimum Depth (Feet)</u> | <u>Erosion Protection</u> |
|-------------------------|------------------------|--------------------------|------------------------|--------------------|-----------------------------|---------------------------|
| Station 0+00 to WFSP-1  | 27.48                  | 26                       | Trapezoidal 12' bottom | 3H:1V              | 4.0                         | Riprap, D50 = 9"          |
| WFSP-1 to WFSP-2        | 46.52                  | 1.3                      | Trapezoidal 12' bottom | 3H:1V              | 4.0                         | Vegetation                |
| WFSP-2 to Station 40+00 | 72.61                  | 1.5                      | Trapezoidal 12' bottom | 3H:1V              | 4.0                         | Vegetation                |
| Station 40+00 to 83+05  | 26.85                  | 8                        | Trapezoidal 12' bottom | 3H:1V              | 4.0                         | Vegetation                |

### **Tributary Ditches**

The six post mine tributaries channels (Trib's 1 through 6) will be constructed to break up long continuous slopes and minimize erosion in the South Taylor reclamation areas. They will also convey flow to the two primary channels. These six tributaries were modeled in accordance with Rule 4.05.3(3) for the 10-year 24-hour event.

A summary of the configurations for each tributary channel is provided on the table below.

| <b><u>Post Mine Tributary Channels</u></b> |                        |                          |                       |                    |                             |                           |
|--------------------------------------------|------------------------|--------------------------|-----------------------|--------------------|-----------------------------|---------------------------|
| <u>Tribuary Name</u>                       | <u>Peak Flow (CFS)</u> | <u>Average Slope (%)</u> | <u>Channel Type</u>   | <u>Side Slopes</u> | <u>Minimum Depth (Feet)</u> | <u>Erosion Protection</u> |
| Trib 1                                     | 9.76                   | 5.0                      | Trapezoidal 6' bottom | 3H:1V              | 2.0                         | Vegetation                |
| Trib 2                                     | 5.26                   | 11.0                     | Trapezoidal 6' bottom | 3H:1V              | 2.0                         | Vegetation                |
| Trib 3                                     | 0.11                   | 11.0                     | Trapezoidal 6' bottom | 3H:1V              | 2.0                         | Vegetation                |
| Trib 4                                     | 0.05                   | 16.0                     | Trapezoidal 6' bottom | 3H:1V              | 2.0                         | Vegetation                |
| Trib 5                                     | 0.09                   | 4.0                      | Trapezoidal 6' bottom | 3H:1V              | 2.0                         | Vegetation                |
| Trib 6                                     | 0.15                   | 6.0                      | Trapezoidal 6' bottom | 3H:1V              | 2.0                         | Vegetation                |

## **Terrace Ditches**

A series of terrace ditches will be constructed across the face of the West Taylor Fill which reports surface water runoff to the West Taylor Pond. The locations of terrace ditches are shown on Map 12. The terrace ditches on the West Taylor Fill will originate near the even 100-foot post mining contours of 7600', 7700', and 7800' elevations on the fill face. Actual on the ground topography will dictate the final placement and profile of the terrace ditches to ensure proper water flow.

The function of the terrace ditches is collect surface flows and direct the flow to the permanent post mine channels (East and West Fork Taylor Ditches) on the outer edges of the West Taylor Fill. The design basis for these terrace ditches is the 100-year, 24-hours event as they will be permanent in the post mine topography, and the 100-year 24-hour storm provides a conservative design.

A summary of the configurations for each terrace ditch is provided on the table below.

| <b><u>Terrace Ditch</u></b>   |                                |                                  |                         |                                   |                                     |                               |
|-------------------------------|--------------------------------|----------------------------------|-------------------------|-----------------------------------|-------------------------------------|-------------------------------|
| <u>Terrace<br/>Ditch Name</u> | <u>Peak<br/>Flow<br/>(CFS)</u> | <u>Average<br/>Slope<br/>(%)</u> | <u>Channel<br/>Type</u> | <u>Side Slopes</u>                | <u>Minimum<br/>Depth<br/>(Feet)</u> | <u>Erosion<br/>Protection</u> |
| 7600'                         | 1.23                           | 1.5                              | Triangular              | Left - 1.5H:1V<br>Right - 3.0H:1V | 3.0                                 | Vegetation                    |
| 7700'                         | 2.24                           | 1.5                              | Triangular              | Left - 1.5H:1V<br>Right - 3.0H:1V | 3.0                                 | Vegetation                    |
| West 7800'                    | 0.58                           | 1.5                              | Triangular              | Left - 1.5H:1V<br>Right - 3.0H:1V | 3.0                                 | Vegetation                    |
| East 7800'                    | 0.92                           | 1.5                              | Triangular              | Left - 1.5H:1V<br>Right - 3.0H:1V | 3.0                                 | Vegetation                    |

# **West Taylor Pond** **10 Yr - 24 Hr Strom Event**

***Effluent Demonstration***  
***Post Mining***

Tony Tennyson

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## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 10 yr - 24 hr |
| Rainfall Depth: | 1.800 inches  |

### ***Particle Size Distribution:***

| Size (mm) | Colowyo Particle Size |
|-----------|-----------------------|
| 4.7500    | 100.000%              |
| 0.0750    | 73.000%               |
| 0.0400    | 33.000%               |
| 0.0010    | 20.000%               |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                              |
|---------|--------|--------------|--------|---------------|---------|------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below West Taylor Pond              |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | West Taylor Pond                         |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above West Taylor Pond              |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | 0+00 to WFSP-1 West Fork Taylor Ditch    |
| Pond    | #5     | ==>          | #4     | 0.000         | 0.000   | WFSP-1 Stock Pond                        |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Channel WFSP-1 to WFSP-2                 |
| Pond    | #7     | ==>          | #6     | 0.000         | 0.000   | WFSP-2 Stockpond                         |
| Channel | #8     | ==>          | #7     | 0.000         | 0.000   | WFSP-2 to Station 40+00                  |
| Null    | #9     | ==>          | #8     | 0.000         | 0.000   | Null Confluence Trib 1                   |
| Channel | #10    | ==>          | #9     | 0.000         | 0.000   | Trib 1                                   |
| Channel | #11    | ==>          | #9     | 0.000         | 0.000   | West Fork Station 40+00 to 83+05         |
| Null    | #13    | ==>          | #4     | 0.000         | 0.000   | Null Confluence West 7800' Terrace Ditch |
| Channel | #14    | ==>          | #13    | 0.000         | 0.000   | West 7800' Terrace Ditch                 |
| Null    | #15    | ==>          | #4     | 0.000         | 0.000   | Null 7700' Terrace Ditch                 |
| Channel | #16    | ==>          | #15    | 0.000         | 0.000   | 7700' Terrace Ditch                      |
| Channel | #17    | ==>          | #3     | 0.000         | 0.000   | East Fork Taylor Ditch 0+00 to EFSP-1    |
| Null    | #18    | ==>          | #17    | 0.000         | 0.000   | Null 7600' Terrace Ditch                 |
| Channel | #19    | ==>          | #18    | 0.000         | 0.000   | 7600' Terrace Ditch                      |
| Null    | #20    | ==>          | #17    | 0.000         | 0.000   | Null 7800' Terrace Ditch                 |
| Channel | #21    | ==>          | #20    | 0.000         | 0.000   | East 7800' Terrace Ditch                 |
| Pond    | #22    | ==>          | #17    | 0.000         | 0.000   | EFSP-1 Stock Pond                        |
| Channel | #23    | ==>          | #22    | 0.000         | 0.000   | EFSP-1 to EFSP-2 Veg Channel             |
| Pond    | #24    | ==>          | #23    | 0.000         | 0.000   | EFSP-2 Stockpond                         |
| Channel | #25    | ==>          | #24    | 0.000         | 0.000   | EFSP-2 to Station 124+03                 |
| Null    | #26    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 2                   |
| Channel | #27    | ==>          | #26    | 0.000         | 0.000   | Trib 2                                   |
| Null    | #28    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 3                   |
| Channel | #29    | ==>          | #28    | 0.000         | 0.000   | Trib 3                                   |
| Null    | #30    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 5                   |
| Channel | #31    | ==>          | #30    | 0.000         | 0.000   | Trib 5                                   |
| Null    | #32    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 4                   |
| Channel | #33    | ==>          | #32    | 0.000         | 0.000   | Trib 4                                   |
| Null    | #34    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 6                   |
| Channel | #35    | ==>          | #34    | 0.000         | 0.000   | Trib 6                                   |

 #35  
Chan'l

|  |                                                                                     |               |
|--|-------------------------------------------------------------------------------------|---------------|
|  |  | #34<br>Null   |
|  |  | #33<br>Chan'l |
|  |  | #32<br>Null   |
|  |  | #31<br>Chan'l |
|  |  | #30<br>Null   |
|  |  | #29<br>Chan'l |
|  |  | #28<br>Null   |
|  |  | #27<br>Chan'l |
|  |  | #26<br>Null   |
|  |    | #25<br>Chan'l |
|  |    | #24<br>Pond   |
|  |  | #23<br>Chan'l |
|  |  | #22<br>Pond   |
|  |  | #21<br>Chan'l |
|  |  | #20<br>Null   |
|  |  | #19<br>Chan'l |
|  |  | #18<br>Null   |
|  |  | #17<br>Chan'l |
|  |  | #16<br>Chan'l |
|  |  | #15<br>Null   |
|  |  | #14<br>Chan'l |
|  |  | #13<br>Null   |

|                                                                                   |                                                                                     |               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #11<br>Chan'l |
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |  | #9<br>Null    |
|                                                                                   |    | #8<br>Chan'l  |
|                                                                                   |    | #7<br>Pond    |
|                                                                                   |    | #6<br>Chan'l  |
|                                                                                   |    | #5<br>Pond    |
|                                                                                   |    | #4<br>Chan'l  |
|                                                                                   |    | #3<br>Null    |
|  |                                                                                     | #2<br>Pond    |
| #1<br>Null                                                                        |                                                                                     |               |

### ***Structure Summary:***

|     | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) | Sediment<br>(tons) | Peak<br>Sediment<br>Conc.<br>(mg/l) | Peak<br>Settleable<br>Conc.<br>(ml/l) | 24VW<br>(ml/l) |
|-----|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|--------------------|-------------------------------------|---------------------------------------|----------------|
| #35 | 31.000                                    | 31.000                                | 0.15                       | 0.10                                 | 0.0                | 272                                 | 0.14                                  | 0.12           |
| #34 | 0.000                                     | 31.000                                | 0.15                       | 0.10                                 | 0.0                | 272                                 | 0.14                                  | 0.12           |
| #33 | 6.600                                     | 6.600                                 | 0.05                       | 0.03                                 | 0.0                | 442                                 | 0.25                                  | 0.19           |
| #32 | 0.000                                     | 6.600                                 | 0.05                       | 0.03                                 | 0.0                | 442                                 | 0.25                                  | 0.19           |
| #31 | 18.800                                    | 18.800                                | 0.09                       | 0.06                                 | 0.0                | 82                                  | 0.04                                  | 0.03           |
| #30 | 0.000                                     | 18.800                                | 0.09                       | 0.06                                 | 0.0                | 82                                  | 0.04                                  | 0.03           |
| #29 | 14.000                                    | 14.000                                | 0.11                       | 0.06                                 | 0.0                | 388                                 | 0.22                                  | 0.17           |
| #28 | 0.000                                     | 14.000                                | 0.11                       | 0.06                                 | 0.0                | 388                                 | 0.22                                  | 0.17           |
| #27 | 25.100                                    | 25.100                                | 5.26                       | 0.44                                 | 35.1               | 139,589                             | 79.56                                 | 32.31          |
| #26 | 0.000                                     | 25.100                                | 5.26                       | 0.44                                 | 35.1               | 139,589                             | 79.56                                 | 32.31          |
| #25 | 129.200                                   | 224.700                               | 5.87                       | 1.14                                 | 36.8               | 130,836                             | 74.48                                 | 13.08          |
| #24 | In<br>Out                                 | 0.000                                 | 224.700                    | 5.87                                 | 36.8               | 130,836                             | 74.48                                 | 13.08          |
|     |                                           |                                       |                            | 0.00                                 | 36.8               | 0                                   | 0.00                                  | 0.00           |
| #23 | 141.900                                   | 366.600                               | 51.68                      | 3.87                                 | 721.1              | 262,703                             | 152.82                                | 70.37          |
| #22 | In<br>Out                                 | 0.000                                 | 366.600                    | 51.68                                | 721.1              | 262,703                             | 152.82                                | 70.37          |
|     |                                           |                                       |                            | 3.88                                 | 0.0                | 1,440                               | 0.00                                  | 0.00           |
| #21 | 3.000                                     | 3.000                                 | 0.02                       | 0.01                                 | 0.0                | 300                                 | 0.17                                  | 0.14           |
| #20 | 0.000                                     | 3.000                                 | 0.02                       | 0.01                                 | 0.0                | 300                                 | 0.17                                  | 0.14           |
| #19 | 4.000                                     | 4.000                                 | 0.03                       | 0.02                                 | 0.0                | 484                                 | 0.28                                  | 0.21           |
| #18 | 0.000                                     | 4.000                                 | 0.03                       | 0.02                                 | 0.0                | 484                                 | 0.28                                  | 0.21           |
| #17 | 35.100                                    | 408.700                               | 5.93                       | 3.14                                 | 72.1               | 243,349                             | 138.65                                | 9.77           |
| #16 | 7.300                                     | 7.300                                 | 0.06                       | 0.03                                 | 0.0                | 519                                 | 0.30                                  | 0.22           |
| #15 | 0.000                                     | 7.300                                 | 0.06                       | 0.03                                 | 0.0                | 519                                 | 0.30                                  | 0.22           |
| #14 | 1.900                                     | 1.900                                 | 0.01                       | 0.00                                 | 0.0                | 1,577                               | 0.90                                  | 0.84           |
| #13 | 0.000                                     | 1.900                                 | 0.01                       | 0.00                                 | 0.0                | 1,577                               | 0.90                                  | 0.84           |
| #11 | 181.300                                   | 181.300                               | 6.03                       | 0.80                                 | 7.7                | 19,417                              | 10.00                                 | 3.63           |
| #10 | 64.500                                    | 64.500                                | 9.76                       | 1.17                                 | 50.6               | 144,085                             | 80.80                                 | 17.35          |
| #9  | 0.000                                     | 245.800                               | 14.49                      | 1.97                                 | 58.3               | 140,530                             | 77.96                                 | 11.81          |
| #8  | 13.300                                    | 259.100                               | 20.88                      | 2.46                                 | 117.3              | 138,841                             | 78.08                                 | 19.11          |
| #7  | In<br>Out                                 | 0.000                                 | 259.100                    | 20.88                                | 117.3              | 138,841                             | 78.08                                 | 19.11          |
|     |                                           |                                       |                            | 1.55                                 | 0.0                | 1                                   | 0.00                                  | 0.00           |
| #6  | 94.500                                    | 353.600                               | 18.47                      | 2.93                                 | 83.7               | 73,639                              | 39.85                                 | 11.70          |
| #5  | In<br>Out                                 | 0.000                                 | 353.600                    | 18.47                                | 83.7               | 73,639                              | 39.85                                 | 11.70          |
|     |                                           |                                       |                            | 2.04                                 | 0.0                | 0                                   | 0.00                                  | 0.00           |
| #4  | 35.400                                    | 398.200                               | 3.81                       | 1.97                                 | 22.3               | 122,943                             | 70.07                                 | 5.98           |
| #3  | 0.000                                     | 806.900                               | 9.74                       | 5.10                                 | 94.3               | 197,690                             | 112.65                                | 8.51           |
| #2  | In<br>Out                                 | 27.600                                | 834.500                    | 9.74                                 | 94.3               | 197,690                             | 112.65                                | 8.51           |
|     |                                           |                                       |                            | 4.76                                 | 0.0                | 0                                   | 0.00                                  | 0.00           |
| #1  | 0.000                                     | 834.500                               | 4.76                       | 3.98                                 | 0.0                | 0                                   | 0.00                                  | 0.00           |

***Particle Size Distribution(s) at Each Structure******Structure #35 (Trib 6):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 94.402%  |
| 0.0400    | 42.675%  |
| 0.0010    | 25.864%  |

***Structure #34 (Null Confluence Trib 6):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 94.402%  |
| 0.0400    | 42.675%  |
| 0.0010    | 25.864%  |

***Structure #33 (Trib 4):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #32 (Null Confluence Trib 4):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #31 (Trib 5):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 94.602%  |
| 0.0400    | 42.765%  |
| 0.0010    | 25.918%  |

### ***Structure #30 (Null Confluence Trib 5):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 94.602%  |
| 0.0400    | 42.765%  |
| 0.0010    | 25.918%  |

### ***Structure #29 (Trib 3):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #28 (Null Confluence Trib 3):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #27 (Trib 2):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

### ***Structure #26 (Null Confluence Trib 2):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |

| Size (mm) | In/Out  |
|-----------|---------|
| 0.0750    | 73.000% |
| 0.0400    | 33.000% |
| 0.0010    | 20.000% |

***Structure #25 (EFSP-2 to Station 124+03):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.202%  |
| 0.0400    | 33.098%  |
| 0.0010    | 20.059%  |

***Structure #24 (EFSP-2 Stockpond):***

| Size (mm) | In       | Out    |
|-----------|----------|--------|
| 4.7500    | 100.000% | 0.000% |
| 0.0750    | 73.202%  | 0.000% |
| 0.0400    | 33.098%  | 0.000% |
| 0.0010    | 20.059%  | 0.000% |

***Structure #23 (EFSP-1 to EFSP-2 Veg Channel):***

| Size (mm) | In/Out  |
|-----------|---------|
| 4.7500    | 94.894% |
| 0.0750    | 69.273% |
| 0.0400    | 31.315% |
| 0.0010    | 18.979% |

***Structure #22 (EFSP-1 Stock Pond):***

| Size (mm) | In      | Out      |
|-----------|---------|----------|
| 4.7500    | 94.894% | 100.000% |
| 0.0750    | 69.273% | 100.000% |
| 0.0400    | 31.315% | 100.000% |
| 0.0010    | 18.979% | 100.000% |

***Structure #21 (East 7800' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |

| Size (mm) | In/Out  |
|-----------|---------|
| 0.0400    | 33.000% |
| 0.0010    | 20.000% |

***Structure #20 (Null 7800' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #19 (7600' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #18 (Null 7600' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #17 (East Fork Taylor Ditch 0+00 to EFSP-1):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.009%  |
| 0.0400    | 33.023%  |
| 0.0010    | 20.028%  |

***Structure #16 (7700' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |

| Size (mm) | In/Out  |
|-----------|---------|
| 0.0010    | 20.000% |

***Structure #15 (Null 7700' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #14 (West 7800' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #13 (Null Confluence West 7800' Terrace Ditch):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.000%  |
| 0.0010    | 20.000%  |

***Structure #11 (West Fork Station 40+00 to 83+05):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 90.487%  |
| 0.0400    | 40.905%  |
| 0.0010    | 24.791%  |

***Structure #10 (Trib 1):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 75.913%  |
| 0.0400    | 34.317%  |
| 0.0010    | 20.798%  |

**Structure #9 (Null Confluence Trib 1):**

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 77.838%  |
| 0.0400    | 35.187%  |
| 0.0010    | 21.326%  |

**Structure #8 (WFSP-2 to Station 40+00):**

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 75.404%  |
| 0.0400    | 34.087%  |
| 0.0010    | 20.659%  |

**Structure #7 (WFSP-2 Stockpond):**

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 75.404%  | 100.000% |
| 0.0400    | 34.087%  | 100.000% |
| 0.0010    | 20.659%  | 100.000% |

**Structure #6 (Channel WFSP-1 to WFSP-2):**

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 82.148%  |
| 0.0400    | 37.135%  |
| 0.0010    | 22.506%  |

**Structure #5 (WFSP-1 Stock Pond):**

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 82.148%  | 100.000% |
| 0.0400    | 37.135%  | 100.000% |
| 0.0010    | 22.506%  | 100.000% |

**Structure #4 (0+00 to WFSP-1 West Fork Taylor Ditch):**

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.000%  |
| 0.0400    | 33.001%  |
| 0.0010    | 20.001%  |

### ***Structure #3 (Null Above West Taylor Pond):***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 73.007%  |
| 0.0400    | 33.018%  |
| 0.0010    | 20.021%  |

### ***Structure #2 (West Taylor Pond):***

| Size (mm) | In       | Out      |
|-----------|----------|----------|
| 4.7500    | 100.000% | 100.000% |
| 0.0750    | 73.007%  | 100.000% |
| 0.0400    | 33.018%  | 100.000% |
| 0.0010    | 20.021%  | 100.000% |

### ***Structure #1:***

| Size (mm) | In/Out   |
|-----------|----------|
| 4.7500    | 100.000% |
| 0.0750    | 100.000% |
| 0.0400    | 100.000% |
| 0.0010    | 100.000% |

***Structure Detail:******Structure #35 (Vegetated Channel)******Trib 6***

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 6.0       | D, B               | 1.78                 |                      |                         | 6.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 0.15 cfs                              |                                      | 0.15 cfs                             |                                     |
| Depth:                 | 0.07 ft                               | 1.85 ft                              | 0.22 ft                              | 2.00 ft                             |
| Top Width:             | 6.43 ft                               | 17.11 ft                             | 7.30 ft                              | 17.98 ft                            |
| Velocity:              | 0.33 fps                              |                                      | 0.10 fps                             |                                     |
| X-Section Area:        | 0.45 sq ft                            |                                      | 1.44 sq ft                           |                                     |
| Hydraulic Radius:      | 0.069 ft                              |                                      | 0.195 ft                             |                                     |
| Froude Number:         | 0.22                                  |                                      | 0.04                                 |                                     |
| Roughness Coefficient: | 0.1846                                |                                      | 1.1808                               |                                     |

***Structure #34 (Null)******Null Confluence Trib 6******Structure #33 (Vegetated Channel)******Trib 4***

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 16.0      | D, B               | 1.88                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.05 cfs                              |                                      | 0.05 cfs                             |                                     |
| Depth:                    | 0.03 ft                               | 1.91 ft                              | 0.12 ft                              | 2.00 ft                             |
| Top Width:                | 6.20 ft                               | 17.48 ft                             | 6.70 ft                              | 17.98 ft                            |
| Velocity:                 | 0.24 fps                              |                                      | 0.07 fps                             |                                     |
| X-Section Area:           | 0.21 sq ft                            |                                      | 0.74 sq ft                           |                                     |
| Hydraulic Radius:         | 0.033 ft                              |                                      | 0.109 ft                             |                                     |
| Froude Number:            | 0.23                                  |                                      | 0.04                                 |                                     |
| Roughness<br>Coefficient: | 0.2544                                |                                      | 1.9965                               |                                     |

Structure #32 (Null)

Null Confluence Trib 4

Structure #31 (Vegetated Channel)

Trib 5

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 6.00                 | 3.0:1                      | 3.0:1                       | 4.0       | D, B                  | 1.79                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.09 cfs                              |                                      | 0.09 cfs                             |                                     |
| Depth:                    | 0.07 ft                               | 1.86 ft                              | 0.21 ft                              | 2.00 ft                             |
| Top Width:                | 6.40 ft                               | 17.14 ft                             | 7.27 ft                              | 18.01 ft                            |
| Velocity:                 | 0.22 fps                              |                                      | 0.06 fps                             |                                     |
| X-Section Area:           | 0.41 sq ft                            |                                      | 1.40 sq ft                           |                                     |
| Hydraulic Radius:         | 0.064 ft                              |                                      | 0.191 ft                             |                                     |
| Froude Number:            | 0.15                                  |                                      | 0.03                                 |                                     |
| Roughness<br>Coefficient: | 0.2150                                |                                      | 1.5359                               |                                     |

Structure #30 (Null)

Null Confluence Trib 5

Structure #29 (Vegetated Channel)

*Trib 3*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 11.0      | D, B               | 1.84                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 0.11 cfs                              |                                      | 0.11 cfs                             |                                     |
| Depth:                 | 0.05 ft                               | 1.89 ft                              | 0.16 ft                              | 2.00 ft                             |
| Top Width:             | 6.31 ft                               | 17.35 ft                             | 6.97 ft                              | 18.01 ft                            |
| Velocity:              | 0.33 fps                              |                                      | 0.10 fps                             |                                     |
| X-Section Area:        | 0.32 sq ft                            |                                      | 1.05 sq ft                           |                                     |
| Hydraulic Radius:      | 0.051 ft                              |                                      | 0.150 ft                             |                                     |
| Froude Number:         | 0.26                                  |                                      | 0.05                                 |                                     |
| Roughness Coefficient: | 0.2033                                |                                      | 1.3743                               |                                     |

Structure #28 (Null)

*Null Confluence Trib 3*

Structure #27 (Vegetated Channel)

*Trib 2*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 11.0      | D, B               | 1.49                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                   | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|-------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge: | 5.26 cfs                              |                                      | 5.26 cfs                             |                                     |
| Depth:            | 0.27 ft                               | 1.76 ft                              | 0.51 ft                              | 2.00 ft                             |
| Top Width:        | 7.61 ft                               | 16.55 ft                             | 9.08 ft                              | 18.02 ft                            |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 2.88 fps                              |                                      | 1.36 fps                             |                                     |
| X-Section Area:           | 1.82 sq ft                            |                                      | 3.88 sq ft                           |                                     |
| Hydraulic Radius:         | 0.237 ft                              |                                      | 0.419 ft                             |                                     |
| Froude Number:            | 1.04                                  |                                      | 0.37                                 |                                     |
| Roughness<br>Coefficient: | 0.0655                                |                                      | 0.2036                               |                                     |

### Structure #26 (Null)

*Null Confluence Trib 2*

### Structure #25 (Vegetated Channel)

*EFSP-2 to Station 124+03*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 4.7       | D, B                  | 3.45                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 5.87 cfs                              |                                      | 5.87 cfs                             |                                     |
| Depth:                    | 0.27 ft                               | 3.72 ft                              | 0.55 ft                              | 4.00 ft                             |
| Top Width:                | 13.62 ft                              | 34.32 ft                             | 15.28 ft                             | 35.98 ft                            |
| Velocity:                 | 1.70 fps                              |                                      | 0.79 fps                             |                                     |
| X-Section Area:           | 3.46 sq ft                            |                                      | 7.45 sq ft                           |                                     |
| Hydraulic Radius:         | 0.252 ft                              |                                      | 0.482 ft                             |                                     |
| Froude Number:            | 0.59                                  |                                      | 0.20                                 |                                     |
| Roughness<br>Coefficient: | 0.0755                                |                                      | 0.2515                               |                                     |

### Structure #24 (Pond)

*EFSP-2 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 92.00 ft   |
| Initial Pool:      | 0.15 ac-ft |

|                    |            |
|--------------------|------------|
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

### Straight Pipe

| Barrel<br>Diameter<br>(in) | Barrel<br>Length<br>(ft) | Barrel<br>Slope (%) | Manning's<br>n | Spillway<br>Elev (ft) | Entrance<br>Loss<br>Coefficient | Tailwater<br>Depth<br>(ft) |
|----------------------------|--------------------------|---------------------|----------------|-----------------------|---------------------------------|----------------------------|
| 12.00                      | 100.00                   | 1.50                | 0.0150         | 98.00                 | 0.50                            | 0.00                       |

### Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 100.00        | 20.00                | 2.00:1            | 2.00:1             | 10.00                |

### Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 97.85 ft  |
| H'graph Detention Time: | 0.00 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.00 days |
| Trap Efficiency:        | 0.00 %    |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              | Top of Sed. Storage      |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 97.85     | 0.296        | 1.285               | 0.000              | 0.00 Peak Stage          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #1              |
| 99.00     | 0.339        | 1.649               | 2.094              |                          |
| 100.00    | 0.380        | 2.008               | 4.263              | Spillway #2              |
| 101.00    | 0.554        | 2.473               | 30.516             |                          |
| 102.00    | 0.761        | 3.127               | 98.736             |                          |
| 103.00    | 1.000        | 4.005               | 207.246            |                          |

### Detailed Discharge Table

| Elevation (ft) | Straight Pipe (cfs) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|---------------------|--------------------------|--------------------------------|
| 90.00          | 0.000               | 0.000                    | 0.000                          |
| 91.00          | 0.000               | 0.000                    | 0.000                          |
| 92.00          | 0.000               | 0.000                    | 0.000                          |
| 93.00          | 0.000               | 0.000                    | 0.000                          |
| 94.00          | 0.000               | 0.000                    | 0.000                          |
| 95.00          | 0.000               | 0.000                    | 0.000                          |
| 96.00          | 0.000               | 0.000                    | 0.000                          |
| 97.00          | 0.000               | 0.000                    | 0.000                          |
| 98.00          | 0.000               | 0.000                    | 0.000                          |
| 99.00          | (3)>2.094           | 0.000                    | 2.094                          |
| 100.00         | (5)>4.263           | 0.000                    | 4.263                          |
| 101.00         | (6)>5.033           | 25.483                   | 30.516                         |
| 102.00         | (6)>5.701           | 93.036                   | 98.736                         |
| 103.00         | (6)>6.275           | 200.972                  | 207.246                        |

### Structure #23 (Vegetated Channel)

#### *EFSP-1 to EFSP-2 Veg Channel*

Trapezoidal Vegetated Channel Inputs:

#### Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.5       | D, B               | 2.51                 |                      |                         | 7.0                     |

#### Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 51.68 cfs                       |                                | 51.68 cfs                      |                               |
| Depth:                 | 0.95 ft                         | 3.46 ft                        | 1.49 ft                        | 4.00 ft                       |
| Top Width:             | 17.69 ft                        | 32.75 ft                       | 20.96 ft                       | 36.02 ft                      |
| Velocity:              | 3.67 fps                        |                                | 2.10 fps                       |                               |
| X-Section Area:        | 14.09 sq ft                     |                                | 24.60 sq ft                    |                               |
| Hydraulic Radius:      | 0.783 ft                        |                                | 1.147 ft                       |                               |
| Froude Number:         | 0.72                            |                                | 0.34                           |                               |
| Roughness Coefficient: | 0.0422                          |                                | 0.0952                         |                               |

## Structure #22 (Pond)

### EFSP-1 Stock Pond

#### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 92.00 ft   |
| Initial Pool:      | 0.15 ac-ft |
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 20.00 %    |

*\*No sediment capacity defined*

### Straight Pipe

| Barrel<br>Diameter<br>(in) | Barrel<br>Length<br>(ft) | Barrel<br>Slope (%) | Manning's<br>n | Spillway<br>Elev (ft) | Entrance<br>Loss<br>Coefficient | Tailwater<br>Depth<br>(ft) |
|----------------------------|--------------------------|---------------------|----------------|-----------------------|---------------------------------|----------------------------|
| 12.00                      | 100.00                   | 1.50                | 0.0150         | 98.00                 | 0.50                            | 0.00                       |

### Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 100.00        | 20.00                | 2.00:1            | 2.00:1             | 10.00                |

#### Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 99.82 ft  |
| H'graph Detention Time: | 3.11 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.87 days |
| Trap Efficiency:        | 100.00 %  |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              | Top of Sed. Storage      |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #1              |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 99.00     | 0.339        | 1.649               | 2.094              | 15.05                    |
| 99.82     | 0.373        | 1.945               | 3.878              | 5.80 Peak Stage          |
| 100.00    | 0.380        | 2.008               | 4.263              | Spillway #2              |
| 101.00    | 0.554        | 2.473               | 30.516             |                          |
| 102.00    | 0.761        | 3.127               | 98.736             |                          |
| 103.00    | 1.000        | 4.005               | 207.246            |                          |

### Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (5)>4.263              | 0.000                       | 4.263                                   |
| 101.00            | (6)>5.033              | 25.483                      | 30.516                                  |
| 102.00            | (6)>5.701              | 93.036                      | 98.736                                  |
| 103.00            | (6)>6.275              | 200.972                     | 207.246                                 |

### Structure #21 (Vegetated Channel)

#### *East 7800' Terrace Ditch*

Triangular Vegetated Channel Inputs:

#### Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  |                         |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.02 cfs                              |                                      | 0.02 cfs                             |                                     |
| Depth:                    | 0.22 ft                               |                                      | 0.51 ft                              |                                     |
| Top Width:                | 0.99 ft                               |                                      | 2.31 ft                              |                                     |
| Velocity:                 | 0.21 fps                              |                                      | 0.04 fps                             |                                     |
| X-Section Area:           | 0.11 sq ft                            |                                      | 0.59 sq ft                           |                                     |
| Hydraulic Radius:         | 0.101 ft                              |                                      | 0.234 ft                             |                                     |
| Froude Number:            | 0.11                                  |                                      | 0.01                                 |                                     |
| Roughness<br>Coefficient: | 0.1901                                |                                      | 1.8047                               |                                     |

### Structure #20 (Null)

*Null 7800' Terrace Ditch*

### Structure #19 (Vegetated Channel)

*7600' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 2.45                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.03 cfs                              |                                      | 0.03 cfs                             |                                     |
| Depth:                    | 0.24 ft                               | 2.69 ft                              | 0.55 ft                              | 3.00 ft                             |
| Top Width:                | 1.08 ft                               | 12.11 ft                             | 2.46 ft                              | 13.49 ft                            |
| Velocity:                 | 0.23 fps                              |                                      | 0.04 fps                             |                                     |
| X-Section Area:           | 0.13 sq ft                            |                                      | 0.67 sq ft                           |                                     |
| Hydraulic Radius:         | 0.110 ft                              |                                      | 0.250 ft                             |                                     |
| Froude Number:            | 0.12                                  |                                      | 0.02                                 |                                     |
| Roughness<br>Coefficient: | 0.1786                                |                                      | 1.6044                               |                                     |

### Structure #18 (Null)

*Null 7600' Terrace Ditch*

### Structure #17 (Riprap Channel)

### *East Fork Taylor Ditch 0+00 to EFSP-1*

#### Trapezoidal Riprap Channel Inputs:

##### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 25.0      | 3.96                 |                      |                         |

#### Riprap Channel Results:

##### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 5.93 cfs      |              |
| Depth:            | 0.04 ft       | 4.00 ft      |
| Top Width:        | 12.21 ft      | 35.97 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 0.43 sq ft    |              |
| Hydraulic Radius: | 0.035 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #16 (Vegetated Channel)

#### *7700' Terrace Ditch*

#### Triangular Vegetated Channel Inputs:

##### Material: Smooth brome

| Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 1.5:1                | 3.0:1                 | 1.5       | D, B               | 2.38                 |                      |                         | 7.0                     |

#### Vegetated Channel Results:

|                   | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|-------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge: | 0.06 cfs                        |                                | 0.06 cfs                       |                               |
| Depth:            | 0.29 ft                         | 2.67 ft                        | 0.62 ft                        | 3.00 ft                       |
| Top Width:        | 1.29 ft                         | 12.00 ft                       | 2.81 ft                        | 13.52 ft                      |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 0.30 fps                              |                                      | 0.06 fps                             |                                     |
| X-Section Area:           | 0.19 sq ft                            |                                      | 0.88 sq ft                           |                                     |
| Hydraulic Radius:         | 0.131 ft                              |                                      | 0.285 ft                             |                                     |
| Froude Number:            | 0.14                                  |                                      | 0.02                                 |                                     |
| Roughness<br>Coefficient: | 0.1569                                |                                      | 1.2529                               |                                     |

Structure #15 (Null)

*Null 7700' Terrace Ditch*

Structure #14 (Vegetated Channel)

*West 7800' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 2.54                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.01 cfs                              |                                      | 0.01 cfs                             |                                     |
| Depth:                    | 0.19 ft                               | 2.73 ft                              | 0.46 ft                              | 3.00 ft                             |
| Top Width:                | 0.87 ft                               | 12.30 ft                             | 2.09 ft                              | 13.52 ft                            |
| Velocity:                 | 0.17 fps                              |                                      | 0.03 fps                             |                                     |
| X-Section Area:           | 0.08 sq ft                            |                                      | 0.48 sq ft                           |                                     |
| Hydraulic Radius:         | 0.088 ft                              |                                      | 0.212 ft                             |                                     |
| Froude Number:            | 0.10                                  |                                      | 0.01                                 |                                     |
| Roughness<br>Coefficient: | 0.2097                                |                                      | 2.1769                               |                                     |

Structure #13 (Null)

*Null Confluence West 7800' Terrace Ditch*

Structure #11 (Vegetated Channel)

*West Fork Station 40+00 to 83+05*

Trapezoidal Vegetated Channel Inputs:

Material: Bermuda grass

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 8.0       | D, B               | 3.53                 |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 6.03 cfs                        |                                | 6.03 cfs                       |                               |
| Depth:                 | 0.23 ft                         | 3.76 ft                        | 0.47 ft                        | 4.00 ft                       |
| Top Width:             | 13.39 ft                        | 34.57 ft                       | 14.80 ft                       | 35.98 ft                      |
| Velocity:              | 2.05 fps                        |                                | 0.97 fps                       |                               |
| X-Section Area:        | 2.95 sq ft                      |                                | 6.24 sq ft                     |                               |
| Hydraulic Radius:      | 0.219 ft                        |                                | 0.418 ft                       |                               |
| Froude Number:         | 0.77                            |                                | 0.26                           |                               |
| Roughness Coefficient: | 0.0745                          |                                | 0.2437                         |                               |

Structure #10 (Vegetated Channel)

*Trib 1*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 5.0       | D, B               | 1.21                 |                      |                         | 7.0                     |

Vegetated Channel Results:

|                   | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|-------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge: | 9.76 cfs                        |                                | 9.76 cfs                       |                               |
| Depth:            | 0.44 ft                         | 1.65 ft                        | 0.79 ft                        | 2.00 ft                       |
| Top Width:        | 8.65 ft                         | 15.91 ft                       | 10.75 ft                       | 18.01 ft                      |
| Velocity:         | 3.02 fps                        |                                | 1.47 fps                       |                               |
| X-Section Area:   | 3.23 sq ft                      |                                | 6.62 sq ft                     |                               |
| Hydraulic Radius: | 0.367 ft                        |                                | 0.602 ft                       |                               |
| Froude Number:    | 0.87                            |                                | 0.33                           |                               |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Roughness<br>Coefficient: | 0.0565                                |                                      | 0.1610                               |                                     |

### Structure #9 (Null)

*Null Confluence Trib 1*

### Structure #8 (Vegetated Channel)

*WFSP-2 to Station 40+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 1.5       | D, B                  | 2.86                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 20.88 cfs                             |                                      | 20.88 cfs                            |                                     |
| Depth:                    | 0.65 ft                               | 3.51 ft                              | 1.14 ft                              | 4.00 ft                             |
| Top Width:                | 15.89 ft                              | 33.05 ft                             | 18.84 ft                             | 36.00 ft                            |
| Velocity:                 | 2.31 fps                              |                                      | 1.19 fps                             |                                     |
| X-Section Area:           | 9.05 sq ft                            |                                      | 17.58 sq ft                          |                                     |
| Hydraulic Radius:         | 0.562 ft                              |                                      | 0.915 ft                             |                                     |
| Froude Number:            | 0.54                                  |                                      | 0.22                                 |                                     |
| Roughness<br>Coefficient: | 0.0539                                |                                      | 0.1447                               |                                     |

### Structure #7 (Pond)

*WFSP-2 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 91.00 ft   |
| Initial Pool:      | 0.06 ac-ft |
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

### Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 100.00        | 20.00                | 2.00:1            | 2.00:1             | 5.00                 |

## Straight Pipe

| Barrel<br>Diameter<br>(in) | Barrel<br>Length<br>(ft) | Barrel<br>Slope (%) | Manning's<br>n | Spillway<br>Elev (ft) | Entrance<br>Loss<br>Coefficient | Tailwater<br>Depth<br>(ft) |
|----------------------------|--------------------------|---------------------|----------------|-----------------------|---------------------------------|----------------------------|
| 12.00                      | 100.00                   | 1.00                | 0.0150         | 98.00                 | 0.90                            | 0.00                       |

## Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 98.74 ft  |
| H'graph Detention Time: | 4.83 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.69 days |
| Trap Efficiency:        | 100.00 %  |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              | Top of Sed. Storage      |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #2              |
| 98.74     | 0.329        | 1.566               | 1.549              | 16.55 Peak Stage         |
| 99.00     | 0.339        | 1.649               | 2.094              |                          |
| 100.00    | 0.380        | 2.008               | 3.745              | Spillway #1              |
| 101.00    | 0.554        | 2.473               | 18.584             |                          |
| 102.00    | 0.761        | 3.127               | 61.251             |                          |
| 103.00    | 1.000        | 4.005               | 135.506            |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Straight Pipe<br>(cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|------------------------|-----------------------------------------|
| 90.00             | 0.000                       | 0.000                  | 0.000                                   |
| 91.00             | 0.000                       | 0.000                  | 0.000                                   |
| 92.00             | 0.000                       | 0.000                  | 0.000                                   |
| 93.00             | 0.000                       | 0.000                  | 0.000                                   |
| 94.00             | 0.000                       | 0.000                  | 0.000                                   |
| 95.00             | 0.000                       | 0.000                  | 0.000                                   |
| 96.00             | 0.000                       | 0.000                  | 0.000                                   |
| 97.00             | 0.000                       | 0.000                  | 0.000                                   |
| 98.00             | 0.000                       | 0.000                  | 0.000                                   |
| 99.00             | 0.000                       | (3)>2.094              | 2.094                                   |
| 100.00            | 0.000                       | (6)>3.745              | 3.745                                   |
| 101.00            | 14.046                      | (6)>4.538              | 18.584                                  |
| 102.00            | 56.062                      | (6)>5.189              | 61.251                                  |
| 103.00            | 129.713                     | (6)>5.793              | 135.506                                 |

### Structure #6 (Vegetated Channel)

Channel WFSP-1 to WFSP-2

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 1.3       | D, B                  | 2.85                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 18.47 cfs                             |                                      | 18.47 cfs                            |                                     |
| Depth:                    | 0.64 ft                               | 3.49 ft                              | 1.15 ft                              | 4.00 ft                             |
| Top Width:                | 15.86 ft                              | 32.96 ft                             | 18.90 ft                             | 36.00 ft                            |
| Velocity:                 | 2.06 fps                              |                                      | 1.04 fps                             |                                     |
| X-Section Area:           | 8.97 sq ft                            |                                      | 17.77 sq ft                          |                                     |
| Hydraulic Radius:         | 0.558 ft                              |                                      | 0.922 ft                             |                                     |
| Froude Number:            | 0.48                                  |                                      | 0.19                                 |                                     |
| Roughness<br>Coefficient: | 0.0559                                |                                      | 0.1546                               |                                     |

### Structure #5 (Pond)

### WFSP-1 Stock Pond

#### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 91.00 ft   |
| Initial Pool:      | 0.06 ac-ft |
| *Sediment Storage: | 0.00 ac-ft |
| Dead Space:        | 0.00 %     |

*\*No sediment capacity defined*

#### Straight Pipe

| Barrel<br>Diameter<br>(in) | Barrel<br>Length<br>(ft) | Barrel<br>Slope (%) | Manning's<br>n | Spillway<br>Elev (ft) | Entrance<br>Loss<br>Coefficient | Tailwater<br>Depth<br>(ft) |
|----------------------------|--------------------------|---------------------|----------------|-----------------------|---------------------------------|----------------------------|
| 12.00                      | 100.00                   | 1.50                | 0.0150         | 98.00                 | 0.90                            | 0.00                       |

#### Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 100.00        | 20.00                | 2.00:1            | 2.00:1             | 10.00                |

#### Pond Results:

|                         |           |
|-------------------------|-----------|
| Peak Elevation:         | 98.97 ft  |
| H'graph Detention Time: | 4.97 hrs  |
| Pond Model:             | CSTRS     |
| Dewater Time:           | 0.78 days |
| Trap Efficiency:        | 100.00 %  |

*Dewatering time is calculated from peak stage to lowest spillway*

#### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              | Top of Sed. Storage      |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #1              |
| 98.97     | 0.338        | 1.640               | 2.037              | 18.70 Peak Stage         |

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 99.00     | 0.339        | 1.649               | 2.094              |                          |
| 100.00    | 0.380        | 2.008               | 4.162              | Spillway #2              |
| 101.00    | 0.554        | 2.473               | 30.351             |                          |
| 102.00    | 0.761        | 3.127               | 98.545             |                          |
| 103.00    | 1.000        | 4.005               | 207.032            |                          |

## Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (6)>4.162              | 0.000                       | 4.162                                   |
| 101.00            | (6)>4.868              | 25.483                      | 30.351                                  |
| 102.00            | (6)>5.509              | 93.036                      | 98.545                                  |
| 103.00            | (6)>6.061              | 200.972                     | 207.032                                 |

### Structure #4 (Riprap Channel)

*0+00 to WFSP-1 West Fork Taylor Ditch*

Trapezoidal Riprap Channel Inputs:

### Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 26.0      | 3.98                    |                         |                               |

Riprap Channel Results:

### Simons/OSM Method - Steep Slope Design

| w/o Freeboard     | w/ Freeboard |
|-------------------|--------------|
| Design Discharge: | 3.81 cfs     |

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Depth:            | 0.02 ft       | 4.00 ft      |
| Top Width:        | 12.12 ft      | 36.00 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 0.24 sq ft    |              |
| Hydraulic Radius: | 0.020 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 2.00 in       |              |
| D50:              | 6.00 in       |              |
| Dmax:             | 7.50 in       |              |

Velocity and Manning's n calculations may not apply for this method.

## Structure #3 (Null)

*Null Above West Taylor Pond*

## Structure #2 (Pond)

*West Taylor Pond*

Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,468.00 ft |
| Initial Pool:      | 1.76 ac-ft  |
| *Sediment Storage: | 0.00 ac-ft  |
| Dead Space:        | 20.00 %     |

*\*No sediment capacity defined*

## Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 10.50             | 18.00                | 150.00             | 2.00             | 0.0150      | 7,471.00           | 2                        |

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,475.00      | 30.00             | 2.00:1         | 2.00:1          | 30.00             |

Pond Results:

|                         |             |
|-------------------------|-------------|
| Peak Elevation:         | 7,471.56 ft |
| H'graph Detention Time: | 2.23 hrs    |
| Pond Model:             | CSTRS       |
| Dewater Time:           | 0.88 days   |
| Trap Efficiency:        | 100.00 %    |

*Dewatering time is calculated from peak stage to lowest spillway*

### Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,455.00  | 0.022        | 0.000               | 0.000              | Top of Sed. Storage      |
| 7,456.00  | 0.032        | 0.027               | 0.000              |                          |
| 7,457.00  | 0.043        | 0.064               | 0.000              |                          |
| 7,458.00  | 0.054        | 0.113               | 0.000              |                          |
| 7,459.00  | 0.066        | 0.173               | 0.000              |                          |
| 7,460.00  | 0.079        | 0.245               | 0.000              |                          |
| 7,461.00  | 0.103        | 0.336               | 0.000              |                          |
| 7,462.00  | 0.139        | 0.456               | 0.000              |                          |
| 7,463.00  | 0.162        | 0.607               | 0.000              |                          |
| 7,464.00  | 0.188        | 0.781               | 0.000              |                          |
| 7,465.00  | 0.213        | 0.981               | 0.000              |                          |
| 7,466.00  | 0.244        | 1.209               | 0.000              |                          |
| 7,467.00  | 0.279        | 1.470               | 0.000              |                          |
| 7,468.00  | 0.312        | 1.766               | 0.000              |                          |
| 7,469.00  | 0.360        | 2.102               | 0.000              |                          |
| 7,470.00  | 0.389        | 2.476               | 0.000              |                          |
| 7,471.00  | 0.430        | 2.886               | 0.000              | Spillway #1              |
| 7,471.56  | 0.447        | 3.135               | 4.756              | 21.10 Peak Stage         |
| 7,472.00  | 0.463        | 3.332               | 8.509              |                          |
| 7,473.00  | 0.503        | 3.814               | 12.033             |                          |
| 7,474.00  | 0.541        | 4.336               | 14.738             |                          |
| 7,475.00  | 0.580        | 4.897               | 17.018             | Spillway #2              |
| 7,476.00  | 0.581        | 5.477               | 83.791             |                          |
| 7,477.00  | 0.582        | 6.058               | 246.034            |                          |
| 7,478.00  | 0.583        | 6.641               | 483.806            |                          |
| 7,479.00  | 0.584        | 7.224               | 794.453            |                          |
| 7,480.00  | 0.585        | 7.809               | 1,172.300          |                          |

### Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,455.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,456.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,457.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,458.00          | 0.000             | 0.000                       | 0.000                                   |

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,459.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,460.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,461.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,462.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,463.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,464.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,465.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,466.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,467.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,468.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,469.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,470.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,471.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,472.00          | 8.509             | 0.000                       | 8.509                                   |
| 7,473.00          | 12.033            | 0.000                       | 12.033                                  |
| 7,474.00          | 14.738            | 0.000                       | 14.738                                  |
| 7,475.00          | 17.018            | 0.000                       | 17.018                                  |
| 7,476.00          | 19.026            | 64.765                      | 83.791                                  |
| 7,477.00          | 20.842            | 225.191                     | 246.034                                 |
| 7,478.00          | 22.512            | 461.294                     | 483.806                                 |
| 7,479.00          | 24.066            | 770.387                     | 794.453                                 |
| 7,480.00          | 25.526            | 1,146.774                   | 1,172.300                               |

Structure #1 (Null)*Null Below West Taylor Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #35        | 1        | 31.000         | 0.224              | 0.000        | 0.000  | 62.000       | M   | 0.15                 | 0.102                 |
|            | <b>Σ</b> | <b>31.000</b>  |                    |              |        |              |     | <b>0.15</b>          | <b>0.102</b>          |
| <b>#34</b> | <b>Σ</b> | <b>31.000</b>  |                    |              |        |              |     | <b>0.15</b>          | <b>0.102</b>          |
| #33        | 1        | 6.600          | 0.043              | 0.000        | 0.000  | 62.000       | M   | 0.05                 | 0.027                 |
|            | <b>Σ</b> | <b>6.600</b>   |                    |              |        |              |     | <b>0.05</b>          | <b>0.027</b>          |
| <b>#32</b> | <b>Σ</b> | <b>6.600</b>   |                    |              |        |              |     | <b>0.05</b>          | <b>0.027</b>          |
| #31        | 1        | 18.800         | 0.247              | 0.000        | 0.000  | 62.000       | M   | 0.09                 | 0.062                 |
|            | <b>Σ</b> | <b>18.800</b>  |                    |              |        |              |     | <b>0.09</b>          | <b>0.062</b>          |
| <b>#30</b> | <b>Σ</b> | <b>18.800</b>  |                    |              |        |              |     | <b>0.09</b>          | <b>0.062</b>          |
| #29        | 1        | 14.000         | 0.059              | 0.000        | 0.000  | 62.000       | M   | 0.11                 | 0.057                 |
|            | <b>Σ</b> | <b>14.000</b>  |                    |              |        |              |     | <b>0.11</b>          | <b>0.057</b>          |
| <b>#28</b> | <b>Σ</b> | <b>14.000</b>  |                    |              |        |              |     | <b>0.11</b>          | <b>0.057</b>          |
| #27        | 1        | 14.900         | 0.094              | 0.000        | 0.000  | 62.000       | M   | 0.11                 | 0.061                 |
|            | 2        | 10.200         | 0.050              | 0.000        | 0.000  | 80.000       | F   | 5.26                 | 0.377                 |
|            | <b>Σ</b> | <b>25.100</b>  |                    |              |        |              |     | <b>5.26</b>          | <b>0.438</b>          |
| <b>#26</b> | <b>Σ</b> | <b>25.100</b>  |                    |              |        |              |     | <b>5.26</b>          | <b>0.438</b>          |
| #25        | 1        | 128.000        | 0.877              | 0.000        | 0.000  | 62.000       | M   | 0.53                 | 0.418                 |
|            | 2        | 0.500          | 0.018              | 0.000        | 0.000  | 80.000       | F   | 0.26                 | 0.015                 |
|            | 3        | 0.700          | 0.024              | 0.000        | 0.000  | 80.000       | F   | 0.36                 | 0.022                 |
|            | <b>Σ</b> | <b>224.700</b> |                    |              |        |              |     | <b>5.87</b>          | <b>1.141</b>          |
| <b>#24</b> | <b>Σ</b> | <b>224.700</b> |                    |              |        |              |     | <b>5.87</b>          | <b>1.141</b>          |
| #23        | 1        | 2.500          | 0.021              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 89.600         | 0.104              | 0.000        | 0.000  | 80.000       | F   | 46.17                | 3.316                 |
|            | 3        | 4.900          | 0.200              | 0.000        | 0.000  | 62.000       | M   | 0.02                 | 0.016                 |
|            | 4        | 4.400          | 0.046              | 0.000        | 0.000  | 80.000       | F   | 2.27                 | 0.163                 |
|            | 5        | 34.200         | 0.063              | 0.000        | 0.000  | 62.000       | M   | 0.26                 | 0.140                 |
|            | 6        | 6.300          | 0.097              | 0.000        | 0.000  | 80.000       | F   | 3.25                 | 0.233                 |
|            | <b>Σ</b> | <b>366.600</b> |                    |              |        |              |     | <b>51.68</b>         | <b>3.868</b>          |
| <b>#22</b> | <b>Σ</b> | <b>366.600</b> |                    |              |        |              |     | <b>51.68</b>         | <b>3.868</b>          |
| #21        | 1        | 3.000          | 0.006              | 0.000        | 0.000  | 62.000       | M   | 0.02                 | 0.011                 |
|            | <b>Σ</b> | <b>3.000</b>   |                    |              |        |              |     | <b>0.02</b>          | <b>0.011</b>          |

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|--------|-------|---------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #20    | Σ     | 3.000         |                    |              |        |              |     | 0.02                 | 0.011                 |
| #19    | 1     | 4.000         | 0.016              | 0.000        | 0.000  | 62.000       | M   | 0.03                 | 0.016                 |
|        | Σ     | 4.000         |                    |              |        |              |     | 0.03                 | 0.016                 |
| #18    | Σ     | 4.000         |                    |              |        |              |     | 0.03                 | 0.016                 |
| #17    | 1     | 10.400        | 0.022              | 0.000        | 0.000  | 80.000       | M   | 5.36                 | 0.385                 |
|        | 2     | 1.100         | 0.014              | 0.000        | 0.000  | 80.000       | M   | 0.57                 | 0.041                 |
|        | 3     | 0.600         | 0.026              | 0.000        | 0.000  | 62.000       | M   | 0.00                 | 0.000                 |
|        | 4     | 0.600         | 0.020              | 0.000        | 0.000  | 62.000       | M   | 0.00                 | 0.000                 |
|        | 5     | 0.900         | 0.021              | 0.000        | 0.000  | 62.000       | M   | 0.00                 | 0.000                 |
|        | 6     | 21.500        | 0.090              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | Σ     | 408.700       |                    |              |        |              |     | 5.93                 | 3.136                 |
| #16    | 1     | 7.300         | 0.015              | 0.000        | 0.000  | 62.000       | M   | 0.06                 | 0.030                 |
|        | Σ     | 7.300         |                    |              |        |              |     | 0.06                 | 0.030                 |
| #15    | Σ     | 7.300         |                    |              |        |              |     | 0.06                 | 0.030                 |
| #14    | 1     | 1.900         | 0.008              | 0.000        | 0.000  | 62.000       | M   | 0.01                 | 0.002                 |
|        | Σ     | 1.900         |                    |              |        |              |     | 0.01                 | 0.002                 |
| #13    | Σ     | 1.900         |                    |              |        |              |     | 0.01                 | 0.002                 |
| #11    | 1     | 98.000        | 0.045              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2     | 29.600        | 0.171              | 0.000        | 0.000  | 74.000       | F   | 6.03                 | 0.621                 |
|        | 3     | 53.700        | 0.137              | 0.000        | 0.000  | 62.000       | M   | 0.27                 | 0.179                 |
|        | Σ     | 181.300       |                    |              |        |              |     | 6.03                 | 0.800                 |
| #10    | 1     | 8.600         | 0.032              | 0.000        | 0.000  | 80.000       | F   | 4.43                 | 0.318                 |
|        | 2     | 36.800        | 0.141              | 0.000        | 0.000  | 74.000       | F   | 7.57                 | 0.772                 |
|        | 3     | 19.100        | 0.105              | 0.000        | 0.000  | 62.000       | M   | 0.14                 | 0.078                 |
|        | Σ     | 64.500        |                    |              |        |              |     | 9.76                 | 1.168                 |
| #9     | Σ     | 245.800       |                    |              |        |              |     | 14.49                | 1.968                 |
| #8     | 1     | 8.600         | 0.044              | 0.000        | 0.000  | 80.000       | F   | 4.43                 | 0.318                 |
|        | 2     | 4.700         | 0.013              | 0.000        | 0.000  | 80.000       | F   | 2.42                 | 0.174                 |
|        | Σ     | 259.100       |                    |              |        |              |     | 20.88                | 2.460                 |
| #7     | Σ     | 259.100       |                    |              |        |              |     | 20.88                | 2.460                 |
| #6     | 1     | 43.000        | 0.095              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2     | 0.400         | 0.015              | 0.000        | 0.000  | 62.000       | M   | 0.00                 | 0.000                 |
|        | 3     | 1.600         | 0.020              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 4     | 1.200         | 0.022              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 5     | 11.600        | 0.051              | 0.000        | 0.000  | 80.000       | F   | 5.98                 | 0.429                 |
|        | 6     | 36.700        | 0.140              | 0.000        | 0.000  | 80.000       | F   | 14.70                | 1.310                 |

| Stru #    | SWS #    | SWS Area (ac)  | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|-----------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|           | <b>Σ</b> | <b>353.600</b> |                    |              |        |              |     | <b>18.47</b>         | <b>2.931</b>          |
| <b>#5</b> | <b>Σ</b> | <b>353.600</b> |                    |              |        |              |     | <b>18.47</b>         | <b>2.931</b>          |
| #4        | 1        | 6.400          | 0.037              | 0.000        | 0.000  | 80.000       | M   | 3.30                 | 0.237                 |
|           | 2        | 1.000          | 0.038              | 0.000        | 0.000  | 80.000       | M   | 0.52                 | 0.037                 |
|           | 3        | 2.800          | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 4        | 0.900          | 0.010              | 0.000        | 0.000  | 62.000       | M   | 0.00                 | 0.000                 |
|           | 5        | 23.300         | 0.094              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 6        | 1.000          | 0.020              | 0.000        | 0.000  | 62.000       | M   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>398.200</b> |                    |              |        |              |     | <b>3.81</b>          | <b>1.966</b>          |
| <b>#3</b> | <b>Σ</b> | <b>806.900</b> |                    |              |        |              |     | <b>9.74</b>          | <b>5.102</b>          |
| #2        | 1        | 10.500         | 0.051              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 2        | 17.100         | 0.058              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>834.500</b> |                    |              |        |              |     | <b>9.74</b>          | <b>5.102</b>          |
| <b>#1</b> | <b>Σ</b> | <b>834.500</b> |                    |              |        |              |     | <b>4.76</b>          | <b>3.981</b>          |

### Subwatershed Sedimentology Detail:

| Stru #     | SWS #    | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l) |
|------------|----------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|-------------|
| #35        | 1        | 0.300  | 400.00 | 10.00 | 0.0100 | 0.3800 | 1    | 0.0             | 272                        | 0.14                        | 0.12        |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>272</b>                 | <b>0.14</b>                 | <b>0.12</b> |
| <b>#34</b> | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>272</b>                 | <b>0.14</b>                 | <b>0.12</b> |
| #33        | 1        | 0.300  | 200.00 | 18.00 | 0.0100 | 0.3800 | 1    | 0.0             | 442                        | 0.25                        | 0.19        |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>442</b>                 | <b>0.25</b>                 | <b>0.19</b> |
| <b>#32</b> | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>442</b>                 | <b>0.25</b>                 | <b>0.19</b> |
| #31        | 1        | 0.300  | 200.00 | 5.00  | 0.0100 | 0.3800 | 1    | 0.0             | 82                         | 0.04                        | 0.03        |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>82</b>                  | <b>0.04</b>                 | <b>0.03</b> |
| <b>#30</b> | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>82</b>                  | <b>0.04</b>                 | <b>0.03</b> |
| #29        | 1        | 0.300  | 200.00 | 15.00 | 0.0100 | 0.3800 | 1    | 0.0             | 388                        | 0.22                        | 0.17        |
|            | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>388</b>                 | <b>0.22</b>                 | <b>0.17</b> |
| <b>#28</b> | <b>Σ</b> |        |        |       |        |        |      | <b>0.0</b>      | <b>388</b>                 | <b>0.22</b>                 | <b>0.17</b> |
| #27        | 1        | 0.300  | 200.00 | 11.00 | 0.0100 | 0.3800 | 1    | 0.0             | 260                        | 0.15                        | 0.11        |
|            | 2        | 0.300  | 200.00 | 12.00 | 0.8000 | 0.3800 | 1    | 35.0            | 139,589                    | 79.56                       | 37.46       |

| Stru #       | SWS # | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)  |
|--------------|-------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|--------------|
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>35.1</b>     | <b>139,589</b>             | <b>79.56</b>                | <b>32.31</b> |
| <b>#26 Σ</b> |       |        |        |       |        |        |      | <b>35.1</b>     | <b>139,589</b>             | <b>79.56</b>                | <b>32.31</b> |
| #25          | 1     | 0.300  | 400.00 | 13.00 | 0.0100 | 0.3800 | 1    | 0.2             | 493                        | 0.24                        | 0.21         |
|              | 2     | 0.300  | 100.00 | 11.00 | 0.8000 | 0.3800 | 1    | 0.7             | 63,602                     | 36.25                       | 19.81        |
|              | 3     | 0.300  | 100.00 | 9.00  | 0.8000 | 0.3800 | 1    | 0.7             | 46,634                     | 26.58                       | 13.65        |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>36.8</b>     | <b>130,836</b>             | <b>74.48</b>                | <b>13.08</b> |
| <b>#24 Σ</b> |       |        |        |       |        |        |      | <b>36.8</b>     | <b>130,836</b>             | <b>74.48</b>                | <b>13.08</b> |
| #23          | 1     | 0.300  | 150.00 | 19.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 2     | 0.300  | 400.00 | 13.00 | 0.8000 | 0.3800 | 1    | 673.5           | 286,377                    | 163.23                      | 78.55        |
|              | 3     | 0.300  | 200.00 | 1.00  | 0.0700 | 0.3800 | 1    | 0.0             | 97                         | 0.05                        | 0.04         |
|              | 4     | 0.300  | 200.00 | 6.00  | 0.8000 | 0.3800 | 1    | 5.2             | 49,425                     | 28.17                       | 13.10        |
|              | 5     | 0.300  | 400.00 | 1.60  | 0.0700 | 0.3800 | 1    | 0.0             | 256                        | 0.15                        | 0.11         |
|              | 6     | 0.300  | 200.00 | 4.30  | 0.8000 | 0.3800 | 1    | 5.6             | 37,821                     | 21.56                       | 10.00        |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>721.1</b>    | <b>262,703</b>             | <b>152.82</b>               | <b>70.37</b> |
| <b>#22 Σ</b> |       |        |        |       |        |        |      | <b>721.1</b>    | <b>262,703</b>             | <b>152.82</b>               | <b>70.37</b> |
| #21          | 1     | 0.300  | 50.00  | 26.00 | 0.0100 | 0.3800 | 1    | 0.0             | 300                        | 0.17                        | 0.14         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.0</b>      | <b>300</b>                 | <b>0.17</b>                 | <b>0.14</b>  |
| <b>#20 Σ</b> |       |        |        |       |        |        |      | <b>0.0</b>      | <b>300</b>                 | <b>0.17</b>                 | <b>0.14</b>  |
| #19          | 1     | 0.300  | 100.00 | 30.00 | 0.0100 | 0.3800 | 1    | 0.0             | 484                        | 0.28                        | 0.21         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.0</b>      | <b>484</b>                 | <b>0.28</b>                 | <b>0.21</b>  |
| <b>#18 Σ</b> |       |        |        |       |        |        |      | <b>0.0</b>      | <b>484</b>                 | <b>0.28</b>                 | <b>0.21</b>  |
| #17          | 1     | 0.300  | 200.00 | 20.00 | 0.8000 | 0.3800 | 1    | 67.4            | 251,013                    | 143.07                      | 68.49        |
|              | 2     | 0.300  | 100.00 | 25.00 | 0.8000 | 0.3800 | 1    | 4.6             | 168,220                    | 95.88                       | 45.34        |
|              | 3     | 0.300  | 100.00 | 30.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 4     | 0.300  | 100.00 | 27.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 5     | 0.300  | 100.00 | 33.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|              | 6     | 0.300  | 400.00 | 22.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>72.1</b>     | <b>243,349</b>             | <b>138.65</b>               | <b>9.77</b>  |
| #16          | 1     | 0.300  | 100.00 | 30.00 | 0.0100 | 0.3800 | 1    | 0.0             | 519                        | 0.30                        | 0.22         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.0</b>      | <b>519</b>                 | <b>0.30</b>                 | <b>0.22</b>  |
| <b>#15 Σ</b> |       |        |        |       |        |        |      | <b>0.0</b>      | <b>519</b>                 | <b>0.30</b>                 | <b>0.22</b>  |
| #14          | 1     | 0.300  | 75.00  | 30.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1,577                      | 0.90                        | 0.84         |
| <b>Σ</b>     |       |        |        |       |        |        |      | <b>0.0</b>      | <b>1,577</b>               | <b>0.90</b>                 | <b>0.84</b>  |
| <b>#13 Σ</b> |       |        |        |       |        |        |      | <b>0.0</b>      | <b>1,577</b>               | <b>0.90</b>                 | <b>0.84</b>  |

| Stru #      | SWS # | Soil K | L (ft) | S (%) | C      | P      | PS # | Sediment (tons) | Peak Sediment Conc. (mg/l) | Peak Settleable Conc (ml/l) | 24VW (ml/l)  |
|-------------|-------|--------|--------|-------|--------|--------|------|-----------------|----------------------------|-----------------------------|--------------|
| #11         | 1     | 0.300  | 200.00 | 35.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 2     | 0.300  | 400.00 | 13.00 | 0.0700 | 0.3800 | 1    | 7.5             | 19,417                     | 10.00                       | 4.56         |
|             | 3     | 0.300  | 400.00 | 20.00 | 0.0100 | 0.3800 | 1    | 0.2             | 851                        | 0.43                        | 0.36         |
| <b>Σ</b>    |       |        |        |       |        |        |      | <b>7.7</b>      | <b>19,417</b>              | <b>10.00</b>                | <b>3.63</b>  |
| #10         | 1     | 0.300  | 200.00 | 16.00 | 0.8000 | 0.3800 | 1    | 41.9            | 193,209                    | 110.12                      | 52.26        |
|             | 2     | 0.300  | 400.00 | 12.00 | 0.0700 | 0.3800 | 1    | 8.7             | 18,107                     | 9.35                        | 4.25         |
|             | 3     | 0.300  | 400.00 | 16.00 | 0.0100 | 0.3800 | 1    | 0.1             | 661                        | 0.38                        | 0.29         |
| <b>Σ</b>    |       |        |        |       |        |        |      | <b>50.6</b>     | <b>144,085</b>             | <b>80.80</b>                | <b>17.35</b> |
| <b>#9 Σ</b> |       |        |        |       |        |        |      | <b>58.3</b>     | <b>140,530</b>             | <b>77.96</b>                | <b>11.81</b> |
| #8          | 1     | 0.300  | 200.00 | 15.00 | 0.8000 | 0.3800 | 1    | 38.6            | 179,477                    | 102.30                      | 48.45        |
|             | 2     | 0.300  | 100.00 | 22.00 | 0.8000 | 0.3800 | 1    | 20.4            | 173,530                    | 98.91                       | 46.80        |
| <b>Σ</b>    |       |        |        |       |        |        |      | <b>117.3</b>    | <b>138,841</b>             | <b>78.08</b>                | <b>19.11</b> |
| <b>#7 Σ</b> |       |        |        |       |        |        |      | <b>117.3</b>    | <b>138,841</b>             | <b>78.08</b>                | <b>19.11</b> |
| #6          | 1     | 0.300  | 200.00 | 20.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 2     | 0.300  | 100.00 | 15.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 3     | 0.300  | 50.00  | 12.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 4     | 0.300  | 50.00  | 11.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 5     | 0.300  | 200.00 | 5.70  | 0.8000 | 0.3800 | 1    | 14.5            | 52,802                     | 30.10                       | 14.00        |
|             | 6     | 0.300  | 400.00 | 6.10  | 0.8000 | 0.3800 | 1    | 69.2            | 77,599                     | 41.53                       | 20.35        |
| <b>Σ</b>    |       |        |        |       |        |        |      | <b>83.7</b>     | <b>73,639</b>              | <b>39.85</b>                | <b>11.70</b> |
| <b>#5 Σ</b> |       |        |        |       |        |        |      | <b>83.7</b>     | <b>73,639</b>              | <b>39.85</b>                | <b>11.70</b> |
| #4          | 1     | 0.300  | 200.00 | 11.00 | 0.8000 | 0.3800 | 1    | 18.5            | 118,211                    | 67.38                       | 31.63        |
|             | 2     | 0.300  | 100.00 | 23.00 | 0.8000 | 0.3800 | 1    | 3.8             | 152,789                    | 87.08                       | 41.09        |
|             | 3     | 0.300  | 100.00 | 20.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 4     | 0.300  | 100.00 | 20.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 5     | 0.300  | 400.00 | 37.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 6     | 0.300  | 150.00 | 30.00 | 0.0100 | 0.3800 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>    |       |        |        |       |        |        |      | <b>22.3</b>     | <b>122,943</b>             | <b>70.07</b>                | <b>5.98</b>  |
| <b>#3 Σ</b> |       |        |        |       |        |        |      | <b>94.3</b>     | <b>197,690</b>             | <b>112.65</b>               | <b>8.51</b>  |
| #2          | 1     | 0.300  | 400.00 | 45.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
|             | 2     | 0.300  | 400.00 | 40.00 | 0.0310 | 0.9000 | 1    | 0.0             | 1                          | 0.00                        | 0.00         |
| <b>Σ</b>    |       |        |        |       |        |        |      | <b>94.3</b>     | <b>197,690</b>             | <b>112.65</b>               | <b>8.51</b>  |
| <b>#1 Σ</b> |       |        |        |       |        |        |      | <b>0.0</b>      | <b>0</b>                   | <b>0.00</b>                 | <b>0.00</b>  |

## Subwatershed Time of Concentration Details:

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture                                | 45.00     | 443.25           | 985.00            | 5.360          | 0.051        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.051</b> |
| #2        | 2        | 3. Short grass pasture                                | 40.00     | 425.60           | 1,064.00          | 5.050          | 0.058        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.058</b> |
| #4        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 11.00     | 48.95            | 445.00            | 3.310          | 0.037        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.037</b> |
| #4        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 23.00     | 49.45            | 215.00            | 4.790          | 0.012        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 5.25             | 350.00            | 3.670          | 0.026        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.038</b> |
| #4        | 3        | 3. Short grass pasture                                | 20.00     | 50.00            | 250.00            | 3.570          | 0.019        |
| <b>#4</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #4        | 4        | 3. Short grass pasture                                | 19.00     | 24.70            | 130.00            | 3.480          | 0.010        |
| <b>#4</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.010</b> |
| #4        | 5        | 3. Short grass pasture                                | 37.00     | 475.45           | 1,285.00          | 4.860          | 0.073        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 28.00     | 345.80           | 1,235.00          | 15.870         | 0.021        |
| <b>#4</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.094</b> |
| #4        | 6        | 3. Short grass pasture                                | 30.00     | 97.80            | 326.00            | 4.380          | 0.020        |
| <b>#4</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #6        | 1        | 3. Short grass pasture                                | 14.60     | 75.01            | 513.76            | 3.050          | 0.046        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 5.67             | 378.00            | 3.670          | 0.028        |
| <b>#6</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.095</b> |
| #6        | 2        | 3. Short grass pasture                                | 20.00     | 246.20           | 1,231.00          | 3.570          | 0.095        |
| <b>#6</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #6        | 3        | 2. Minimum tillage cultivation                        | 6.00      | 73.19            | 1,220.00          | 1.220          | 0.277        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 20.43            | 1,362.00          | 3.670          | 0.103        |
| <b>#6</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #6        | 4        | 2. Minimum tillage cultivation                        | 6.00      | 26.51            | 442.00            | 1.220          | 0.100        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 19.50            | 1,300.00          | 3.670          | 0.098        |
| <b>#6</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #6        | 5        | 5. Nearly bare and untilled, and alluvial valley fans | 5.70      | 25.19            | 442.00            | 2.380          | 0.051        |
| <b>#6</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.051</b> |
| #6        | 6        | 5. Nearly bare and untilled, and alluvial valley fans | 6.10      | 75.64            | 1,240.00          | 2.460          | 0.140        |
| <b>#6</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.140</b> |
| #8        | 1        | 3. Short grass pasture                                | 15.00     | 73.80            | 492.00            | 3.090          | 0.044        |
| <b>#8</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #8        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 22.00     | 50.38            | 229.00            | 4.690          | 0.013        |
| <b>#8</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.013</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #10        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 16.00     | 75.19            | 470.00            | 4.000          | 0.032        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.032</b> |
| #10        | 2        | 3. Short grass pasture                                | 12.00     | 169.44           | 1,412.00          | 2.770          | 0.141        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.141</b> |
| #10        | 3        | 3. Short grass pasture                                | 16.00     | 194.72           | 1,217.00          | 3.200          | 0.105        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.105</b> |
| #11        | 1        | 3. Short grass pasture                                | 35.00     | 271.94           | 777.00            | 4.730          | 0.045        |
| <b>#11</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.045</b> |
| #11        | 2        | 3. Short grass pasture                                | 13.00     | 231.79           | 1,783.00          | 2.880          | 0.171        |
| <b>#11</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.171</b> |
| #11        | 3        | 3. Short grass pasture                                | 20.00     | 352.80           | 1,764.00          | 3.570          | 0.137        |
| <b>#11</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.137</b> |
| #14        | 1        | 3. Short grass pasture                                | 30.00     | 40.80            | 135.99            | 4.380          | 0.008        |
| <b>#14</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.008</b> |
| #16        | 1        | 3. Short grass pasture                                | 30.00     | 73.50            | 244.99            | 4.380          | 0.015        |
| <b>#16</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #17        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 20.00     | 73.40            | 367.00            | 4.470          | 0.022        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #17        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 24.80     | 49.60            | 200.00            | 4.970          | 0.011        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 0.75             | 50.00             | 3.670          | 0.003        |
| <b>#17</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.014</b> |
| #17        | 3        | 3. Short grass pasture                                | 30.00     | 80.40            | 268.00            | 4.380          | 0.016        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 14.00     | 60.62            | 433.00            | 11.220         | 0.010        |
| <b>#17</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.026</b> |
| #17        | 4        | 3. Short grass pasture                                | 27.00     | 49.95            | 185.00            | 4.150          | 0.012        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 24.00     | 111.36           | 464.00            | 14.690         | 0.008        |
| <b>#17</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #17        | 5        | 3. Short grass pasture                                | 33.00     | 74.25            | 225.00            | 4.590          | 0.013        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 25.00     | 120.00           | 480.00            | 15.000         | 0.008        |
| <b>#17</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #17        | 6        | 3. Short grass pasture                                | 33.00     | 448.80           | 1,360.00          | 4.590          | 0.082        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 25.00     | 120.00           | 480.00            | 15.000         | 0.008        |
| <b>#17</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.090</b> |
| #19        | 1        | 3. Short grass pasture                                | 30.00     | 78.00            | 260.00            | 4.380          | 0.016        |
| <b>#19</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.016</b> |
| #21        | 1        | 3. Short grass pasture                                | 26.00     | 24.70            | 95.00             | 4.070          | 0.006        |
| <b>#21</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.006</b> |
| #23        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 4.00      | 23.28            | 582.00            | 2.000          | 0.080        |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| <b>#23</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #23        | 2        | 8. Large gullies, diversions, and low flowing streams | 1.00      | 4.92             | 492.00            | 3.000          | 0.045        |
|            |          | 5. Nearly bare and untilled, and alluvial valley fans | 13.00     | 99.84            | 768.00            | 3.600          | 0.059        |
| <b>#23</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.104</b> |
| #23        | 3        | 3. Short grass pasture                                | 1.00      | 5.78             | 578.00            | 0.800          | 0.200        |
| <b>#23</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.200</b> |
| #23        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 6.00      | 24.48            | 408.00            | 2.440          | 0.046        |
| <b>#23</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.046</b> |
| #23        | 5        | 3. Short grass pasture                                | 19.00     | 152.00           | 800.00            | 3.480          | 0.063        |
| <b>#23</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.063</b> |
| #23        | 6        | 3. Short grass pasture                                | 4.30      | 25.02            | 582.00            | 1.650          | 0.097        |
| <b>#23</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.097</b> |
| #25        | 1        | 3. Short grass pasture                                | 4.00      | 148.44           | 3,711.00          | 1.600          | 0.644        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 4.70      | 256.62           | 5,460.00          | 6.500          | 0.233        |
| <b>#25</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.877</b> |
| #25        | 2        | 3. Short grass pasture                                | 20.00     | 75.00            | 375.00            | 3.570          | 0.029        |
| <b>#25</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.018</b> |
| #25        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 9.00      | 24.03            | 267.00            | 3.000          | 0.024        |
| <b>#25</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #27        | 1        | 3. Short grass pasture                                | 11.00     | 99.00            | 900.00            | 2.650          | 0.094        |
| <b>#27</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.094</b> |
| #27        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 12.00     | 74.87            | 624.00            | 3.460          | 0.050        |
| <b>#27</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #29        | 1        | 3. Short grass pasture                                | 15.00     | 99.00            | 660.00            | 3.090          | 0.059        |
| <b>#29</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.059</b> |
| #31        | 1        | 3. Short grass pasture                                | 5.00      | 79.25            | 1,585.00          | 1.780          | 0.247        |
| <b>#31</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.247</b> |
| #33        | 1        | 3. Short grass pasture                                | 18.00     | 95.04            | 528.00            | 3.390          | 0.043        |
| <b>#33</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.043</b> |
| #35        | 1        | 3. Short grass pasture                                | 10.00     | 203.50           | 2,035.00          | 2.520          | 0.224        |
| <b>#35</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.224</b> |

# **West Taylor Pond** **25 Yr - 24 Hr Storm Event**

***Emergency Spillway Demonstration***  
***Post Mining***

Tony Tennyson

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Westminster, CO 80234

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## ***General Information***

### ***Storm Information:***

|                 |               |
|-----------------|---------------|
| Storm Type:     | NRCS Type II  |
| Design Storm:   | 25 yr - 24 hr |
| Rainfall Depth: | 2.300 inches  |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                              |
|---------|--------|--------------|--------|---------------|---------|------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below West Taylor Pond              |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | West Taylor Pond                         |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above West Taylor Pond              |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | 0+00 to WFSP-1 West Fork Taylor Ditch    |
| Pond    | #5     | ==>          | #4     | 0.000         | 0.000   | WFSP-1 Stock Pond                        |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Channel WFSP-1 to WFSP-2                 |
| Pond    | #7     | ==>          | #6     | 0.000         | 0.000   | WFSP-2 Stockpond                         |
| Channel | #8     | ==>          | #7     | 0.000         | 0.000   | WFSP-2 to Station 40+00                  |
| Null    | #9     | ==>          | #8     | 0.000         | 0.000   | Null Confluence Trib 1                   |
| Channel | #10    | ==>          | #9     | 0.000         | 0.000   | Trib 1                                   |
| Channel | #11    | ==>          | #9     | 0.000         | 0.000   | West Fork Station 40+00 to 83+05         |
| Null    | #13    | ==>          | #4     | 0.000         | 0.000   | Null Confluence West 7800' Terrace Ditch |
| Channel | #14    | ==>          | #13    | 0.000         | 0.000   | West 7800' Terrace Ditch                 |
| Null    | #15    | ==>          | #4     | 0.000         | 0.000   | Null 7700' Terrace Ditch                 |
| Channel | #16    | ==>          | #15    | 0.000         | 0.000   | 7700' Terrace Ditch                      |
| Channel | #17    | ==>          | #3     | 0.000         | 0.000   | East Fork Taylor Ditch 0+00 to EFSP-1    |
| Null    | #18    | ==>          | #17    | 0.000         | 0.000   | Null 7600' Terrace Ditch                 |
| Channel | #19    | ==>          | #18    | 0.000         | 0.000   | 7600' Terrace Ditch                      |
| Null    | #20    | ==>          | #17    | 0.000         | 0.000   | Null 7800' Terrace Ditch                 |
| Channel | #21    | ==>          | #20    | 0.000         | 0.000   | East 7800' Terrace Ditch                 |
| Pond    | #22    | ==>          | #17    | 0.000         | 0.000   | EFSP-1 Stock Pond                        |
| Channel | #23    | ==>          | #22    | 0.000         | 0.000   | EFSP-1 to EFSP-2 Veg Channel             |
| Pond    | #24    | ==>          | #23    | 0.000         | 0.000   | EFSP-2 Stockpond                         |
| Channel | #25    | ==>          | #24    | 0.000         | 0.000   | EFSP-2 to Station 124+03                 |
| Null    | #26    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 2                   |
| Channel | #27    | ==>          | #26    | 0.000         | 0.000   | Trib 2                                   |
| Null    | #28    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 3                   |
| Channel | #29    | ==>          | #28    | 0.000         | 0.000   | Trib 3                                   |
| Null    | #30    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 5                   |
| Channel | #31    | ==>          | #30    | 0.000         | 0.000   | Trib 5                                   |
| Null    | #32    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 4                   |
| Channel | #33    | ==>          | #32    | 0.000         | 0.000   | Trib 4                                   |
| Null    | #34    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 6                   |
| Channel | #35    | ==>          | #34    | 0.000         | 0.000   | Trib 6                                   |



#35  
Chan'l

|  |                                                                                     |               |
|--|-------------------------------------------------------------------------------------|---------------|
|  |  | #34<br>Null   |
|  |  | #33<br>Chan'l |
|  |  | #32<br>Null   |
|  |  | #31<br>Chan'l |
|  |  | #30<br>Null   |
|  |  | #29<br>Chan'l |
|  |  | #28<br>Null   |
|  |  | #27<br>Chan'l |
|  |  | #26<br>Null   |
|  |    | #25<br>Chan'l |
|  |    | #24<br>Pond   |
|  |  | #23<br>Chan'l |
|  |  | #22<br>Pond   |
|  |  | #21<br>Chan'l |
|  |  | #20<br>Null   |
|  |  | #19<br>Chan'l |
|  |  | #18<br>Null   |
|  |  | #17<br>Chan'l |
|  |  | #16<br>Chan'l |
|  |  | #15<br>Null   |
|  |  | #14<br>Chan'l |
|  |  | #13<br>Null   |

|                                                                                   |                                                                                     |               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #11<br>Chan'l |
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |  | #9<br>Null    |
|                                                                                   |    | #8<br>Chan'l  |
|                                                                                   |    | #7<br>Pond    |
|                                                                                   |    | #6<br>Chan'l  |
|                                                                                   |    | #5<br>Pond    |
|                                                                                   |    | #4<br>Chan'l  |
|                                                                                   |    | #3<br>Null    |
|  |                                                                                     | #2<br>Pond    |
| #1<br>Null                                                                        |                                                                                     |               |

### ***Structure Summary:***

|        | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|--------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #35    | 31.000                                    | 31.000                                | 1.40                       | 0.33                                 |
| #34    | 0.000                                     | 31.000                                | 1.40                       | 0.33                                 |
| #33    | 6.600                                     | 6.600                                 | 0.91                       | 0.09                                 |
| #32    | 0.000                                     | 6.600                                 | 0.91                       | 0.09                                 |
| #31    | 18.800                                    | 18.800                                | 0.81                       | 0.20                                 |
| #30    | 0.000                                     | 18.800                                | 0.81                       | 0.20                                 |
| #29    | 14.000                                    | 14.000                                | 1.93                       | 0.19                                 |
| #28    | 0.000                                     | 14.000                                | 1.93                       | 0.19                                 |
| #27    | 25.100                                    | 25.100                                | 10.76                      | 0.84                                 |
| #26    | 0.000                                     | 25.100                                | 10.76                      | 0.84                                 |
| #25    | 129.200                                   | 224.700                               | 14.89                      | 3.08                                 |
| #24 In | 0.000                                     | 224.700                               | 14.89                      | 3.08                                 |
| Out    |                                           |                                       | 2.38                       | 1.89                                 |
| #23    | 141.900                                   | 366.600                               | 90.34                      | 8.69                                 |
| #22 In | 0.000                                     | 366.600                               | 90.34                      | 8.69                                 |
| Out    |                                           |                                       | 32.00                      | 7.51                                 |
| #21    | 3.000                                     | 3.000                                 | 0.41                       | 0.04                                 |
| #20    | 0.000                                     | 3.000                                 | 0.41                       | 0.04                                 |
| #19    | 4.000                                     | 4.000                                 | 0.55                       | 0.05                                 |
| #18    | 0.000                                     | 4.000                                 | 0.55                       | 0.05                                 |
| #17    | 35.100                                    | 408.700                               | 36.45                      | 8.34                                 |
| #16    | 7.300                                     | 7.300                                 | 1.01                       | 0.10                                 |
| #15    | 0.000                                     | 7.300                                 | 1.01                       | 0.10                                 |
| #14    | 1.900                                     | 1.900                                 | 0.26                       | 0.03                                 |
| #13    | 0.000                                     | 1.900                                 | 0.26                       | 0.03                                 |
| #11    | 181.300                                   | 181.300                               | 15.39                      | 1.77                                 |
| #10    | 64.500                                    | 64.500                                | 23.30                      | 2.27                                 |
| #9     | 0.000                                     | 245.800                               | 34.54                      | 4.04                                 |
| #8     | 13.300                                    | 259.100                               | 45.89                      | 4.87                                 |
| #7 In  | 0.000                                     | 259.100                               | 45.89                      | 4.87                                 |
| Out    |                                           |                                       | 6.64                       | 3.60                                 |
| #6     | 94.500                                    | 353.600                               | 32.86                      | 6.55                                 |
| #5 In  | 0.000                                     | 353.600                               | 32.86                      | 6.55                                 |
| Out    |                                           |                                       | 8.68                       | 5.28                                 |
| #4     | 35.400                                    | 398.200                               | 9.30                       | 5.89                                 |
| #3     | 0.000                                     | 806.900                               | 44.30                      | 14.22                                |
| #2 In  | 27.600                                    | 834.500                               | 44.30                      | 14.22                                |
| Out    |                                           |                                       | 13.99                      | 13.10                                |
| #1     | 0.000                                     | 834.500                               | 13.99                      | 13.10                                |

## Structure Detail:

### Structure #35 (Vegetated Channel)

#### Trib 6

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 6.0       | D, B               | 1.58                 |                      |                         | 6.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 1.40 cfs                              |                                      | 1.40 cfs                             |                                     |
| Depth:                 | 0.19 ft                               | 1.77 ft                              | 0.42 ft                              | 2.00 ft                             |
| Top Width:             | 7.11 ft                               | 16.59 ft                             | 8.51 ft                              | 17.99 ft                            |
| Velocity:              | 1.16 fps                              |                                      | 0.46 fps                             |                                     |
| X-Section Area:        | 1.21 sq ft                            |                                      | 3.04 sq ft                           |                                     |
| Hydraulic Radius:      | 0.169 ft                              |                                      | 0.352 ft                             |                                     |
| Froude Number:         | 0.49                                  |                                      | 0.14                                 |                                     |
| Roughness Coefficient: | 0.0960                                |                                      | 0.3939                               |                                     |

### Structure #34 (Null)

#### Null Confluence Trib 6

### Structure #33 (Vegetated Channel)

#### Trib 4

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 16.0      | D, B               | 1.73                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.91 cfs                              |                                      | 0.91 cfs                             |                                     |
| Depth:                    | 0.12 ft                               | 1.85 ft                              | 0.27 ft                              | 2.00 ft                             |
| Top Width:                | 6.69 ft                               | 17.07 ft                             | 7.63 ft                              | 18.01 ft                            |
| Velocity:                 | 1.25 fps                              |                                      | 0.49 fps                             |                                     |
| X-Section Area:           | 0.73 sq ft                            |                                      | 1.85 sq ft                           |                                     |
| Hydraulic Radius:         | 0.108 ft                              |                                      | 0.239 ft                             |                                     |
| Froude Number:            | 0.67                                  |                                      | 0.18                                 |                                     |
| Roughness<br>Coefficient: | 0.1074                                |                                      | 0.4652                               |                                     |

## Structure #32 (Null)

*Null Confluence Trib 4*

## Structure #31 (Vegetated Channel)

*Trib 5*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 6.00                 | 3.0:1                      | 3.0:1                       | 4.0       | D, B                  | 1.60                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.81 cfs                              |                                      | 0.81 cfs                             |                                     |
| Depth:                    | 0.17 ft                               | 1.77 ft                              | 0.40 ft                              | 2.00 ft                             |
| Top Width:                | 7.00 ft                               | 16.60 ft                             | 8.42 ft                              | 18.02 ft                            |
| Velocity:                 | 0.75 fps                              |                                      | 0.28 fps                             |                                     |
| X-Section Area:           | 1.08 sq ft                            |                                      | 2.91 sq ft                           |                                     |
| Hydraulic Radius:         | 0.153 ft                              |                                      | 0.341 ft                             |                                     |
| Froude Number:            | 0.34                                  |                                      | 0.08                                 |                                     |
| Roughness<br>Coefficient: | 0.1131                                |                                      | 0.5242                               |                                     |

## Structure #30 (Null)

*Null Confluence Trib 5*

## Structure #29 (Vegetated Channel)

### *Trib 3*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 11.0      | D, B               | 1.62                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 1.93 cfs                        |                                | 1.93 cfs                       |                               |
| Depth:                 | 0.18 ft                         | 1.80 ft                        | 0.38 ft                        | 2.00 ft                       |
| Top Width:             | 7.06 ft                         | 16.78 ft                       | 8.29 ft                        | 18.01 ft                      |
| Velocity:              | 1.68 fps                        |                                | 0.71 fps                       |                               |
| X-Section Area:        | 1.15 sq ft                      |                                | 2.72 sq ft                     |                               |
| Hydraulic Radius:      | 0.162 ft                        |                                | 0.324 ft                       |                               |
| Froude Number:         | 0.73                            |                                | 0.22                           |                               |
| Roughness Coefficient: | 0.0868                          |                                | 0.3277                         |                               |

### Structure #28 (Null)

*Null Confluence Trib 3*

### Structure #27 (Vegetated Channel)

### *Trib 2*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 11.0      | D, B               | 1.36                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                   | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|-------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge: | 10.76 cfs                       |                                | 10.76 cfs                      |                               |
| Depth:            | 0.36 ft                         | 1.72 ft                        | 0.64 ft                        | 2.00 ft                       |
| Top Width:        | 8.17 ft                         | 16.33 ft                       | 9.82 ft                        | 17.98 ft                      |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 4.19 fps                              |                                      | 2.14 fps                             |                                     |
| X-Section Area:           | 2.57 sq ft                            |                                      | 5.03 sq ft                           |                                     |
| Hydraulic Radius:         | 0.309 ft                              |                                      | 0.502 ft                             |                                     |
| Froude Number:            | 1.32                                  |                                      | 0.53                                 |                                     |
| Roughness<br>Coefficient: | 0.0538                                |                                      | 0.1456                               |                                     |

### Structure #26 (Null)

*Null Confluence Trib 2*

### Structure #25 (Vegetated Channel)

*EFSP-2 to Station 124+03*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 4.7       | D, B                  | 3.28                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 14.89 cfs                             |                                      | 14.89 cfs                            |                                     |
| Depth:                    | 0.40 ft                               | 3.68 ft                              | 0.72 ft                              | 4.00 ft                             |
| Top Width:                | 14.39 ft                              | 34.07 ft                             | 16.32 ft                             | 36.00 ft                            |
| Velocity:                 | 2.83 fps                              |                                      | 1.46 fps                             |                                     |
| X-Section Area:           | 5.27 sq ft                            |                                      | 10.20 sq ft                          |                                     |
| Hydraulic Radius:         | 0.363 ft                              |                                      | 0.616 ft                             |                                     |
| Froude Number:            | 0.82                                  |                                      | 0.33                                 |                                     |
| Roughness<br>Coefficient: | 0.0579                                |                                      | 0.1599                               |                                     |

### Structure #24 (Pond)

*EFSP-2 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 92.00 ft   |
| Initial Pool:      | 0.15 ac-ft |

## Straight Pipe

| Barrel<br>Diameter<br>(in) | Barrel<br>Length<br>(ft) | Barrel<br>Slope (%) | Manning's<br>n | Spillway<br>Elev (ft) | Entrance<br>Loss<br>Coefficient | Tailwater<br>Depth<br>(ft) |
|----------------------------|--------------------------|---------------------|----------------|-----------------------|---------------------------------|----------------------------|
| 12.00                      | 100.00                   | 1.50                | 0.0150         | 98.00                 | 0.50                            | 0.00                       |

## Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 100.00        | 20.00                | 2.00:1            | 2.00:1             | 10.00                |

## Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 99.13 ft  |
| Dewater Time:   | 0.75 days |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #1              |
| 99.00     | 0.339        | 1.649               | 2.094              | 15.65                    |
| 99.13     | 0.346        | 1.697               | 2.385              | 2.35 Peak Stage          |
| 100.00    | 0.380        | 2.008               | 4.263              | Spillway #2              |
| 101.00    | 0.554        | 2.473               | 30.516             |                          |
| 102.00    | 0.761        | 3.127               | 98.736             |                          |
| 103.00    | 1.000        | 4.005               | 207.246            |                          |

## Detailed Discharge Table

| Elevation (ft) | Straight Pipe (cfs) | Emergency Spillway (cfs) | Combined Total Discharge (cfs) |
|----------------|---------------------|--------------------------|--------------------------------|
| 90.00          | 0.000               | 0.000                    | 0.000                          |
| 91.00          | 0.000               | 0.000                    | 0.000                          |
| 92.00          | 0.000               | 0.000                    | 0.000                          |
| 93.00          | 0.000               | 0.000                    | 0.000                          |
| 94.00          | 0.000               | 0.000                    | 0.000                          |
| 95.00          | 0.000               | 0.000                    | 0.000                          |
| 96.00          | 0.000               | 0.000                    | 0.000                          |
| 97.00          | 0.000               | 0.000                    | 0.000                          |
| 98.00          | 0.000               | 0.000                    | 0.000                          |
| 99.00          | (3)>2.094           | 0.000                    | 2.094                          |
| 100.00         | (5)>4.263           | 0.000                    | 4.263                          |
| 101.00         | (6)>5.033           | 25.483                   | 30.516                         |
| 102.00         | (6)>5.701           | 93.036                   | 98.736                         |
| 103.00         | (6)>6.275           | 200.972                  | 207.246                        |

## Structure #23 (Vegetated Channel)

### *EFSP-1 to EFSP-2 Veg Channel*

Trapezoidal Vegetated Channel Inputs:

#### Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.5       | D, B               | 2.24                 |                      |                         | 7.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 90.34 cfs                       |                                | 90.34 cfs                      |                               |
| Depth:                 | 1.20 ft                         | 3.44 ft                        | 1.76 ft                        | 4.00 ft                       |
| Top Width:             | 19.19 ft                        | 32.63 ft                       | 22.57 ft                       | 36.01 ft                      |
| Velocity:              | 4.84 fps                        |                                | 2.97 fps                       |                               |
| X-Section Area:        | 18.68 sq ft                     |                                | 30.46 sq ft                    |                               |
| Hydraulic Radius:      | 0.954 ft                        |                                | 1.316 ft                       |                               |
| Froude Number:         | 0.86                            |                                | 0.45                           |                               |
| Roughness Coefficient: | 0.0365                          |                                | 0.0738                         |                               |

## Structure #22 (Pond)

# *EFSP-1 Stock Pond*

## Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 92.00 ft   |
| Initial Pool:      | 0.15 ac-ft |

## Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|----------------------|--------------------|------------------|-------------|--------------------|---------------------------|----------------------|
| 12.00                | 100.00             | 1.50             | 0.0150      | 98.00              | 0.50                      | 0.00                 |

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 100.00        | 20.00             | 2.00:1         | 2.00:1          | 10.00             |

## Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 101.02 ft |
| Dewater Time:   | 1.15 days |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 90.00     | 0.050     | 0.000            | 0.000           |                    |
| 91.00     | 0.072     | 0.061            | 0.000           |                    |
| 92.00     | 0.098     | 0.145            | 0.000           |                    |
| 93.00     | 0.128     | 0.258            | 0.000           |                    |
| 94.00     | 0.162     | 0.403            | 0.000           |                    |
| 95.00     | 0.200     | 0.583            | 0.000           |                    |
| 96.00     | 0.231     | 0.799            | 0.000           |                    |
| 97.00     | 0.265     | 1.046            | 0.000           |                    |
| 98.00     | 0.301     | 1.329            | 0.000           | Spillway #1        |
| 99.00     | 0.339     | 1.649            | 2.094           | 13.55              |
| 100.00    | 0.380     | 2.008            | 4.263           | 5.85 Spillway #2   |
| 101.00    | 0.554     | 2.473            | 30.516          |                    |
| 101.02    | 0.575     | 2.487            | 32.004          | 8.10 Peak Stage    |
| 102.00    | 0.761     | 3.127            | 98.736          |                    |
| 103.00    | 1.000     | 4.005            | 207.246         |                    |

### Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (5)>4.263              | 0.000                       | 4.263                                   |
| 101.00            | (6)>5.033              | 25.483                      | 30.516                                  |
| 102.00            | (6)>5.701              | 93.036                      | 98.736                                  |
| 103.00            | (6)>6.275              | 200.972                     | 207.246                                 |

### Structure #21 (Vegetated Channel)

#### *East 7800' Terrace Ditch*

Triangular Vegetated Channel Inputs:

#### Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 2.03                    |                         |                               | 7.0                           |

#### Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.41 cfs                              |                                      | 0.41 cfs                             |                                     |
| Depth:                    | 0.52 ft                               | 2.55 ft                              | 0.97 ft                              | 3.00 ft                             |
| Top Width:                | 2.33 ft                               | 11.47 ft                             | 4.39 ft                              | 13.52 ft                            |
| Velocity:                 | 0.69 fps                              |                                      | 0.19 fps                             |                                     |
| X-Section Area:           | 0.60 sq ft                            |                                      | 2.14 sq ft                           |                                     |
| Hydraulic Radius:         | 0.237 ft                              |                                      | 0.445 ft                             |                                     |
| Froude Number:            | 0.24                                  |                                      | 0.05                                 |                                     |
| Roughness<br>Coefficient: | 0.1016                                |                                      | 0.5489                               |                                     |

### Structure #20 (Null)

*Null 7800' Terrace Ditch*

### Structure #19 (Vegetated Channel)

*7600' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 1.96                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.55 cfs                              |                                      | 0.55 cfs                             |                                     |
| Depth:                    | 0.56 ft                               | 2.52 ft                              | 1.04 ft                              | 3.00 ft                             |
| Top Width:                | 2.54 ft                               | 11.36 ft                             | 4.68 ft                              | 13.50 ft                            |
| Velocity:                 | 0.77 fps                              |                                      | 0.23 fps                             |                                     |
| X-Section Area:           | 0.72 sq ft                            |                                      | 2.43 sq ft                           |                                     |
| Hydraulic Radius:         | 0.258 ft                              |                                      | 0.475 ft                             |                                     |
| Froude Number:            | 0.26                                  |                                      | 0.06                                 |                                     |
| Roughness<br>Coefficient: | 0.0955                                |                                      | 0.4878                               |                                     |

### Structure #18 (Null)

*Null 7600' Terrace Ditch*

### Structure #17 (Riprap Channel)

*East Fork Taylor Ditch 0+00 to EFSP-1*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 25.0      | 3.83                    |                         |                               |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 36.45 cfs     |              |
| Depth:            | 0.17 ft       | 4.00 ft      |
| Top Width:        | 13.05 ft      | 36.03 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 2.19 sq ft    |              |
| Hydraulic Radius: | 0.167 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 4.00 in       |              |
| D50:              | 12.00 in      |              |
| Dmax:             | 15.00 in      |              |

Velocity and Manning's n calculations may not apply for this method.

## Structure #16 (Vegetated Channel)

### *7700' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 1.81                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 1.01 cfs                              |                                      | 1.01 cfs                             |                                     |
| Depth:                    | 0.67 ft                               | 2.48 ft                              | 1.19 ft                              | 3.00 ft                             |
| Top Width:                | 3.03 ft                               | 11.17 ft                             | 5.34 ft                              | 13.49 ft                            |
| Velocity:                 | 0.99 fps                              |                                      | 0.32 fps                             |                                     |
| X-Section Area:           | 1.02 sq ft                            |                                      | 3.17 sq ft                           |                                     |
| Hydraulic Radius:         | 0.307 ft                              |                                      | 0.542 ft                             |                                     |
| Froude Number:            | 0.30                                  |                                      | 0.07                                 |                                     |
| Roughness<br>Coefficient: | 0.0839                                |                                      | 0.3812                               |                                     |

## Structure #15 (Null)

### *Null 7700' Terrace Ditch*

## Structure #14 (Vegetated Channel)

### *West 7800' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 2.12                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.26 cfs                              |                                      | 0.26 cfs                             |                                     |
| Depth:                    | 0.45 ft                               | 2.57 ft                              | 0.88 ft                              | 3.00 ft                             |
| Top Width:                | 2.04 ft                               | 11.58 ft                             | 3.96 ft                              | 13.50 ft                            |
| Velocity:                 | 0.57 fps                              |                                      | 0.15 fps                             |                                     |
| X-Section Area:           | 0.46 sq ft                            |                                      | 1.75 sq ft                           |                                     |
| Hydraulic Radius:         | 0.207 ft                              |                                      | 0.403 ft                             |                                     |
| Froude Number:            | 0.21                                  |                                      | 0.04                                 |                                     |
| Roughness<br>Coefficient: | 0.1121                                |                                      | 0.6617                               |                                     |

### Structure #13 (Null)

*Null Confluence West 7800' Terrace Ditch*

### Structure #11 (Vegetated Channel)

*West Fork Station 40+00 to 83+05*

Trapezoidal Vegetated Channel Inputs:

Material: Bermuda grass

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 8.0       | D, B                  | 3.39                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                   | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|-------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge: | 15.39 cfs                             |                                      | 15.39 cfs                            |                                     |
| Depth:            | 0.34 ft                               | 3.73 ft                              | 0.61 ft                              | 4.00 ft                             |
| Top Width:        | 14.06 ft                              | 34.40 ft                             | 15.69 ft                             | 36.03 ft                            |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 3.43 fps                              |                                      | 1.81 fps                             |                                     |
| X-Section Area:           | 4.48 sq ft                            |                                      | 8.51 sq ft                           |                                     |
| Hydraulic Radius:         | 0.316 ft                              |                                      | 0.536 ft                             |                                     |
| Froude Number:            | 1.07                                  |                                      | 0.43                                 |                                     |
| Roughness<br>Coefficient: | 0.0569                                |                                      | 0.1538                               |                                     |

### Structure #10 (Vegetated Channel)

#### *Trib 1*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 6.00                 | 3.0:1                      | 3.0:1                       | 5.0       | D, B                  | 1.98                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 23.30 cfs                             |                                      | 23.30 cfs                            |                                     |
| Depth:                    | 0.63 ft                               | 2.61 ft                              | 1.02 ft                              | 3.00 ft                             |
| Top Width:                | 9.80 ft                               | 21.68 ft                             | 12.14 ft                             | 24.02 ft                            |
| Velocity:                 | 4.65 fps                              |                                      | 2.51 fps                             |                                     |
| X-Section Area:           | 5.01 sq ft                            |                                      | 9.28 sq ft                           |                                     |
| Hydraulic Radius:         | 0.500 ft                              |                                      | 0.744 ft                             |                                     |
| Froude Number:            | 1.15                                  |                                      | 0.51                                 |                                     |
| Roughness<br>Coefficient: | 0.0450                                |                                      | 0.1088                               |                                     |

### Structure #9 (Null)

#### *Null Confluence Trib 1*

### Structure #8 (Vegetated Channel)

#### *WFSP-2 to Station 40+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.5       | D, B               | 2.56                 |                      |                         | 7.0                     |

## Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 45.89 cfs                       |                                | 45.89 cfs                      |                               |
| Depth:                 | 0.90 ft                         | 3.46 ft                        | 1.44 ft                        | 4.00 ft                       |
| Top Width:             | 17.42 ft                        | 32.78 ft                       | 20.65 ft                       | 36.01 ft                      |
| Velocity:              | 3.45 fps                        |                                | 1.95 fps                       |                               |
| X-Section Area:        | 13.28 sq ft                     |                                | 23.52 sq ft                    |                               |
| Hydraulic Radius:      | 0.750 ft                        |                                | 1.114 ft                       |                               |
| Froude Number:         | 0.70                            |                                | 0.32                           |                               |
| Roughness Coefficient: | 0.0436                          |                                | 0.1005                         |                               |

## Structure #7 (Pond)

### WFSP-2 Stockpond

#### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 91.00 ft   |
| Initial Pool:      | 0.06 ac-ft |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 100.00        | 20.00             | 2.00:1         | 2.00:1          | 5.00              |

#### Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|----------------------|--------------------|------------------|-------------|--------------------|---------------------------|----------------------|
| 12.00                | 100.00             | 1.00             | 0.0150      | 98.00              | 0.90                      | 0.00                 |

#### Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 100.20 ft |
| Dewater Time:   | 0.91 days |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #2              |
| 99.00     | 0.339        | 1.649               | 2.094              | 12.45                    |
| 100.00    | 0.380        | 2.008               | 3.745              | 7.05 Spillway #1         |
| 100.20    | 0.467        | 2.099               | 6.640              | 2.40 Peak Stage          |
| 101.00    | 0.554        | 2.473               | 18.584             |                          |
| 102.00    | 0.761        | 3.127               | 61.251             |                          |
| 103.00    | 1.000        | 4.005               | 135.506            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Straight Pipe<br>(cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|------------------------|-----------------------------------------|
| 90.00             | 0.000                       | 0.000                  | 0.000                                   |
| 91.00             | 0.000                       | 0.000                  | 0.000                                   |
| 92.00             | 0.000                       | 0.000                  | 0.000                                   |
| 93.00             | 0.000                       | 0.000                  | 0.000                                   |
| 94.00             | 0.000                       | 0.000                  | 0.000                                   |
| 95.00             | 0.000                       | 0.000                  | 0.000                                   |
| 96.00             | 0.000                       | 0.000                  | 0.000                                   |
| 97.00             | 0.000                       | 0.000                  | 0.000                                   |
| 98.00             | 0.000                       | 0.000                  | 0.000                                   |
| 99.00             | 0.000                       | (3)>2.094              | 2.094                                   |
| 100.00            | 0.000                       | (6)>3.745              | 3.745                                   |
| 101.00            | 14.046                      | (6)>4.538              | 18.584                                  |
| 102.00            | 56.062                      | (6)>5.189              | 61.251                                  |
| 103.00            | 129.713                     | (6)>5.793              | 135.506                                 |

### Structure #6 (Vegetated Channel)

*Channel WFSP-1 to WFSP-2*

Trapezoidal Vegetated Channel Inputs:

### Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.3       | D, B               | 2.63                 |                      |                         | 7.0                     |

### Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 32.86 cfs                             |                                      | 32.86 cfs                            |                                     |
| Depth:                 | 0.82 ft                               | 3.45 ft                              | 1.37 ft                              | 4.00 ft                             |
| Top Width:             | 16.92 ft                              | 32.70 ft                             | 20.19 ft                             | 35.97 ft                            |
| Velocity:              | 2.77 fps                              |                                      | 1.50 fps                             |                                     |
| X-Section Area:        | 11.86 sq ft                           |                                      | 21.97 sq ft                          |                                     |
| Hydraulic Radius:      | 0.690 ft                              |                                      | 1.065 ft                             |                                     |
| Froude Number:         | 0.58                                  |                                      | 0.25                                 |                                     |
| Roughness Coefficient: | 0.0478                                |                                      | 0.1184                               |                                     |

### Structure #5 (Pond)

#### *WFSP-1 Stock Pond*

### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 91.00 ft   |
| Initial Pool:      | 0.06 ac-ft |

### Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|----------------------|--------------------|------------------|-------------|--------------------|---------------------------|----------------------|
| 12.00                | 100.00             | 1.50             | 0.0150      | 98.00              | 0.90                      | 0.00                 |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 100.00        | 20.00             | 2.00:1         | 2.00:1          | 10.00             |

### Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 100.17 ft |
| Dewater Time:   | 1.07 days |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #1              |
| 99.00     | 0.339        | 1.649               | 2.094              | 13.65                    |
| 100.00    | 0.380        | 2.008               | 4.162              | 6.95 Spillway #2         |
| 100.17    | 0.465        | 2.089               | 8.683              | 5.00 Peak Stage          |
| 101.00    | 0.554        | 2.473               | 30.351             |                          |
| 102.00    | 0.761        | 3.127               | 98.545             |                          |
| 103.00    | 1.000        | 4.005               | 207.032            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (6)>4.162              | 0.000                       | 4.162                                   |
| 101.00            | (6)>4.868              | 25.483                      | 30.351                                  |
| 102.00            | (6)>5.509              | 93.036                      | 98.545                                  |
| 103.00            | (6)>6.061              | 200.972                     | 207.032                                 |

### Structure #4 (Riprap Channel)

*0+00 to WFSP-1 West Fork Taylor Ditch*

Trapezoidal Riprap Channel Inputs:

### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 26.0      | 3.95                 |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 9.30 cfs      |              |
| Depth:            | 0.05 ft       | 4.00 ft      |
| Top Width:        | 12.29 ft      | 35.99 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 0.58 sq ft    |              |
| Hydraulic Radius: | 0.047 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 3.00 in       |              |
| D50:              | 9.00 in       |              |
| Dmax:             | 11.25 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Null)

*Null Above West Taylor Pond*

### Structure #2 (Pond)

*West Taylor Pond*

### Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,468.00 ft |
| Initial Pool:      | 1.76 ac-ft  |

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 10.50             | 18.00                | 150.00             | 2.00             | 0.0150      | 7,471.00           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,475.00      | 30.00             | 2.00:1         | 2.00:1          | 30.00             |

Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,473.72 ft |
| Dewater Time:   | 1.11 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,455.00  | 0.022        | 0.000               | 0.000              |                          |
| 7,456.00  | 0.032        | 0.027               | 0.000              |                          |
| 7,457.00  | 0.043        | 0.064               | 0.000              |                          |
| 7,458.00  | 0.054        | 0.113               | 0.000              |                          |
| 7,459.00  | 0.066        | 0.173               | 0.000              |                          |
| 7,460.00  | 0.079        | 0.245               | 0.000              |                          |
| 7,461.00  | 0.103        | 0.336               | 0.000              |                          |
| 7,462.00  | 0.139        | 0.456               | 0.000              |                          |
| 7,463.00  | 0.162        | 0.607               | 0.000              |                          |
| 7,464.00  | 0.188        | 0.781               | 0.000              |                          |
| 7,465.00  | 0.213        | 0.981               | 0.000              |                          |
| 7,466.00  | 0.244        | 1.209               | 0.000              |                          |
| 7,467.00  | 0.279        | 1.470               | 0.000              |                          |
| 7,468.00  | 0.312        | 1.766               | 0.000              |                          |
| 7,469.00  | 0.360        | 2.102               | 0.000              |                          |
| 7,470.00  | 0.389        | 2.476               | 0.000              |                          |
| 7,471.00  | 0.430        | 2.886               | 0.000              | Spillway #1              |
| 7,472.00  | 0.463        | 3.332               | 8.509              | 18.80                    |
| 7,473.00  | 0.503        | 3.815               | 12.033             | 4.40                     |
| 7,473.72  | 0.530        | 4.193               | 13.993             | 3.35 Peak Stage          |
| 7,474.00  | 0.541        | 4.336               | 14.738             |                          |
| 7,475.00  | 0.580        | 4.897               | 17.018             | Spillway #2              |
| 7,476.00  | 0.581        | 5.477               | 83.791             |                          |
| 7,477.00  | 0.582        | 6.059               | 246.034            |                          |
| 7,478.00  | 0.583        | 6.641               | 483.806            |                          |
| 7,479.00  | 0.584        | 7.225               | 794.453            |                          |
| 7,480.00  | 0.585        | 7.809               | 1,172.300          |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,455.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,456.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,457.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,458.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,459.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,460.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,461.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,462.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,463.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,464.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,465.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,466.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,467.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,468.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,469.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,470.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,471.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,472.00          | 8.509             | 0.000                       | 8.509                                   |
| 7,473.00          | 12.033            | 0.000                       | 12.033                                  |
| 7,474.00          | 14.738            | 0.000                       | 14.738                                  |
| 7,475.00          | 17.018            | 0.000                       | 17.018                                  |
| 7,476.00          | 19.026            | 64.765                      | 83.791                                  |
| 7,477.00          | 20.842            | 225.191                     | 246.034                                 |
| 7,478.00          | 22.512            | 461.294                     | 483.806                                 |
| 7,479.00          | 24.066            | 770.387                     | 794.453                                 |
| 7,480.00          | 25.526            | 1,146.774                   | 1,172.300                               |

Structure #1 (Null)

*Null Below West Taylor Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #35        | 1        | 31.000         | 0.224              | 0.000        | 0.000  | 62.000       | M   | 1.40                 | 0.332                 |
|            | <b>Σ</b> | <b>31.000</b>  |                    |              |        |              |     | <b>1.40</b>          | <b>0.332</b>          |
| <b>#34</b> | <b>Σ</b> | <b>31.000</b>  |                    |              |        |              |     | <b>1.40</b>          | <b>0.332</b>          |
| #33        | 1        | 6.600          | 0.043              | 0.000        | 0.000  | 62.000       | M   | 0.91                 | 0.088                 |
|            | <b>Σ</b> | <b>6.600</b>   |                    |              |        |              |     | <b>0.91</b>          | <b>0.088</b>          |
| <b>#32</b> | <b>Σ</b> | <b>6.600</b>   |                    |              |        |              |     | <b>0.91</b>          | <b>0.088</b>          |
| #31        | 1        | 18.800         | 0.247              | 0.000        | 0.000  | 62.000       | M   | 0.81                 | 0.202                 |
|            | <b>Σ</b> | <b>18.800</b>  |                    |              |        |              |     | <b>0.81</b>          | <b>0.202</b>          |
| <b>#30</b> | <b>Σ</b> | <b>18.800</b>  |                    |              |        |              |     | <b>0.81</b>          | <b>0.202</b>          |
| #29        | 1        | 14.000         | 0.059              | 0.000        | 0.000  | 62.000       | M   | 1.93                 | 0.186                 |
|            | <b>Σ</b> | <b>14.000</b>  |                    |              |        |              |     | <b>1.93</b>          | <b>0.186</b>          |
| <b>#28</b> | <b>Σ</b> | <b>14.000</b>  |                    |              |        |              |     | <b>1.93</b>          | <b>0.186</b>          |
| #27        | 1        | 14.900         | 0.094              | 0.000        | 0.000  | 62.000       | M   | 2.06                 | 0.198                 |
|            | 2        | 10.200         | 0.050              | 0.000        | 0.000  | 80.000       | F   | 8.70                 | 0.640                 |
|            | <b>Σ</b> | <b>25.100</b>  |                    |              |        |              |     | <b>10.76</b>         | <b>0.838</b>          |
| <b>#26</b> | <b>Σ</b> | <b>25.100</b>  |                    |              |        |              |     | <b>10.76</b>         | <b>0.838</b>          |
| #25        | 1        | 128.000        | 0.877              | 0.000        | 0.000  | 62.000       | M   | 3.22                 | 1.360                 |
|            | 2        | 0.500          | 0.018              | 0.000        | 0.000  | 80.000       | F   | 0.43                 | 0.028                 |
|            | 3        | 0.700          | 0.024              | 0.000        | 0.000  | 80.000       | F   | 0.60                 | 0.044                 |
|            | <b>Σ</b> | <b>224.700</b> |                    |              |        |              |     | <b>14.89</b>         | <b>3.078</b>          |
| <b>#24</b> | <b>Σ</b> | <b>224.700</b> |                    |              |        |              |     | <b>14.89</b>         | <b>3.078</b>          |
| #23        | 1        | 2.500          | 0.021              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 89.600         | 0.104              | 0.000        | 0.000  | 80.000       | F   | 76.43                | 5.619                 |
|            | 3        | 4.900          | 0.200              | 0.000        | 0.000  | 62.000       | M   | 0.24                 | 0.052                 |
|            | 4        | 4.400          | 0.046              | 0.000        | 0.000  | 80.000       | F   | 3.75                 | 0.276                 |
|            | 5        | 34.200         | 0.063              | 0.000        | 0.000  | 62.000       | M   | 4.72                 | 0.455                 |
|            | 6        | 6.300          | 0.097              | 0.000        | 0.000  | 80.000       | F   | 5.37                 | 0.395                 |
|            | <b>Σ</b> | <b>366.600</b> |                    |              |        |              |     | <b>90.34</b>         | <b>8.692</b>          |
| <b>#22</b> | <b>Σ</b> | <b>366.600</b> |                    |              |        |              |     | <b>90.34</b>         | <b>8.692</b>          |
| #21        | 1        | 3.000          | 0.006              | 0.000        | 0.000  | 62.000       | M   | 0.41                 | 0.040                 |
|            | <b>Σ</b> | <b>3.000</b>   |                    |              |        |              |     | <b>0.41</b>          | <b>0.040</b>          |

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|--------|-------|---------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #20    | Σ     | 3.000         |                    |              |        |              |     | 0.41                 | 0.040                 |
| #19    | 1     | 4.000         | 0.016              | 0.000        | 0.000  | 62.000       | M   | 0.55                 | 0.053                 |
|        | Σ     | 4.000         |                    |              |        |              |     | 0.55                 | 0.053                 |
| #18    | Σ     | 4.000         |                    |              |        |              |     | 0.55                 | 0.053                 |
| #17    | 1     | 10.400        | 0.022              | 0.000        | 0.000  | 80.000       | M   | 8.87                 | 0.652                 |
|        | 2     | 1.100         | 0.014              | 0.000        | 0.000  | 80.000       | M   | 0.94                 | 0.069                 |
|        | 3     | 0.600         | 0.026              | 0.000        | 0.000  | 62.000       | M   | 0.08                 | 0.003                 |
|        | 4     | 0.600         | 0.020              | 0.000        | 0.000  | 62.000       | M   | 0.08                 | 0.003                 |
|        | 5     | 0.900         | 0.021              | 0.000        | 0.000  | 62.000       | M   | 0.12                 | 0.008                 |
|        | 6     | 21.500        | 0.090              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | Σ     | 408.700       |                    |              |        |              |     | 36.45                | 8.336                 |
| #16    | 1     | 7.300         | 0.015              | 0.000        | 0.000  | 62.000       | M   | 1.01                 | 0.097                 |
|        | Σ     | 7.300         |                    |              |        |              |     | 1.01                 | 0.097                 |
| #15    | Σ     | 7.300         |                    |              |        |              |     | 1.01                 | 0.097                 |
| #14    | 1     | 1.900         | 0.008              | 0.000        | 0.000  | 62.000       | M   | 0.26                 | 0.025                 |
|        | Σ     | 1.900         |                    |              |        |              |     | 0.26                 | 0.025                 |
| #13    | Σ     | 1.900         |                    |              |        |              |     | 0.26                 | 0.025                 |
| #11    | 1     | 98.000        | 0.045              | 0.000        | 0.000  | 47.000       | S   | 0.02                 | 0.001                 |
|        | 2     | 29.600        | 0.171              | 0.000        | 0.000  | 74.000       | F   | 12.95                | 1.188                 |
|        | 3     | 53.700        | 0.137              | 0.000        | 0.000  | 62.000       | M   | 2.86                 | 0.583                 |
|        | Σ     | 181.300       |                    |              |        |              |     | 15.39                | 1.772                 |
| #10    | 1     | 8.600         | 0.032              | 0.000        | 0.000  | 80.000       | F   | 7.34                 | 0.539                 |
|        | 2     | 36.800        | 0.141              | 0.000        | 0.000  | 74.000       | F   | 16.23                | 1.475                 |
|        | 3     | 19.100        | 0.105              | 0.000        | 0.000  | 62.000       | M   | 2.64                 | 0.254                 |
|        | Σ     | 64.500        |                    |              |        |              |     | 23.30                | 2.269                 |
| #9     | Σ     | 245.800       |                    |              |        |              |     | 34.54                | 4.040                 |
| #8     | 1     | 8.600         | 0.044              | 0.000        | 0.000  | 80.000       | F   | 7.34                 | 0.539                 |
|        | 2     | 4.700         | 0.013              | 0.000        | 0.000  | 80.000       | F   | 4.01                 | 0.295                 |
|        | Σ     | 259.100       |                    |              |        |              |     | 45.89                | 4.874                 |
| #7     | Σ     | 259.100       |                    |              |        |              |     | 45.89                | 4.874                 |
| #6     | 1     | 43.000        | 0.095              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 2     | 0.400         | 0.015              | 0.000        | 0.000  | 62.000       | M   | 0.06                 | 0.001                 |
|        | 3     | 1.600         | 0.020              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 4     | 1.200         | 0.022              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 5     | 11.600        | 0.051              | 0.000        | 0.000  | 80.000       | F   | 9.90                 | 0.727                 |
|        | 6     | 36.700        | 0.140              | 0.000        | 0.000  | 80.000       | F   | 25.39                | 2.220                 |

| Stru #    | SWS #    | SWS Area (ac)  | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|-----------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|           | <b>Σ</b> | <b>353.600</b> |                    |              |        |              |     | <b>32.86</b>         | <b>6.554</b>          |
| <b>#5</b> | <b>Σ</b> | <b>353.600</b> |                    |              |        |              |     | <b>32.86</b>         | <b>6.554</b>          |
| #4        | 1        | 6.400          | 0.037              | 0.000        | 0.000  | 80.000       | M   | 5.46                 | 0.401                 |
|           | 2        | 1.000          | 0.038              | 0.000        | 0.000  | 80.000       | M   | 0.85                 | 0.063                 |
|           | 3        | 2.800          | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 4        | 0.900          | 0.010              | 0.000        | 0.000  | 62.000       | M   | 0.12                 | 0.008                 |
|           | 5        | 23.300         | 0.094              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 6        | 1.000          | 0.020              | 0.000        | 0.000  | 62.000       | M   | 0.14                 | 0.009                 |
|           | <b>Σ</b> | <b>398.200</b> |                    |              |        |              |     | <b>9.30</b>          | <b>5.888</b>          |
| <b>#3</b> | <b>Σ</b> | <b>806.900</b> |                    |              |        |              |     | <b>44.30</b>         | <b>14.223</b>         |
| #2        | 1        | 10.500         | 0.051              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 2        | 17.100         | 0.058              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | <b>Σ</b> | <b>834.500</b> |                    |              |        |              |     | <b>44.30</b>         | <b>14.223</b>         |
| <b>#1</b> | <b>Σ</b> | <b>834.500</b> |                    |              |        |              |     | <b>13.99</b>         | <b>13.102</b>         |

### Subwatershed Time of Concentration Details:

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture                                | 45.00     | 443.25           | 985.00            | 5.360          | 0.051        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.051</b> |
| #2        | 2        | 3. Short grass pasture                                | 40.00     | 425.60           | 1,064.00          | 5.050          | 0.058        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.058</b> |
| #4        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 11.00     | 48.95            | 445.00            | 3.310          | 0.037        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.037</b> |
| #4        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 23.00     | 49.45            | 215.00            | 4.790          | 0.012        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 5.25             | 350.00            | 3.670          | 0.026        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.038</b> |
| #4        | 3        | 3. Short grass pasture                                | 20.00     | 50.00            | 250.00            | 3.570          | 0.019        |
| <b>#4</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #4        | 4        | 3. Short grass pasture                                | 19.00     | 24.70            | 130.00            | 3.480          | 0.010        |
| <b>#4</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.010</b> |
| #4        | 5        | 3. Short grass pasture                                | 37.00     | 475.45           | 1,285.00          | 4.860          | 0.073        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 28.00     | 345.80           | 1,235.00          | 15.870         | 0.021        |
| <b>#4</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.094</b> |
| #4        | 6        | 3. Short grass pasture                                | 30.00     | 97.80            | 326.00            | 4.380          | 0.020        |
| <b>#4</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #6         | 1        | 3. Short grass pasture                                | 14.60     | 75.01            | 513.76            | 3.050          | 0.046        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 5.67             | 378.00            | 3.670          | 0.028        |
| <b>#6</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.095</b> |
| #6         | 2        | 3. Short grass pasture                                | 20.00     | 246.20           | 1,231.00          | 3.570          | 0.095        |
| <b>#6</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #6         | 3        | 2. Minimum tillage cultivation                        | 6.00      | 73.19            | 1,220.00          | 1.220          | 0.277        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 20.43            | 1,362.00          | 3.670          | 0.103        |
| <b>#6</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #6         | 4        | 2. Minimum tillage cultivation                        | 6.00      | 26.51            | 442.00            | 1.220          | 0.100        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 19.50            | 1,300.00          | 3.670          | 0.098        |
| <b>#6</b>  | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #6         | 5        | 5. Nearly bare and untilled, and alluvial valley fans | 5.70      | 25.19            | 442.00            | 2.380          | 0.051        |
| <b>#6</b>  | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.051</b> |
| #6         | 6        | 5. Nearly bare and untilled, and alluvial valley fans | 6.10      | 75.64            | 1,240.00          | 2.460          | 0.140        |
| <b>#6</b>  | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.140</b> |
| #8         | 1        | 3. Short grass pasture                                | 15.00     | 73.80            | 492.00            | 3.090          | 0.044        |
| <b>#8</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #8         | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 22.00     | 50.38            | 229.00            | 4.690          | 0.013        |
| <b>#8</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.013</b> |
| #10        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 16.00     | 75.19            | 470.00            | 4.000          | 0.032        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.032</b> |
| #10        | 2        | 3. Short grass pasture                                | 12.00     | 169.44           | 1,412.00          | 2.770          | 0.141        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.141</b> |
| #10        | 3        | 3. Short grass pasture                                | 16.00     | 194.72           | 1,217.00          | 3.200          | 0.105        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.105</b> |
| #11        | 1        | 3. Short grass pasture                                | 35.00     | 271.94           | 777.00            | 4.730          | 0.045        |
| <b>#11</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.045</b> |
| #11        | 2        | 3. Short grass pasture                                | 13.00     | 231.79           | 1,783.00          | 2.880          | 0.171        |
| <b>#11</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.171</b> |
| #11        | 3        | 3. Short grass pasture                                | 20.00     | 352.80           | 1,764.00          | 3.570          | 0.137        |
| <b>#11</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.137</b> |
| #14        | 1        | 3. Short grass pasture                                | 30.00     | 40.80            | 135.99            | 4.380          | 0.008        |
| <b>#14</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.008</b> |
| #16        | 1        | 3. Short grass pasture                                | 30.00     | 73.50            | 244.99            | 4.380          | 0.015        |
| <b>#16</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #17        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 20.00     | 73.40            | 367.00            | 4.470          | 0.022        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #17        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 24.80     | 49.60            | 200.00            | 4.970          | 0.011        |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 0.75             | 50.00             | 3.670          | 0.003        |
| <b>#17</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.014</b> |
| #17        | 3        | 3. Short grass pasture                                | 30.00     | 80.40            | 268.00            | 4.380          | 0.016        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 14.00     | 60.62            | 433.00            | 11.220         | 0.010        |
| <b>#17</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.026</b> |
| #17        | 4        | 3. Short grass pasture                                | 27.00     | 49.95            | 185.00            | 4.150          | 0.012        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 24.00     | 111.36           | 464.00            | 14.690         | 0.008        |
| <b>#17</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #17        | 5        | 3. Short grass pasture                                | 33.00     | 74.25            | 225.00            | 4.590          | 0.013        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 25.00     | 120.00           | 480.00            | 15.000         | 0.008        |
| <b>#17</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #17        | 6        | 3. Short grass pasture                                | 33.00     | 448.80           | 1,360.00          | 4.590          | 0.082        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 25.00     | 120.00           | 480.00            | 15.000         | 0.008        |
| <b>#17</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.090</b> |
| #19        | 1        | 3. Short grass pasture                                | 30.00     | 78.00            | 260.00            | 4.380          | 0.016        |
| <b>#19</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.016</b> |
| #21        | 1        | 3. Short grass pasture                                | 26.00     | 24.70            | 95.00             | 4.070          | 0.006        |
| <b>#21</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.006</b> |
| #23        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 4.00      | 23.28            | 582.00            | 2.000          | 0.080        |
| <b>#23</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #23        | 2        | 8. Large gullies, diversions, and low flowing streams | 1.00      | 4.92             | 492.00            | 3.000          | 0.045        |
|            |          | 5. Nearly bare and untilled, and alluvial valley fans | 13.00     | 99.84            | 768.00            | 3.600          | 0.059        |
| <b>#23</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.104</b> |
| #23        | 3        | 3. Short grass pasture                                | 1.00      | 5.78             | 578.00            | 0.800          | 0.200        |
| <b>#23</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.200</b> |
| #23        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 6.00      | 24.48            | 408.00            | 2.440          | 0.046        |
| <b>#23</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.046</b> |
| #23        | 5        | 3. Short grass pasture                                | 19.00     | 152.00           | 800.00            | 3.480          | 0.063        |
| <b>#23</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.063</b> |
| #23        | 6        | 3. Short grass pasture                                | 4.30      | 25.02            | 582.00            | 1.650          | 0.097        |
| <b>#23</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.097</b> |
| #25        | 1        | 3. Short grass pasture                                | 4.00      | 148.44           | 3,711.00          | 1.600          | 0.644        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 4.70      | 256.62           | 5,460.00          | 6.500          | 0.233        |
| <b>#25</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.877</b> |
| #25        | 2        | 3. Short grass pasture                                | 20.00     | 75.00            | 375.00            | 3.570          | 0.029        |
| <b>#25</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.018</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #25        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 9.00      | 24.03            | 267.00            | 3.000          | 0.024        |
| <b>#25</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #27        | 1        | 3. Short grass pasture                                | 11.00     | 99.00            | 900.00            | 2.650          | 0.094        |
| <b>#27</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.094</b> |
| #27        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 12.00     | 74.87            | 624.00            | 3.460          | 0.050        |
| <b>#27</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #29        | 1        | 3. Short grass pasture                                | 15.00     | 99.00            | 660.00            | 3.090          | 0.059        |
| <b>#29</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.059</b> |
| #31        | 1        | 3. Short grass pasture                                | 5.00      | 79.25            | 1,585.00          | 1.780          | 0.247        |
| <b>#31</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.247</b> |
| #33        | 1        | 3. Short grass pasture                                | 18.00     | 95.04            | 528.00            | 3.390          | 0.043        |
| <b>#33</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.043</b> |
| #35        | 1        | 3. Short grass pasture                                | 10.00     | 203.50           | 2,035.00          | 2.520          | 0.224        |
| <b>#35</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.224</b> |

# **West Taylor Permanent Channels** **100 Yr - 24 Hr Storm Event**

***Permanent Channel Demonstration***  
***Post Mining***

Tony Tennyson

Tri-State Generation & Transmission Association, Inc.  
1100 West 116th Avenue  
Westminster, CO 80234

Phone: (970) 824-1232  
Email: [ttennyson@tristategt.org](mailto:ttennyson@tristategt.org)

## ***General Information***

### ***Storm Information:***

|                 |                |
|-----------------|----------------|
| Storm Type:     | NRCS Type II   |
| Design Storm:   | 100 yr - 24 hr |
| Rainfall Depth: | 2.700 inches   |

## Structure Networking:

| Type    | Stru # | (flows into) | Stru # | Musk. K (hrs) | Musk. X | Description                              |
|---------|--------|--------------|--------|---------------|---------|------------------------------------------|
| Null    | #1     | ==>          | End    | 0.000         | 0.000   | Null Below West Taylor Pond              |
| Pond    | #2     | ==>          | #1     | 0.000         | 0.000   | West Taylor Pond                         |
| Null    | #3     | ==>          | #2     | 0.000         | 0.000   | Null Above West Taylor Pond              |
| Channel | #4     | ==>          | #3     | 0.000         | 0.000   | 0+00 to WFSP-1 West Fork Taylor Ditch    |
| Pond    | #5     | ==>          | #4     | 0.000         | 0.000   | WFSP-1 Stock Pond                        |
| Channel | #6     | ==>          | #5     | 0.000         | 0.000   | Channel WFSP-1 to WFSP-2                 |
| Pond    | #7     | ==>          | #6     | 0.000         | 0.000   | WFSP-2 Stockpond                         |
| Channel | #8     | ==>          | #7     | 0.000         | 0.000   | WFSP-2 to Station 40+00                  |
| Null    | #9     | ==>          | #8     | 0.000         | 0.000   | Null Confluence Trib 1                   |
| Channel | #10    | ==>          | #9     | 0.000         | 0.000   | Trib 1                                   |
| Channel | #11    | ==>          | #9     | 0.000         | 0.000   | West Fork Station 40+00 to 83+05         |
| Null    | #13    | ==>          | #4     | 0.000         | 0.000   | Null Confluence West 7800' Terrace Ditch |
| Channel | #14    | ==>          | #13    | 0.000         | 0.000   | West 7800' Terrace Ditch                 |
| Null    | #15    | ==>          | #4     | 0.000         | 0.000   | Null 7700' Terrace Ditch                 |
| Channel | #16    | ==>          | #15    | 0.000         | 0.000   | 7700' Terrace Ditch                      |
| Channel | #17    | ==>          | #3     | 0.000         | 0.000   | East Fork Taylor Ditch 0+00 to EFSP-1    |
| Null    | #18    | ==>          | #17    | 0.000         | 0.000   | Null 7600' Terrace Ditch                 |
| Channel | #19    | ==>          | #18    | 0.000         | 0.000   | 7600' Terrace Ditch                      |
| Null    | #20    | ==>          | #17    | 0.000         | 0.000   | Null 7800' Terrace Ditch                 |
| Channel | #21    | ==>          | #20    | 0.000         | 0.000   | East 7800' Terrace Ditch                 |
| Pond    | #22    | ==>          | #17    | 0.000         | 0.000   | EFSP-1 Stock Pond                        |
| Channel | #23    | ==>          | #22    | 0.000         | 0.000   | EFSP-1 to EFSP-2 Veg Channel             |
| Pond    | #24    | ==>          | #23    | 0.000         | 0.000   | EFSP-2 Stockpond                         |
| Channel | #25    | ==>          | #24    | 0.000         | 0.000   | EFSP-2 to Station 124+03                 |
| Null    | #26    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 2                   |
| Channel | #27    | ==>          | #26    | 0.000         | 0.000   | Trib 2                                   |
| Null    | #28    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 3                   |
| Channel | #29    | ==>          | #28    | 0.000         | 0.000   | Trib 3                                   |
| Null    | #30    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 5                   |
| Channel | #31    | ==>          | #30    | 0.000         | 0.000   | Trib 5                                   |
| Null    | #32    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 4                   |
| Channel | #33    | ==>          | #32    | 0.000         | 0.000   | Trib 4                                   |
| Null    | #34    | ==>          | #25    | 0.000         | 0.000   | Null Confluence Trib 6                   |
| Channel | #35    | ==>          | #34    | 0.000         | 0.000   | Trib 6                                   |



#35  
Chan'l

|  |                                                                                     |               |
|--|-------------------------------------------------------------------------------------|---------------|
|  |  | #34<br>Null   |
|  |  | #33<br>Chan'l |
|  |  | #32<br>Null   |
|  |  | #31<br>Chan'l |
|  |  | #30<br>Null   |
|  |  | #29<br>Chan'l |
|  |  | #28<br>Null   |
|  |  | #27<br>Chan'l |
|  |  | #26<br>Null   |
|  |    | #25<br>Chan'l |
|  |    | #24<br>Pond   |
|  |  | #23<br>Chan'l |
|  |  | #22<br>Pond   |
|  |  | #21<br>Chan'l |
|  |  | #20<br>Null   |
|  |  | #19<br>Chan'l |
|  |  | #18<br>Null   |
|  |  | #17<br>Chan'l |
|  |  | #16<br>Chan'l |
|  |  | #15<br>Null   |
|  |  | #14<br>Chan'l |
|  |  | #13<br>Null   |

|                                                                                   |                                                                                     |               |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------|
|                                                                                   |  | #11<br>Chan'l |
|                                                                                   |  | #10<br>Chan'l |
|                                                                                   |  | #9<br>Null    |
|                                                                                   |    | #8<br>Chan'l  |
|                                                                                   |    | #7<br>Pond    |
|                                                                                   |    | #6<br>Chan'l  |
|                                                                                   |    | #5<br>Pond    |
|                                                                                   |    | #4<br>Chan'l  |
|                                                                                   |    | #3<br>Null    |
|  |                                                                                     | #2<br>Pond    |
| #1<br>Null                                                                        |                                                                                     |               |

### ***Structure Summary:***

|        | Immediate<br>Contributing<br>Area<br>(ac) | Total<br>Contributing<br>Area<br>(ac) | Peak<br>Discharge<br>(cfs) | Total<br>Runoff<br>Volume<br>(ac-ft) |
|--------|-------------------------------------------|---------------------------------------|----------------------------|--------------------------------------|
| #35    | 31.000                                    | 31.000                                | 3.86                       | 0.59                                 |
| #34    | 0.000                                     | 31.000                                | 3.86                       | 0.59                                 |
| #33    | 6.600                                     | 6.600                                 | 2.03                       | 0.16                                 |
| #32    | 0.000                                     | 6.600                                 | 2.03                       | 0.16                                 |
| #31    | 18.800                                    | 18.800                                | 2.24                       | 0.36                                 |
| #30    | 0.000                                     | 18.800                                | 2.24                       | 0.36                                 |
| #29    | 14.000                                    | 14.000                                | 4.30                       | 0.33                                 |
| #28    | 0.000                                     | 14.000                                | 4.30                       | 0.33                                 |
| #27    | 25.100                                    | 25.100                                | 16.24                      | 1.23                                 |
| #26    | 0.000                                     | 25.100                                | 16.24                      | 1.23                                 |
| #25    | 129.200                                   | 224.700                               | 26.40                      | 5.20                                 |
| #24 In | 0.000                                     | 224.700                               | 26.40                      | 5.20                                 |
| Out    |                                           |                                       | 6.89                       | 4.02                                 |
| #23    | 141.900                                   | 366.600                               | 125.52                     | 13.52                                |
| #22 In | 0.000                                     | 366.600                               | 125.52                     | 13.52                                |
| Out    |                                           |                                       | 85.37                      | 12.33                                |
| #21    | 3.000                                     | 3.000                                 | 0.92                       | 0.07                                 |
| #20    | 0.000                                     | 3.000                                 | 0.92                       | 0.07                                 |
| #19    | 4.000                                     | 4.000                                 | 1.23                       | 0.10                                 |
| #18    | 0.000                                     | 4.000                                 | 1.23                       | 0.10                                 |
| #17    | 35.100                                    | 408.700                               | 101.31                     | 13.56                                |
| #16    | 7.300                                     | 7.300                                 | 2.24                       | 0.17                                 |
| #15    | 0.000                                     | 7.300                                 | 2.24                       | 0.17                                 |
| #14    | 1.900                                     | 1.900                                 | 0.58                       | 0.05                                 |
| #13    | 0.000                                     | 1.900                                 | 0.58                       | 0.05                                 |
| #11    | 181.300                                   | 181.300                               | 26.85                      | 2.90                                 |
| #10    | 64.500                                    | 64.500                                | 36.66                      | 3.33                                 |
| #9     | 0.000                                     | 245.800                               | 57.40                      | 6.23                                 |
| #8     | 13.300                                    | 259.100                               | 72.61                      | 7.37                                 |
| #7 In  | 0.000                                     | 259.100                               | 72.61                      | 7.37                                 |
| Out    |                                           |                                       | 20.78                      | 6.10                                 |
| #6     | 94.500                                    | 353.600                               | 46.52                      | 10.19                                |
| #5 In  | 0.000                                     | 353.600                               | 46.52                      | 10.19                                |
| Out    |                                           |                                       | 26.09                      | 8.92                                 |
| #4     | 35.400                                    | 398.200                               | 27.48                      | 9.85                                 |
| #3     | 0.000                                     | 806.900                               | 113.18                     | 23.41                                |
| #2 In  | 27.600                                    | 834.500                               | 113.18                     | 23.45                                |
| Out    |                                           |                                       | 48.51                      | 22.33                                |
| #1     | 0.000                                     | 834.500                               | 48.51                      | 22.33                                |

## Structure Detail:

### Structure #35 (Vegetated Channel)

#### Trib 6

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 6.0       | D, B               | 1.43                 |                      |                         | 6.0                     |

Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 3.86 cfs                              |                                      | 3.86 cfs                             |                                     |
| Depth:                 | 0.28 ft                               | 1.71 ft                              | 0.57 ft                              | 2.00 ft                             |
| Top Width:             | 7.70 ft                               | 16.28 ft                             | 9.40 ft                              | 17.98 ft                            |
| Velocity:              | 1.99 fps                              |                                      | 0.88 fps                             |                                     |
| X-Section Area:        | 1.94 sq ft                            |                                      | 4.37 sq ft                           |                                     |
| Hydraulic Radius:      | 0.249 ft                              |                                      | 0.456 ft                             |                                     |
| Froude Number:         | 0.70                                  |                                      | 0.23                                 |                                     |
| Roughness Coefficient: | 0.0723                                |                                      | 0.2440                               |                                     |

### Structure #34 (Null)

#### Null Confluence Trib 6

### Structure #33 (Vegetated Channel)

#### Trib 4

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 16.0      | D, B               | 1.66                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 2.03 cfs                              |                                      | 2.03 cfs                             |                                     |
| Depth:                    | 0.16 ft                               | 1.82 ft                              | 0.34 ft                              | 2.00 ft                             |
| Top Width:                | 6.96 ft                               | 16.92 ft                             | 8.06 ft                              | 18.02 ft                            |
| Velocity:                 | 1.95 fps                              |                                      | 0.84 fps                             |                                     |
| X-Section Area:           | 1.04 sq ft                            |                                      | 2.42 sq ft                           |                                     |
| Hydraulic Radius:         | 0.148 ft                              |                                      | 0.296 ft                             |                                     |
| Froude Number:            | 0.89                                  |                                      | 0.27                                 |                                     |
| Roughness<br>Coefficient: | 0.0852                                |                                      | 0.3150                               |                                     |

### Structure #32 (Null)

*Null Confluence Trib 4*

### Structure #31 (Vegetated Channel)

*Trib 5*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 6.00                 | 3.0:1                      | 3.0:1                       | 4.0       | D, B                  | 1.45                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 2.24 cfs                              |                                      | 2.24 cfs                             |                                     |
| Depth:                    | 0.26 ft                               | 1.71 ft                              | 0.55 ft                              | 2.00 ft                             |
| Top Width:                | 7.53 ft                               | 16.23 ft                             | 9.29 ft                              | 17.99 ft                            |
| Velocity:                 | 1.30 fps                              |                                      | 0.54 fps                             |                                     |
| X-Section Area:           | 1.73 sq ft                            |                                      | 4.19 sq ft                           |                                     |
| Hydraulic Radius:         | 0.227 ft                              |                                      | 0.443 ft                             |                                     |
| Froude Number:            | 0.48                                  |                                      | 0.14                                 |                                     |
| Roughness<br>Coefficient: | 0.0847                                |                                      | 0.3226                               |                                     |

### Structure #30 (Null)

*Null Confluence Trib 5*

### Structure #29 (Vegetated Channel)

*Trib 3*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 11.0      | D, B               | 1.52                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                        | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|------------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge:      | 4.30 cfs                        |                                | 4.30 cfs                       |                               |
| Depth:                 | 0.25 ft                         | 1.77 ft                        | 0.48 ft                        | 2.00 ft                       |
| Top Width:             | 7.48 ft                         | 16.60 ft                       | 8.90 ft                        | 18.02 ft                      |
| Velocity:              | 2.59 fps                        |                                | 1.19 fps                       |                               |
| X-Section Area:        | 1.66 sq ft                      |                                | 3.61 sq ft                     |                               |
| Hydraulic Radius:      | 0.219 ft                        |                                | 0.398 ft                       |                               |
| Froude Number:         | 0.97                            |                                | 0.33                           |                               |
| Roughness Coefficient: | 0.0693                          |                                | 0.2238                         |                               |

Structure #28 (Null)

*Null Confluence Trib 3*

Structure #27 (Vegetated Channel)

*Trib 2*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 6.00              | 3.0:1                | 3.0:1                 | 11.0      | D, B               | 1.28                 |                      |                         | 5.0                     |

Vegetated Channel Results:

|                   | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|-------------------|---------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Design Discharge: | 16.24 cfs                       |                                | 16.24 cfs                      |                               |
| Depth:            | 0.43 ft                         | 1.71 ft                        | 0.72 ft                        | 2.00 ft                       |
| Top Width:        | 8.58 ft                         | 16.26 ft                       | 10.31 ft                       | 17.99 ft                      |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 5.18 fps                              |                                      | 2.77 fps                             |                                     |
| X-Section Area:           | 3.13 sq ft                            |                                      | 5.86 sq ft                           |                                     |
| Hydraulic Radius:         | 0.360 ft                              |                                      | 0.556 ft                             |                                     |
| Froude Number:            | 1.51                                  |                                      | 0.65                                 |                                     |
| Roughness<br>Coefficient: | 0.0482                                |                                      | 0.1205                               |                                     |

### Structure #26 (Null)

*Null Confluence Trib 2*

### Structure #25 (Vegetated Channel)

*EFSP-2 to Station 124+03*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 4.7       | D, B                  | 3.15                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 26.40 cfs                             |                                      | 26.40 cfs                            |                                     |
| Depth:                    | 0.51 ft                               | 3.66 ft                              | 0.85 ft                              | 4.00 ft                             |
| Top Width:                | 15.04 ft                              | 33.94 ft                             | 17.12 ft                             | 36.02 ft                            |
| Velocity:                 | 3.85 fps                              |                                      | 2.12 fps                             |                                     |
| X-Section Area:           | 6.86 sq ft                            |                                      | 12.44 sq ft                          |                                     |
| Hydraulic Radius:         | 0.451 ft                              |                                      | 0.715 ft                             |                                     |
| Froude Number:            | 1.01                                  |                                      | 0.44                                 |                                     |
| Roughness<br>Coefficient: | 0.0493                                |                                      | 0.1214                               |                                     |

### Structure #24 (Pond)

*EFSP-2 Stockpond*

Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 92.00 ft   |
| Initial Pool:      | 0.15 ac-ft |

## Straight Pipe

| Barrel<br>Diameter<br>(in) | Barrel<br>Length<br>(ft) | Barrel<br>Slope (%) | Manning's<br>n | Spillway<br>Elev (ft) | Entrance<br>Loss<br>Coefficient | Tailwater<br>Depth<br>(ft) |
|----------------------------|--------------------------|---------------------|----------------|-----------------------|---------------------------------|----------------------------|
| 12.00                      | 100.00                   | 1.50                | 0.0150         | 98.00                 | 0.50                            | 0.00                       |

## Emergency Spillway

| Spillway Elev | Crest Length<br>(ft) | Left<br>Sideslope | Right<br>Sideslope | Bottom<br>Width (ft) |
|---------------|----------------------|-------------------|--------------------|----------------------|
| 100.00        | 20.00                | 2.00:1            | 2.00:1             | 10.00                |

## Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 100.10 ft |
| Dewater Time:   | 0.92 days |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |             |
|-----------|--------------|---------------------|--------------------|--------------------------|-------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |             |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |             |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |             |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |             |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |             |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |             |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |             |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |             |
| 98.00     | 0.301        | 1.329               | 0.000              |                          | Spillway #1 |
| 99.00     | 0.339        | 1.649               | 2.094              | 11.50                    |             |
| 100.00    | 0.380        | 2.008               | 4.263              | 8.30                     | Spillway #2 |
| 100.10    | 0.457        | 2.055               | 6.885              | 2.20                     | Peak Stage  |
| 101.00    | 0.554        | 2.473               | 30.516             |                          |             |
| 102.00    | 0.761        | 3.127               | 98.736             |                          |             |
| 103.00    | 1.000        | 4.005               | 207.246            |                          |             |

## Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (5)>4.263              | 0.000                       | 4.263                                   |
| 101.00            | (6)>5.033              | 25.483                      | 30.516                                  |
| 102.00            | (6)>5.701              | 93.036                      | 98.736                                  |
| 103.00            | (6)>6.275              | 200.972                     | 207.246                                 |

### Structure #23 (Vegetated Channel)

#### *EFSP-1 to EFSP-2 Veg Channel*

Trapezoidal Vegetated Channel Inputs:

#### Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 1.5       | D, B                  | 2.06                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 125.52 cfs                            |                                      | 125.52 cfs                           |                                     |
| Depth:                    | 1.37 ft                               | 3.43 ft                              | 1.94 ft                              | 4.00 ft                             |
| Top Width:                | 20.23 ft                              | 32.59 ft                             | 23.65 ft                             | 36.01 ft                            |
| Velocity:                 | 5.68 fps                              |                                      | 3.63 fps                             |                                     |
| X-Section Area:           | 22.11 sq ft                           |                                      | 34.60 sq ft                          |                                     |
| Hydraulic Radius:         | 1.069 ft                              |                                      | 1.425 ft                             |                                     |
| Froude Number:            | 0.96                                  |                                      | 0.53                                 |                                     |
| Roughness<br>Coefficient: | 0.0336                                |                                      | 0.0637                               |                                     |

### Structure #22 (Pond)

# EFSP-1 Stock Pond

## Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 92.00 ft   |
| Initial Pool:      | 0.15 ac-ft |

## Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|----------------------|--------------------|------------------|-------------|--------------------|---------------------------|----------------------|
| 12.00                | 100.00             | 1.50             | 0.0150      | 98.00              | 0.50                      | 0.00                 |

## Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 100.00        | 20.00             | 2.00:1         | 2.00:1          | 10.00             |

## Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 101.80 ft |
| Dewater Time:   | 1.18 days |

*Dewatering time is calculated from peak stage to lowest spillway*

## Elevation-Capacity-Discharge Table

| Elevation | Area (ac) | Capacity (ac-ft) | Discharge (cfs) | Dewater Time (hrs) |
|-----------|-----------|------------------|-----------------|--------------------|
| 90.00     | 0.050     | 0.000            | 0.000           |                    |
| 91.00     | 0.072     | 0.061            | 0.000           |                    |
| 92.00     | 0.098     | 0.145            | 0.000           |                    |
| 93.00     | 0.128     | 0.258            | 0.000           |                    |
| 94.00     | 0.162     | 0.403            | 0.000           |                    |
| 95.00     | 0.200     | 0.583            | 0.000           |                    |
| 96.00     | 0.231     | 0.799            | 0.000           |                    |
| 97.00     | 0.265     | 1.046            | 0.000           |                    |
| 98.00     | 0.301     | 1.329            | 0.000           | Spillway #1        |
| 99.00     | 0.339     | 1.649            | 2.094           | 13.60              |
| 100.00    | 0.380     | 2.008            | 4.263           | 2.70 Spillway #2   |
| 101.00    | 0.554     | 2.473            | 30.516          | 11.75              |
| 101.80    | 0.724     | 2.999            | 85.372          | 0.30 Peak Stage    |
| 102.00    | 0.761     | 3.127            | 98.736          |                    |
| 103.00    | 1.000     | 4.005            | 207.246         |                    |

### Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (5)>4.263              | 0.000                       | 4.263                                   |
| 101.00            | (6)>5.033              | 25.483                      | 30.516                                  |
| 102.00            | (6)>5.701              | 93.036                      | 98.736                                  |
| 103.00            | (6)>6.275              | 200.972                     | 207.246                                 |

### Structure #21 (Vegetated Channel)

#### *East 7800' Terrace Ditch*

Triangular Vegetated Channel Inputs:

#### Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 1.84                    |                         |                               | 7.0                           |

#### Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.92 cfs                              |                                      | 0.92 cfs                             |                                     |
| Depth:                    | 0.65 ft                               | 2.49 ft                              | 1.16 ft                              | 3.00 ft                             |
| Top Width:                | 2.95 ft                               | 11.23 ft                             | 5.23 ft                              | 13.51 ft                            |
| Velocity:                 | 0.95 fps                              |                                      | 0.30 fps                             |                                     |
| X-Section Area:           | 0.97 sq ft                            |                                      | 3.04 sq ft                           |                                     |
| Hydraulic Radius:         | 0.299 ft                              |                                      | 0.531 ft                             |                                     |
| Froude Number:            | 0.29                                  |                                      | 0.07                                 |                                     |
| Roughness<br>Coefficient: | 0.0855                                |                                      | 0.3955                               |                                     |

Structure #20 (Null)

*Null 7800' Terrace Ditch*

Structure #19 (Vegetated Channel)

*7600' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 1.76                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 1.23 cfs                              |                                      | 1.23 cfs                             |                                     |
| Depth:                    | 0.71 ft                               | 2.47 ft                              | 1.24 ft                              | 3.00 ft                             |
| Top Width:                | 3.21 ft                               | 11.13 ft                             | 5.58 ft                              | 13.50 ft                            |
| Velocity:                 | 1.07 fps                              |                                      | 0.36 fps                             |                                     |
| X-Section Area:           | 1.14 sq ft                            |                                      | 3.46 sq ft                           |                                     |
| Hydraulic Radius:         | 0.326 ft                              |                                      | 0.567 ft                             |                                     |
| Froude Number:            | 0.32                                  |                                      | 0.08                                 |                                     |
| Roughness<br>Coefficient: | 0.0804                                |                                      | 0.3516                               |                                     |

Structure #18 (Null)

*Null 7600' Terrace Ditch*

Structure #17 (Riprap Channel)

*East Fork Taylor Ditch 0+00 to EFSP-1*

Trapezoidal Riprap Channel Inputs:

Material: Riprap

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) |
|----------------------|----------------------------|-----------------------------|-----------|-------------------------|-------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 25.0      | 3.61                    |                         |                               |

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 101.31 cfs    |              |
| Depth:            | 0.39 ft       | 4.00 ft      |
| Top Width:        | 14.33 ft      | 35.99 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 5.10 sq ft    |              |
| Hydraulic Radius: | 0.353 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 6.00 in       |              |
| D50:              | 18.00 in      |              |
| Dmax:             | 22.50 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #16 (Vegetated Channel)

#### *7700' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 1.58                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 2.24 cfs                              |                                      | 2.24 cfs                             |                                     |
| Depth:                    | 0.85 ft                               | 2.43 ft                              | 1.42 ft                              | 3.00 ft                             |
| Top Width:                | 3.83 ft                               | 10.94 ft                             | 6.37 ft                              | 13.48 ft                            |
| Velocity:                 | 1.38 fps                              |                                      | 0.50 fps                             |                                     |
| X-Section Area:           | 1.63 sq ft                            |                                      | 4.51 sq ft                           |                                     |
| Hydraulic Radius:         | 0.389 ft                              |                                      | 0.647 ft                             |                                     |
| Froude Number:            | 0.37                                  |                                      | 0.10                                 |                                     |
| Roughness<br>Coefficient: | 0.0706                                |                                      | 0.2747                               |                                     |

### Structure #15 (Null)

#### *Null 7700' Terrace Ditch*

### Structure #14 (Vegetated Channel)

### *West 7800' Terrace Ditch*

Triangular Vegetated Channel Inputs:

Material: Smooth brome

| Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 1.5:1                      | 3.0:1                       | 1.5       | D, B                  | 1.95                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 0.58 cfs                              |                                      | 0.58 cfs                             |                                     |
| Depth:                    | 0.57 ft                               | 2.52 ft                              | 1.05 ft                              | 3.00 ft                             |
| Top Width:                | 2.58 ft                               | 11.35 ft                             | 4.73 ft                              | 13.51 ft                            |
| Velocity:                 | 0.79 fps                              |                                      | 0.23 fps                             |                                     |
| X-Section Area:           | 0.74 sq ft                            |                                      | 2.49 sq ft                           |                                     |
| Hydraulic Radius:         | 0.262 ft                              |                                      | 0.481 ft                             |                                     |
| Froude Number:            | 0.26                                  |                                      | 0.06                                 |                                     |
| Roughness<br>Coefficient: | 0.0944                                |                                      | 0.4771                               |                                     |

### Structure #13 (Null)

*Null Confluence West 7800' Terrace Ditch*

### Structure #11 (Vegetated Channel)

*West Fork Station 40+00 to 83+05*

Trapezoidal Vegetated Channel Inputs:

Material: Bermuda grass

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 12.00                | 3.0:1                      | 3.0:1                       | 8.0       | D, B                  | 3.27                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                   | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|-------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge: | 26.85 cfs                             |                                      | 26.85 cfs                            |                                     |
| Depth:            | 0.43 ft                               | 3.70 ft                              | 0.73 ft                              | 4.00 ft                             |
| Top Width:        | 14.61 ft                              | 34.23 ft                             | 16.36 ft                             | 35.98 ft                            |

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Velocity:                 | 4.64 fps                              |                                      | 2.61 fps                             |                                     |
| X-Section Area:           | 5.79 sq ft                            |                                      | 10.29 sq ft                          |                                     |
| Hydraulic Radius:         | 0.392 ft                              |                                      | 0.620 ft                             |                                     |
| Froude Number:            | 1.30                                  |                                      | 0.58                                 |                                     |
| Roughness<br>Coefficient: | 0.0486                                |                                      | 0.1174                               |                                     |

### Structure #10 (Vegetated Channel)

#### *Trib 1*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom<br>Width (ft) | Left<br>Sideslope<br>Ratio | Right<br>Sideslope<br>Ratio | Slope (%) | Retardance<br>Classes | Freeboard<br>Depth (ft) | Freeboard<br>% of Depth | Freeboard<br>Mult. x<br>(VxD) | Limiting<br>Velocity<br>(fps) |
|----------------------|----------------------------|-----------------------------|-----------|-----------------------|-------------------------|-------------------------|-------------------------------|-------------------------------|
| 6.00                 | 3.0:1                      | 3.0:1                       | 5.0       | D, B                  | 0.83                    |                         |                               | 7.0                           |

Vegetated Channel Results:

|                           | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:         | 36.66 cfs                             |                                      | 36.66 cfs                            |                                     |
| Depth:                    | 0.76 ft                               | 1.59 ft                              | 1.17 ft                              | 2.00 ft                             |
| Top Width:                | 10.58 ft                              | 15.56 ft                             | 13.01 ft                             | 17.99 ft                            |
| Velocity:                 | 5.79 fps                              |                                      | 3.30 fps                             |                                     |
| X-Section Area:           | 6.34 sq ft                            |                                      | 11.10 sq ft                          |                                     |
| Hydraulic Radius:         | 0.585 ft                              |                                      | 0.829 ft                             |                                     |
| Froude Number:            | 1.32                                  |                                      | 0.63                                 |                                     |
| Roughness<br>Coefficient: | 0.0402                                |                                      | 0.0890                               |                                     |

### Structure #9 (Null)

#### *Null Confluence Trib 1*

### Structure #8 (Vegetated Channel)

#### *WFSP-2 to Station 40+00*

Trapezoidal Vegetated Channel Inputs:

Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.5       | D, B               | 2.35                 |                      |                         | 7.0                     |

## Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 72.61 cfs                             |                                      | 72.61 cfs                            |                                     |
| Depth:                 | 1.09 ft                               | 3.44 ft                              | 1.65 ft                              | 4.00 ft                             |
| Top Width:             | 18.56 ft                              | 32.66 ft                             | 21.91 ft                             | 36.01 ft                            |
| Velocity:              | 4.34 fps                              |                                      | 2.59 fps                             |                                     |
| X-Section Area:        | 16.72 sq ft                           |                                      | 27.99 sq ft                          |                                     |
| Hydraulic Radius:      | 0.884 ft                              |                                      | 1.247 ft                             |                                     |
| Froude Number:         | 0.81                                  |                                      | 0.40                                 |                                     |
| Roughness Coefficient: | 0.0387                                |                                      | 0.0815                               |                                     |

## Structure #7 (Pond)

### WFSP-2 Stockpond

#### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 91.00 ft   |
| Initial Pool:      | 0.06 ac-ft |

#### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 100.00        | 20.00             | 2.00:1         | 2.00:1          | 5.00              |

#### Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|----------------------|--------------------|------------------|-------------|--------------------|---------------------------|----------------------|
| 12.00                | 100.00             | 1.00             | 0.0150      | 98.00              | 0.90                      | 0.00                 |

#### Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 101.05 ft |
| Dewater Time:   | 0.98 days |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #2              |
| 99.00     | 0.339        | 1.649               | 2.094              | 11.15                    |
| 100.00    | 0.380        | 2.008               | 3.745              | 6.80 Spillway #1         |
| 101.00    | 0.554        | 2.473               | 18.584             | 5.40                     |
| 101.05    | 0.580        | 2.506               | 20.783             | 0.20 Peak Stage          |
| 102.00    | 0.761        | 3.127               | 61.251             |                          |
| 103.00    | 1.000        | 4.005               | 135.506            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Emergency<br>Spillway (cfs) | Straight Pipe<br>(cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-----------------------------|------------------------|-----------------------------------------|
| 90.00             | 0.000                       | 0.000                  | 0.000                                   |
| 91.00             | 0.000                       | 0.000                  | 0.000                                   |
| 92.00             | 0.000                       | 0.000                  | 0.000                                   |
| 93.00             | 0.000                       | 0.000                  | 0.000                                   |
| 94.00             | 0.000                       | 0.000                  | 0.000                                   |
| 95.00             | 0.000                       | 0.000                  | 0.000                                   |
| 96.00             | 0.000                       | 0.000                  | 0.000                                   |
| 97.00             | 0.000                       | 0.000                  | 0.000                                   |
| 98.00             | 0.000                       | 0.000                  | 0.000                                   |
| 99.00             | 0.000                       | (3)>2.094              | 2.094                                   |
| 100.00            | 0.000                       | (6)>3.745              | 3.745                                   |
| 101.00            | 14.046                      | (6)>4.538              | 18.584                                  |
| 102.00            | 56.062                      | (6)>5.189              | 61.251                                  |
| 103.00            | 129.713                     | (6)>5.793              | 135.506                                 |

### Structure #6 (Vegetated Channel)

*Channel WFSP-1 to WFSP-2*

Trapezoidal Vegetated Channel Inputs:

### Material: Smooth brome

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|-------------------|----------------------|-----------------------|-----------|--------------------|----------------------|----------------------|-------------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 1.3       | D, B               | 2.49                 |                      |                         | 7.0                     |

### Vegetated Channel Results:

|                        | Stability<br>Class D w/o<br>Freeboard | Stability<br>Class D w/<br>Freeboard | Capacity<br>Class B w/o<br>Freeboard | Capacity<br>Class B w/<br>Freeboard |
|------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-------------------------------------|
| Design Discharge:      | 46.52 cfs                             |                                      | 46.52 cfs                            |                                     |
| Depth:                 | 0.95 ft                               | 3.44 ft                              | 1.51 ft                              | 4.00 ft                             |
| Top Width:             | 17.69 ft                              | 32.63 ft                             | 21.08 ft                             | 36.02 ft                            |
| Velocity:              | 3.30 fps                              |                                      | 1.86 fps                             |                                     |
| X-Section Area:        | 14.09 sq ft                           |                                      | 25.02 sq ft                          |                                     |
| Hydraulic Radius:      | 0.783 ft                              |                                      | 1.160 ft                             |                                     |
| Froude Number:         | 0.65                                  |                                      | 0.30                                 |                                     |
| Roughness Coefficient: | 0.0436                                |                                      | 0.1009                               |                                     |

### Structure #5 (Pond)

#### *WFSP-1 Stock Pond*

### Pond Inputs:

|                    |            |
|--------------------|------------|
| Initial Pool Elev: | 91.00 ft   |
| Initial Pool:      | 0.06 ac-ft |

### Straight Pipe

| Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Entrance Loss Coefficient | Tailwater Depth (ft) |
|----------------------|--------------------|------------------|-------------|--------------------|---------------------------|----------------------|
| 12.00                | 100.00             | 1.50             | 0.0150      | 98.00              | 0.90                      | 0.00                 |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 100.00        | 20.00             | 2.00:1         | 2.00:1          | 10.00             |

### Pond Results:

|                 |           |
|-----------------|-----------|
| Peak Elevation: | 100.84 ft |
| Dewater Time:   | 1.15 days |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 90.00     | 0.050        | 0.000               | 0.000              |                          |
| 91.00     | 0.072        | 0.061               | 0.000              |                          |
| 92.00     | 0.098        | 0.145               | 0.000              |                          |
| 93.00     | 0.128        | 0.258               | 0.000              |                          |
| 94.00     | 0.162        | 0.403               | 0.000              |                          |
| 95.00     | 0.200        | 0.583               | 0.000              |                          |
| 96.00     | 0.231        | 0.799               | 0.000              |                          |
| 97.00     | 0.265        | 1.046               | 0.000              |                          |
| 98.00     | 0.301        | 1.329               | 0.000              | Spillway #1              |
| 99.00     | 0.339        | 1.649               | 2.094              | 13.45                    |
| 100.00    | 0.380        | 2.008               | 4.162              | 4.70 Spillway #2         |
| 100.84    | 0.536        | 2.397               | 26.086             | 9.50 Peak Stage          |
| 101.00    | 0.554        | 2.473               | 30.351             |                          |
| 102.00    | 0.761        | 3.127               | 98.545             |                          |
| 103.00    | 1.000        | 4.005               | 207.032            |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Straight Pipe<br>(cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|------------------------|-----------------------------|-----------------------------------------|
| 90.00             | 0.000                  | 0.000                       | 0.000                                   |
| 91.00             | 0.000                  | 0.000                       | 0.000                                   |
| 92.00             | 0.000                  | 0.000                       | 0.000                                   |
| 93.00             | 0.000                  | 0.000                       | 0.000                                   |
| 94.00             | 0.000                  | 0.000                       | 0.000                                   |
| 95.00             | 0.000                  | 0.000                       | 0.000                                   |
| 96.00             | 0.000                  | 0.000                       | 0.000                                   |
| 97.00             | 0.000                  | 0.000                       | 0.000                                   |
| 98.00             | 0.000                  | 0.000                       | 0.000                                   |
| 99.00             | (3)>2.094              | 0.000                       | 2.094                                   |
| 100.00            | (6)>4.162              | 0.000                       | 4.162                                   |
| 101.00            | (6)>4.868              | 25.483                      | 30.351                                  |
| 102.00            | (6)>5.509              | 93.036                      | 98.545                                  |
| 103.00            | (6)>6.061              | 200.972                     | 207.032                                 |

### Structure #4 (Riprap Channel)

*0+00 to WFSP-1 West Fork Taylor Ditch*

Trapezoidal Riprap Channel Inputs:

### Material: Riprap

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) |
|-------------------|----------------------|-----------------------|-----------|----------------------|----------------------|-------------------------|
| 12.00             | 3.0:1                | 3.0:1                 | 26.0      | 3.87                 |                      |                         |

### Riprap Channel Results:

#### Simons/OSM Method - Steep Slope Design

|                   | w/o Freeboard | w/ Freeboard |
|-------------------|---------------|--------------|
| Design Discharge: | 27.48 cfs     |              |
| Depth:            | 0.13 ft       | 4.00 ft      |
| Top Width:        | 12.78 ft      | 36.00 ft     |
| Velocity*:        |               |              |
| X-Section Area:   | 1.61 sq ft    |              |
| Hydraulic Radius: | 0.125 ft      |              |
| Froude Number*:   |               |              |
| Manning's n*:     |               |              |
| Dmin:             | 3.00 in       |              |
| D50:              | 9.00 in       |              |
| Dmax:             | 11.25 in      |              |

Velocity and Manning's n calculations may not apply for this method.

### Structure #3 (Null)

*Null Above West Taylor Pond*

### Structure #2 (Pond)

*West Taylor Pond*

### Pond Inputs:

|                    |             |
|--------------------|-------------|
| Initial Pool Elev: | 7,468.00 ft |
| Initial Pool:      | 1.76 ac-ft  |

### Perforated Riser

| Riser Diameter (in) | Riser Height (ft) | Barrel Diameter (in) | Barrel Length (ft) | Barrel Slope (%) | Manning's n | Spillway Elev (ft) | Number of Holes per Elev |
|---------------------|-------------------|----------------------|--------------------|------------------|-------------|--------------------|--------------------------|
| 18.00               | 10.50             | 18.00                | 150.00             | 2.00             | 0.0150      | 7,471.00           | 2                        |

### Emergency Spillway

| Spillway Elev | Crest Length (ft) | Left Sideslope | Right Sideslope | Bottom Width (ft) |
|---------------|-------------------|----------------|-----------------|-------------------|
| 7,475.00      | 30.00             | 2.00:1         | 2.00:1          | 30.00             |

Pond Results:

|                 |             |
|-----------------|-------------|
| Peak Elevation: | 7,475.47 ft |
| Dewater Time:   | 1.24 days   |

*Dewatering time is calculated from peak stage to lowest spillway*

Elevation-Capacity-Discharge Table

| Elevation | Area<br>(ac) | Capacity<br>(ac-ft) | Discharge<br>(cfs) | Dewater<br>Time<br>(hrs) |
|-----------|--------------|---------------------|--------------------|--------------------------|
| 7,455.00  | 0.022        | 0.000               | 0.000              |                          |
| 7,456.00  | 0.032        | 0.027               | 0.000              |                          |
| 7,457.00  | 0.043        | 0.064               | 0.000              |                          |
| 7,458.00  | 0.054        | 0.113               | 0.000              |                          |
| 7,459.00  | 0.066        | 0.173               | 0.000              |                          |
| 7,460.00  | 0.079        | 0.245               | 0.000              |                          |
| 7,461.00  | 0.103        | 0.336               | 0.000              |                          |
| 7,462.00  | 0.139        | 0.456               | 0.000              |                          |
| 7,463.00  | 0.162        | 0.607               | 0.000              |                          |
| 7,464.00  | 0.188        | 0.781               | 0.000              |                          |
| 7,465.00  | 0.213        | 0.981               | 0.000              |                          |
| 7,466.00  | 0.244        | 1.209               | 0.000              |                          |
| 7,467.00  | 0.279        | 1.470               | 0.000              |                          |
| 7,468.00  | 0.312        | 1.766               | 0.000              |                          |
| 7,469.00  | 0.360        | 2.102               | 0.000              |                          |
| 7,470.00  | 0.389        | 2.476               | 0.000              |                          |
| 7,471.00  | 0.430        | 2.886               | 0.000              | Spillway #1              |
| 7,472.00  | 0.463        | 3.332               | 8.509              | 16.90                    |
| 7,473.00  | 0.503        | 3.815               | 12.033             | 3.05                     |
| 7,474.00  | 0.541        | 4.336               | 14.738             | 2.45                     |
| 7,475.00  | 0.580        | 4.897               | 17.018             | 3.15 Spillway #2         |
| 7,475.47  | 0.570        | 5.171               | 48.514             | 4.20 Peak Stage          |
| 7,476.00  | 0.581        | 5.477               | 83.791             |                          |
| 7,477.00  | 0.582        | 6.059               | 246.034            |                          |
| 7,478.00  | 0.583        | 6.641               | 483.806            |                          |
| 7,479.00  | 0.584        | 7.225               | 794.453            |                          |
| 7,480.00  | 0.585        | 7.809               | 1,172.300          |                          |

Detailed Discharge Table

| Elevation<br>(ft) | Perf. Riser (cfs) | Emergency<br>Spillway (cfs) | Combined<br>Total<br>Discharge<br>(cfs) |
|-------------------|-------------------|-----------------------------|-----------------------------------------|
| 7,455.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,456.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,457.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,458.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,459.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,460.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,461.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,462.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,463.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,464.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,465.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,466.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,467.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,468.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,469.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,470.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,471.00          | 0.000             | 0.000                       | 0.000                                   |
| 7,472.00          | 8.509             | 0.000                       | 8.509                                   |
| 7,473.00          | 12.033            | 0.000                       | 12.033                                  |
| 7,474.00          | 14.738            | 0.000                       | 14.738                                  |
| 7,475.00          | 17.018            | 0.000                       | 17.018                                  |
| 7,476.00          | 19.026            | 64.765                      | 83.791                                  |
| 7,477.00          | 20.842            | 225.191                     | 246.034                                 |
| 7,478.00          | 22.512            | 461.294                     | 483.806                                 |
| 7,479.00          | 24.066            | 770.387                     | 794.453                                 |
| 7,480.00          | 25.526            | 1,146.774                   | 1,172.300                               |

Structure #1 (Null)

*Null Below West Taylor Pond*

***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) |
|------------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #35        | 1        | 31.000         | 0.224              | 0.000        | 0.000  | 62.000       | M   | 3.86                 | 0.593                 |
|            | <b>Σ</b> | <b>31.000</b>  |                    |              |        |              |     | <b>3.86</b>          | <b>0.593</b>          |
| <b>#34</b> | <b>Σ</b> | <b>31.000</b>  |                    |              |        |              |     | <b>3.86</b>          | <b>0.593</b>          |
| #33        | 1        | 6.600          | 0.043              | 0.000        | 0.000  | 62.000       | M   | 2.03                 | 0.157                 |
|            | <b>Σ</b> | <b>6.600</b>   |                    |              |        |              |     | <b>2.03</b>          | <b>0.157</b>          |
| <b>#32</b> | <b>Σ</b> | <b>6.600</b>   |                    |              |        |              |     | <b>2.03</b>          | <b>0.157</b>          |
| #31        | 1        | 18.800         | 0.247              | 0.000        | 0.000  | 62.000       | M   | 2.24                 | 0.360                 |
|            | <b>Σ</b> | <b>18.800</b>  |                    |              |        |              |     | <b>2.24</b>          | <b>0.360</b>          |
| <b>#30</b> | <b>Σ</b> | <b>18.800</b>  |                    |              |        |              |     | <b>2.24</b>          | <b>0.360</b>          |
| #29        | 1        | 14.000         | 0.059              | 0.000        | 0.000  | 62.000       | M   | 4.30                 | 0.333                 |
|            | <b>Σ</b> | <b>14.000</b>  |                    |              |        |              |     | <b>4.30</b>          | <b>0.333</b>          |
| <b>#28</b> | <b>Σ</b> | <b>14.000</b>  |                    |              |        |              |     | <b>4.30</b>          | <b>0.333</b>          |
| #27        | 1        | 14.900         | 0.094              | 0.000        | 0.000  | 62.000       | M   | 4.57                 | 0.354                 |
|            | 2        | 10.200         | 0.050              | 0.000        | 0.000  | 80.000       | F   | 11.66                | 0.874                 |
|            | <b>Σ</b> | <b>25.100</b>  |                    |              |        |              |     | <b>16.24</b>         | <b>1.229</b>          |
| <b>#26</b> | <b>Σ</b> | <b>25.100</b>  |                    |              |        |              |     | <b>16.24</b>         | <b>1.229</b>          |
| #25        | 1        | 128.000        | 0.877              | 0.000        | 0.000  | 62.000       | M   | 7.60                 | 2.427                 |
|            | 2        | 0.500          | 0.018              | 0.000        | 0.000  | 80.000       | F   | 0.57                 | 0.043                 |
|            | 3        | 0.700          | 0.024              | 0.000        | 0.000  | 80.000       | F   | 0.80                 | 0.060                 |
|            | <b>Σ</b> | <b>224.700</b> |                    |              |        |              |     | <b>26.40</b>         | <b>5.200</b>          |
| <b>#24</b> | <b>Σ</b> | <b>224.700</b> |                    |              |        |              |     | <b>26.40</b>         | <b>5.200</b>          |
| #23        | 1        | 2.500          | 0.021              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|            | 2        | 89.600         | 0.104              | 0.000        | 0.000  | 80.000       | F   | 102.44               | 7.680                 |
|            | 3        | 4.900          | 0.200              | 0.000        | 0.000  | 62.000       | M   | 0.64                 | 0.093                 |
|            | 4        | 4.400          | 0.046              | 0.000        | 0.000  | 80.000       | F   | 5.03                 | 0.377                 |
|            | 5        | 34.200         | 0.063              | 0.000        | 0.000  | 62.000       | M   | 10.50                | 0.813                 |
|            | 6        | 6.300          | 0.097              | 0.000        | 0.000  | 80.000       | F   | 7.20                 | 0.540                 |
|            | <b>Σ</b> | <b>366.600</b> |                    |              |        |              |     | <b>125.52</b>        | <b>13.519</b>         |
| <b>#22</b> | <b>Σ</b> | <b>366.600</b> |                    |              |        |              |     | <b>125.52</b>        | <b>13.519</b>         |
| #21        | 1        | 3.000          | 0.006              | 0.000        | 0.000  | 62.000       | M   | 0.92                 | 0.071                 |
|            | <b>Σ</b> | <b>3.000</b>   |                    |              |        |              |     | <b>0.92</b>          | <b>0.071</b>          |

| Stru # | SWS # | SWS Area (ac) | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|--------|-------|---------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
| #20    | Σ     | 3.000         |                    |              |        |              |     | 0.92                 | 0.071                 |
| #19    | 1     | 4.000         | 0.016              | 0.000        | 0.000  | 62.000       | M   | 1.23                 | 0.095                 |
|        | Σ     | 4.000         |                    |              |        |              |     | 1.23                 | 0.095                 |
| #18    | Σ     | 4.000         |                    |              |        |              |     | 1.23                 | 0.095                 |
| #17    | 1     | 10.400        | 0.022              | 0.000        | 0.000  | 80.000       | M   | 11.89                | 0.891                 |
|        | 2     | 1.100         | 0.014              | 0.000        | 0.000  | 80.000       | M   | 1.26                 | 0.094                 |
|        | 3     | 0.600         | 0.026              | 0.000        | 0.000  | 62.000       | M   | 0.18                 | 0.010                 |
|        | 4     | 0.600         | 0.020              | 0.000        | 0.000  | 62.000       | M   | 0.18                 | 0.010                 |
|        | 5     | 0.900         | 0.021              | 0.000        | 0.000  | 62.000       | M   | 0.28                 | 0.020                 |
|        | 6     | 21.500        | 0.090              | 0.000        | 0.000  | 47.000       | S   | 0.05                 | 0.030                 |
|        | Σ     | 408.700       |                    |              |        |              |     | 101.31               | 13.556                |
| #16    | 1     | 7.300         | 0.015              | 0.000        | 0.000  | 62.000       | M   | 2.24                 | 0.174                 |
|        | Σ     | 7.300         |                    |              |        |              |     | 2.24                 | 0.174                 |
| #15    | Σ     | 7.300         |                    |              |        |              |     | 2.24                 | 0.174                 |
| #14    | 1     | 1.900         | 0.008              | 0.000        | 0.000  | 62.000       | M   | 0.58                 | 0.045                 |
|        | Σ     | 1.900         |                    |              |        |              |     | 0.58                 | 0.045                 |
| #13    | Σ     | 1.900         |                    |              |        |              |     | 0.58                 | 0.045                 |
| #11    | 1     | 98.000        | 0.045              | 0.000        | 0.000  | 47.000       | S   | 0.24                 | 0.137                 |
|        | 2     | 29.600        | 0.171              | 0.000        | 0.000  | 74.000       | F   | 19.32                | 1.723                 |
|        | 3     | 53.700        | 0.137              | 0.000        | 0.000  | 62.000       | M   | 7.58                 | 1.039                 |
|        | Σ     | 181.300       |                    |              |        |              |     | 26.85                | 2.899                 |
| #10    | 1     | 8.600         | 0.032              | 0.000        | 0.000  | 80.000       | F   | 9.83                 | 0.737                 |
|        | 2     | 36.800        | 0.141              | 0.000        | 0.000  | 74.000       | F   | 24.19                | 2.139                 |
|        | 3     | 19.100        | 0.105              | 0.000        | 0.000  | 62.000       | M   | 5.86                 | 0.454                 |
|        | Σ     | 64.500        |                    |              |        |              |     | 36.66                | 3.330                 |
| #9     | Σ     | 245.800       |                    |              |        |              |     | 57.40                | 6.229                 |
| #8     | 1     | 8.600         | 0.044              | 0.000        | 0.000  | 80.000       | F   | 9.83                 | 0.737                 |
|        | 2     | 4.700         | 0.013              | 0.000        | 0.000  | 80.000       | F   | 5.37                 | 0.403                 |
|        | Σ     | 259.100       |                    |              |        |              |     | 72.61                | 7.369                 |
| #7     | Σ     | 259.100       |                    |              |        |              |     | 72.61                | 7.369                 |
| #6     | 1     | 43.000        | 0.095              | 0.000        | 0.000  | 47.000       | S   | 0.10                 | 0.060                 |
|        | 2     | 0.400         | 0.015              | 0.000        | 0.000  | 62.000       | M   | 0.12                 | 0.005                 |
|        | 3     | 1.600         | 0.020              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 4     | 1.200         | 0.022              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|        | 5     | 11.600        | 0.051              | 0.000        | 0.000  | 80.000       | F   | 13.26                | 0.994                 |
|        | 6     | 36.700        | 0.140              | 0.000        | 0.000  | 80.000       | F   | 34.72                | 3.034                 |

| Stru #    | SWS #    | SWS Area (ac)  | Time of Conc (hrs) | Musk K (hrs) | Musk X | Curve Number | UHS | Peak Discharge (cfs) | Runoff Volume (ac-ft) |
|-----------|----------|----------------|--------------------|--------------|--------|--------------|-----|----------------------|-----------------------|
|           | <b>Σ</b> | <b>353.600</b> |                    |              |        |              |     | <b>46.52</b>         | <b>10.193</b>         |
| <b>#5</b> | <b>Σ</b> | <b>353.600</b> |                    |              |        |              |     | <b>46.52</b>         | <b>10.193</b>         |
| #4        | 1        | 6.400          | 0.037              | 0.000        | 0.000  | 80.000       | M   | 7.32                 | 0.549                 |
|           | 2        | 1.000          | 0.038              | 0.000        | 0.000  | 80.000       | M   | 1.14                 | 0.086                 |
|           | 3        | 2.800          | 0.019              | 0.000        | 0.000  | 47.000       | S   | 0.00                 | 0.000                 |
|           | 4        | 0.900          | 0.010              | 0.000        | 0.000  | 62.000       | M   | 0.28                 | 0.020                 |
|           | 5        | 23.300         | 0.094              | 0.000        | 0.000  | 47.000       | S   | 0.06                 | 0.032                 |
|           | 6        | 1.000          | 0.020              | 0.000        | 0.000  | 62.000       | M   | 0.31                 | 0.024                 |
|           | <b>Σ</b> | <b>398.200</b> |                    |              |        |              |     | <b>27.48</b>         | <b>9.852</b>          |
| <b>#3</b> | <b>Σ</b> | <b>806.900</b> |                    |              |        |              |     | <b>113.18</b>        | <b>23.408</b>         |
| #2        | 1        | 10.500         | 0.051              | 0.000        | 0.000  | 47.000       | S   | 0.03                 | 0.014                 |
|           | 2        | 17.100         | 0.058              | 0.000        | 0.000  | 47.000       | S   | 0.04                 | 0.024                 |
|           | <b>Σ</b> | <b>834.500</b> |                    |              |        |              |     | <b>113.18</b>        | <b>23.446</b>         |
| <b>#1</b> | <b>Σ</b> | <b>834.500</b> |                    |              |        |              |     | <b>48.51</b>         | <b>22.325</b>         |

### ***Subwatershed Time of Concentration Details:***

| Stru #    | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|-----------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #2        | 1        | 3. Short grass pasture                                | 45.00     | 443.25           | 985.00            | 5.360          | 0.051        |
| <b>#2</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.051</b> |
| #2        | 2        | 3. Short grass pasture                                | 40.00     | 425.60           | 1,064.00          | 5.050          | 0.058        |
| <b>#2</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.058</b> |
| #4        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 11.00     | 48.95            | 445.00            | 3.310          | 0.037        |
| <b>#4</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.037</b> |
| #4        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 23.00     | 49.45            | 215.00            | 4.790          | 0.012        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 5.25             | 350.00            | 3.670          | 0.026        |
| <b>#4</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.038</b> |
| #4        | 3        | 3. Short grass pasture                                | 20.00     | 50.00            | 250.00            | 3.570          | 0.019        |
| <b>#4</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.019</b> |
| #4        | 4        | 3. Short grass pasture                                | 19.00     | 24.70            | 130.00            | 3.480          | 0.010        |
| <b>#4</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.010</b> |
| #4        | 5        | 3. Short grass pasture                                | 37.00     | 475.45           | 1,285.00          | 4.860          | 0.073        |
|           |          | 8. Large gullies, diversions, and low flowing streams | 28.00     | 345.80           | 1,235.00          | 15.870         | 0.021        |
| <b>#4</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.094</b> |
| #4        | 6        | 3. Short grass pasture                                | 30.00     | 97.80            | 326.00            | 4.380          | 0.020        |
| <b>#4</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #6         | 1        | 3. Short grass pasture                                | 14.60     | 75.01            | 513.76            | 3.050          | 0.046        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 5.67             | 378.00            | 3.670          | 0.028        |
| <b>#6</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.095</b> |
| #6         | 2        | 3. Short grass pasture                                | 20.00     | 246.20           | 1,231.00          | 3.570          | 0.095        |
| <b>#6</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #6         | 3        | 2. Minimum tillage cultivation                        | 6.00      | 73.19            | 1,220.00          | 1.220          | 0.277        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 20.43            | 1,362.00          | 3.670          | 0.103        |
| <b>#6</b>  | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #6         | 4        | 2. Minimum tillage cultivation                        | 6.00      | 26.51            | 442.00            | 1.220          | 0.100        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 19.50            | 1,300.00          | 3.670          | 0.098        |
| <b>#6</b>  | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #6         | 5        | 5. Nearly bare and untilled, and alluvial valley fans | 5.70      | 25.19            | 442.00            | 2.380          | 0.051        |
| <b>#6</b>  | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.051</b> |
| #6         | 6        | 5. Nearly bare and untilled, and alluvial valley fans | 6.10      | 75.64            | 1,240.00          | 2.460          | 0.140        |
| <b>#6</b>  | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.140</b> |
| #8         | 1        | 3. Short grass pasture                                | 15.00     | 73.80            | 492.00            | 3.090          | 0.044        |
| <b>#8</b>  | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.044</b> |
| #8         | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 22.00     | 50.38            | 229.00            | 4.690          | 0.013        |
| <b>#8</b>  | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.013</b> |
| #10        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 16.00     | 75.19            | 470.00            | 4.000          | 0.032        |
| <b>#10</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.032</b> |
| #10        | 2        | 3. Short grass pasture                                | 12.00     | 169.44           | 1,412.00          | 2.770          | 0.141        |
| <b>#10</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.141</b> |
| #10        | 3        | 3. Short grass pasture                                | 16.00     | 194.72           | 1,217.00          | 3.200          | 0.105        |
| <b>#10</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.105</b> |
| #11        | 1        | 3. Short grass pasture                                | 35.00     | 271.94           | 777.00            | 4.730          | 0.045        |
| <b>#11</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.045</b> |
| #11        | 2        | 3. Short grass pasture                                | 13.00     | 231.79           | 1,783.00          | 2.880          | 0.171        |
| <b>#11</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.171</b> |
| #11        | 3        | 3. Short grass pasture                                | 20.00     | 352.80           | 1,764.00          | 3.570          | 0.137        |
| <b>#11</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.137</b> |
| #14        | 1        | 3. Short grass pasture                                | 30.00     | 40.80            | 135.99            | 4.380          | 0.008        |
| <b>#14</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.008</b> |
| #16        | 1        | 3. Short grass pasture                                | 30.00     | 73.50            | 244.99            | 4.380          | 0.015        |
| <b>#16</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.015</b> |
| #17        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 20.00     | 73.40            | 367.00            | 4.470          | 0.022        |
| <b>#17</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.022</b> |
| #17        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 24.80     | 49.60            | 200.00            | 4.970          | 0.011        |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
|            |          | 8. Large gullies, diversions, and low flowing streams | 1.50      | 0.75             | 50.00             | 3.670          | 0.003        |
| <b>#17</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.014</b> |
| #17        | 3        | 3. Short grass pasture                                | 30.00     | 80.40            | 268.00            | 4.380          | 0.016        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 14.00     | 60.62            | 433.00            | 11.220         | 0.010        |
| <b>#17</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.026</b> |
| #17        | 4        | 3. Short grass pasture                                | 27.00     | 49.95            | 185.00            | 4.150          | 0.012        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 24.00     | 111.36           | 464.00            | 14.690         | 0.008        |
| <b>#17</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.020</b> |
| #17        | 5        | 3. Short grass pasture                                | 33.00     | 74.25            | 225.00            | 4.590          | 0.013        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 25.00     | 120.00           | 480.00            | 15.000         | 0.008        |
| <b>#17</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #17        | 6        | 3. Short grass pasture                                | 33.00     | 448.80           | 1,360.00          | 4.590          | 0.082        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 25.00     | 120.00           | 480.00            | 15.000         | 0.008        |
| <b>#17</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.090</b> |
| #19        | 1        | 3. Short grass pasture                                | 30.00     | 78.00            | 260.00            | 4.380          | 0.016        |
| <b>#19</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.016</b> |
| #21        | 1        | 3. Short grass pasture                                | 26.00     | 24.70            | 95.00             | 4.070          | 0.006        |
| <b>#21</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.006</b> |
| #23        | 1        | 5. Nearly bare and untilled, and alluvial valley fans | 4.00      | 23.28            | 582.00            | 2.000          | 0.080        |
| <b>#23</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.021</b> |
| #23        | 2        | 8. Large gullies, diversions, and low flowing streams | 1.00      | 4.92             | 492.00            | 3.000          | 0.045        |
|            |          | 5. Nearly bare and untilled, and alluvial valley fans | 13.00     | 99.84            | 768.00            | 3.600          | 0.059        |
| <b>#23</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.104</b> |
| #23        | 3        | 3. Short grass pasture                                | 1.00      | 5.78             | 578.00            | 0.800          | 0.200        |
| <b>#23</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.200</b> |
| #23        | 4        | 5. Nearly bare and untilled, and alluvial valley fans | 6.00      | 24.48            | 408.00            | 2.440          | 0.046        |
| <b>#23</b> | <b>4</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.046</b> |
| #23        | 5        | 3. Short grass pasture                                | 19.00     | 152.00           | 800.00            | 3.480          | 0.063        |
| <b>#23</b> | <b>5</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.063</b> |
| #23        | 6        | 3. Short grass pasture                                | 4.30      | 25.02            | 582.00            | 1.650          | 0.097        |
| <b>#23</b> | <b>6</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.097</b> |
| #25        | 1        | 3. Short grass pasture                                | 4.00      | 148.44           | 3,711.00          | 1.600          | 0.644        |
|            |          | 8. Large gullies, diversions, and low flowing streams | 4.70      | 256.62           | 5,460.00          | 6.500          | 0.233        |
| <b>#25</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.877</b> |
| #25        | 2        | 3. Short grass pasture                                | 20.00     | 75.00            | 375.00            | 3.570          | 0.029        |
| <b>#25</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.018</b> |

| Stru #     | SWS #    | Land Flow Condition                                   | Slope (%) | Vert. Dist. (ft) | Horiz. Dist. (ft) | Velocity (fps) | Time (hrs)   |
|------------|----------|-------------------------------------------------------|-----------|------------------|-------------------|----------------|--------------|
| #25        | 3        | 5. Nearly bare and untilled, and alluvial valley fans | 9.00      | 24.03            | 267.00            | 3.000          | 0.024        |
| <b>#25</b> | <b>3</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.024</b> |
| #27        | 1        | 3. Short grass pasture                                | 11.00     | 99.00            | 900.00            | 2.650          | 0.094        |
| <b>#27</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.094</b> |
| #27        | 2        | 5. Nearly bare and untilled, and alluvial valley fans | 12.00     | 74.87            | 624.00            | 3.460          | 0.050        |
| <b>#27</b> | <b>2</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.050</b> |
| #29        | 1        | 3. Short grass pasture                                | 15.00     | 99.00            | 660.00            | 3.090          | 0.059        |
| <b>#29</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.059</b> |
| #31        | 1        | 3. Short grass pasture                                | 5.00      | 79.25            | 1,585.00          | 1.780          | 0.247        |
| <b>#31</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.247</b> |
| #33        | 1        | 3. Short grass pasture                                | 18.00     | 95.04            | 528.00            | 3.390          | 0.043        |
| <b>#33</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.043</b> |
| #35        | 1        | 3. Short grass pasture                                | 10.00     | 203.50           | 2,035.00          | 2.520          | 0.224        |
| <b>#35</b> | <b>1</b> | <b>Time of Concentration:</b>                         |           |                  |                   |                | <b>0.224</b> |

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