Geosyntec consultants

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Johnson City, TN 37604-5767
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20 February 2025

Mr. David M. Griffin, P.E.
Program Manager
Safe Dams Program
Georgia Department of Natural Resources
2 Martin Luther King, Jr. Drive
Atlanta, Georgia 30334

**Subject: Lake Petit Dam**
**Spillway Repair Drawings and Design Documents**
**Pickens County, Georgia**
**Permit #112-009-00462-A-01**

Dear Mr. Griffin:

On behalf of Big Canoe Property Owners Association (POA), Geosyntec Consultants, Inc. (Geosyntec) is providing this cover letter and submitting the drawings and design documents required for spillway repairs for Lake Petit Dam (Dam) for review.

The existing permit application was initially submitted to Georgia Safe Dams Program (GSDP) in April 2023 (Revision 0), and subsequently was was revised and submitted to GSDP in March 2024 (Revision 1). The revised permit was amended in January 2025. The drawings and design documents for spillway repairs are being submitted in accordance with the amendment to the existing permit Special Conditions section.

The purpose of the proposed spillway repair is to prevent perpetual maintenance needs along the stepped chute spillway. Proposed spillway modifications address operational items in Compliance Issue 3 from the GSDP letter dated 20 May 2021. The proposed repair requires modifications to an appurtenance of the Dam which led to this submittal as part of the revised permit. The proposed spillway repair includes only portions of the spillway chute downstream of the existing weir and control structure. The existing weir and control structure will be protected during construction and continue to operate as originally designed at the end of construction.

If you have further questions, feel free to contact us at 423.355.2105.

Sincerely,

John W. Barrett, P.E. (AL, GA, MI, NC, TN)
Principal Engineer and Engineer of Record
Geosyntec Consultants, Inc.

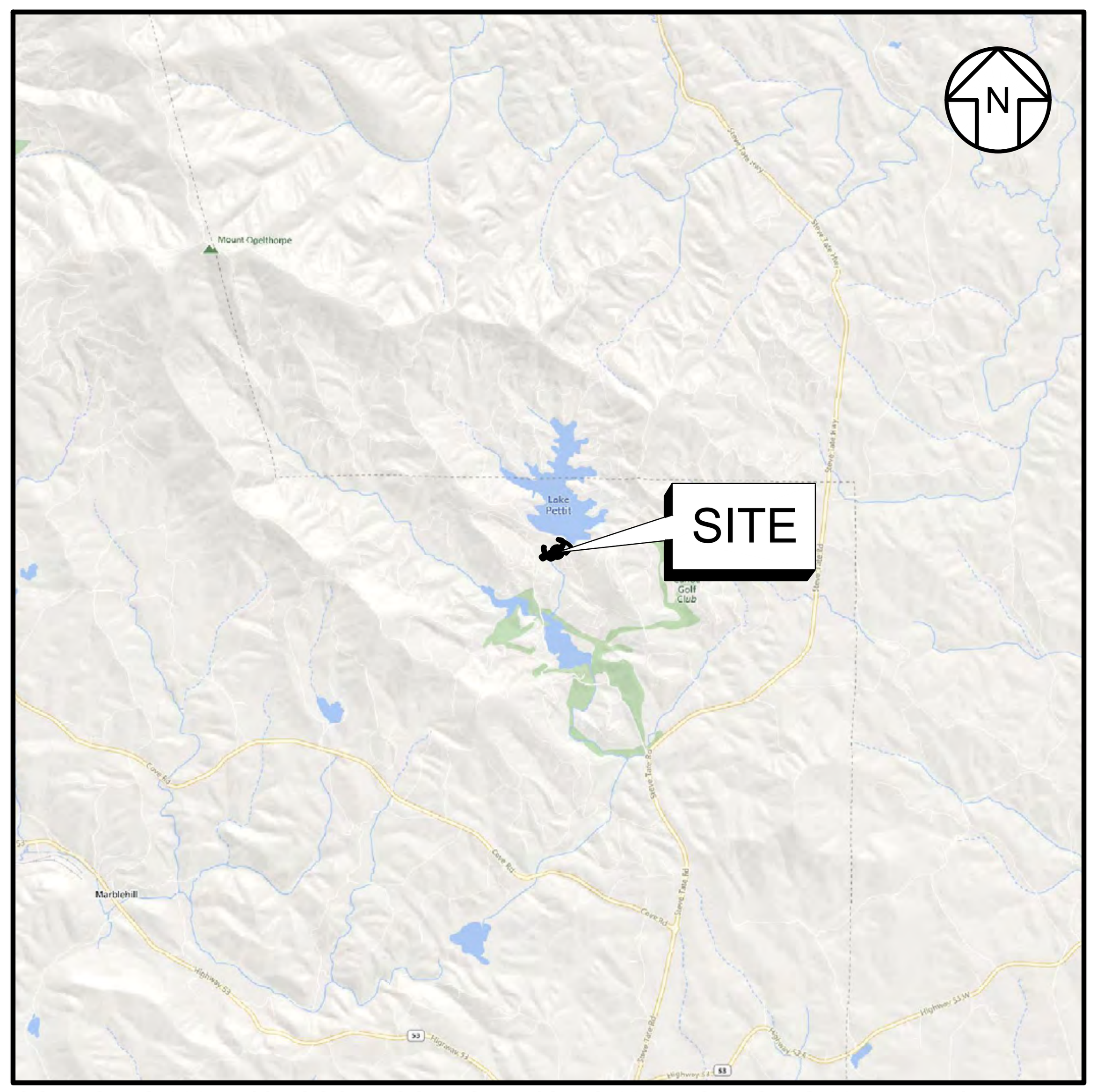
cc: Scott Auer, Big Canoe Property Owners Association
Wesley MacDonald, P.E., Geosyntec Consultants, Inc.

Attachments: Design Drawings
Specification 03 30 00 – Cast-in-place Concrete
Calculation Packages

# DESIGN DRAWINGS

# BIG CANOE PROPERTY OWNER'S ASSOCIATION
# SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT
# LAKE PETIT DAM
# JASPER, GEORGIA

## FEBRUARY 2025

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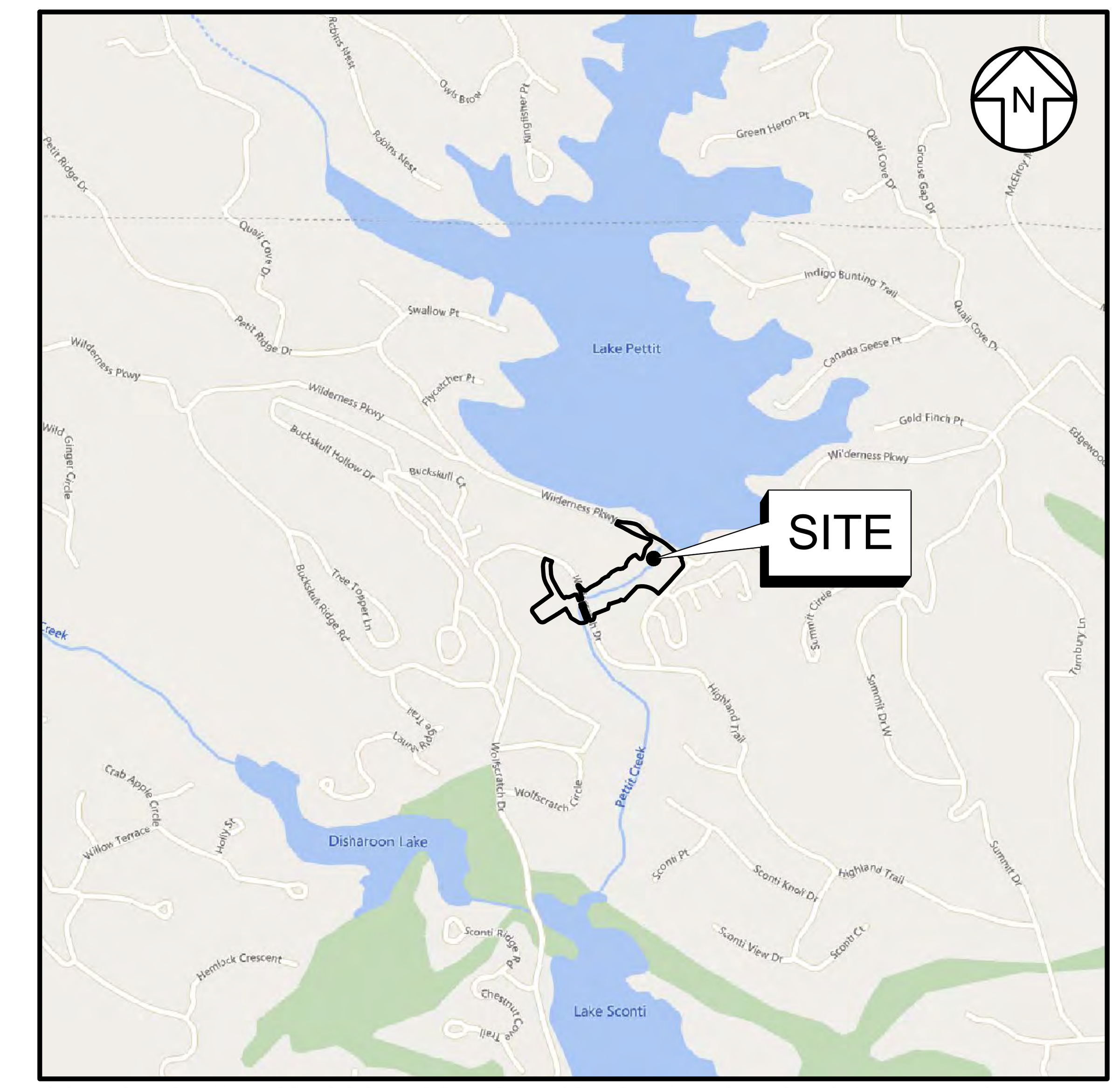
LOCATION MAP

0 5000 10000
SCALE IN FEET

**SHEET LIST TABLE**



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VICINITY MAP

0 1000 2000
SCALE IN FEET

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*NOTE: CONSTRUCTION MUST COORDINATE WITH UTILITY PROVIDERS TO MAINTAIN UTILITY SERVICE AND A SAFE WORK SITE*

PREPARED FOR:


BIG CANOE PROPERTY OWNERS ASSOCIATION

10586 BIG CANOE
JASPER, GA 30143


24 HOUR EROSION CONTROL CONTACT
LYDELL MACK
BIG CANOE PROPERTY OWNERS ASSOCIATION
PHONE: 678.758.9763

PREPARED BY:


Geosyntec consultants

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835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402
TELEPHONE: 423.385.2310


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| REV | DATE | DESCRIPTION | DRN | APP |
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| A | 02/20/2025 | ISSUE FOR PERMITTING | TAW | JWB |

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044253 02/20/2025 JOHN W. BARRETT



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|---|---|
| DESIGN BY: | JWB |
| DRAWN BY: | TW |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: COVER SHEET

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C01 |
| SHEET NO.: | 1 OF 41 |

## CONTOUR LEGEND

| | |
|---|---|
| — — 1650 — — | EXISTING GROUND ELEVATION (FEET) (NOTE 1) |
| —— 1570 —— | FINISHED GRADE SURFACE ELEVATION (FEET) |

## LINETYPE LEGEND

| | |
|---|---|
| | CONCRETE CHUTE WALL |
| | EXISTING CREEK SHORELINE |
| | EXISTING GROUND |
| | EXISTING LAKE SHORELINE |
| — ST — ST — | EXISTING 4"± SIPHON (DEFUNCT) |
| — CBL — CBL — | EXISTING UNDERGROUND CABLE TRANSMISSION LINE |
| — P — P — | EXISTING UNDERGROUND POWER LINE |
| — T — T — T — T — | EXISTING UNDERGROUND TELEPHONE LINE |
| | EXISTING VEGETATION |
| — WL — WL — | EXISTING WATER LINE |
| | FENCE |
| | GEOTEXTILE FABRIC |
| | GUARDRAIL |
| —— LOD —— | LIMITS OF DISTURBANCE |
| | LIMITS OF EXCAVATION |
| | LIMITS OF VEGETATION |
| | PROPERTY BOUNDARY |
| — SF — SF — | SILT FENCE |
| | STREAM |
| | TECCO VEGETATION MAT |
| | TECCO WIRE MESH |
| | WETLAND DELINEATION |

## HATCH LEGEND

| | |
|---|---|
| | CLEARING AREA |
| | CONCRETE |
| | SUBGRADE |
| | EXISTING PAVED ROAD |
| | FILL |
| | FILTER SAND |
| | FILTER STONE |
| | NEAT CEMENT GROUT |
| | NO. 57 STONE |
| | PERMANENT STREAM IMPACTS |
| | PROPOSED ACCESS ROAD |
| | PROPOSED CONSTRUCTION ENTRANCE |
| | PROPOSED DEMOLITION |
| | PROPOSED EXCAVATION |

## HATCH LEGEND (CONTINUED)

| | |
|---|---|
| | PROPOSED LAYDOWN AREA |
| | PROPOSED TEMPORARY STOCKPILE |
| | PROPOSED UTV ACCESS TRAIL |
| | RIPRAP |
| | SLOTTED PIPE |
| | TEMPORARY STREAM IMPACTS |
| | WETLAND |

## SYMBOL LEGEND

| | |
|---|---|
| | BORING - BALDWIN & CRANSTON, 1971 |
| | CHECK DAM |
| | CHUTE WEIR |
| | CHUTE WEIR REVETMENT MAT CONCRETE BLOCK |
| | CONTROL POINT BORING - BALDWIN & CRANSTON, 1971 |
| | EXISTING CURRENT BORINGS |
| | FIRE HYDRANT |
| | FLOW DIRECTION |
| | GROUND DEPRESSION OR OVERHANG |
| | MAN HOLE |
| | PIPE END |
| | ROCK DAM |
| | SEALANT JOINT |
| | SIGNAGE |
| | SILT FENCE POST |
| 1% | SLOPE GRADE |
| 2 / 1 | SLOPE LABEL |
| | SOIL NAIL HEAD CENTRALIZER |
| | STORM DRAIN CULVERT |
| ▲ | SURVEY CONTROL POINT - JORDAN ENGINEERING, APRIL 2021 |
| | WATER STOP |
| | WATER STRUCTURE |
| | WATER SURFACE |
| | WATER VALVE |

## ABBREVIATIONS

| | |
|---|---|
| AASHTO | AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS |
| APP | APPROVED BY |
| APPROX | APPROXIMATE |
| ARV | AIR RELEASE VALVE |
| CJ | CONSTRUCTION JOINT |
| CMG | CONRETE MON. FD |
| CRJ | CONTRACTION JOINT |
| ℄ | CENTER LINE |
| D.B. | DEED BOOK |
| DIA | DIAMETER |
| DRN | DRAWN BY |
| DWG | DRAWING |
| E | EAST OR EASTING |
| EF | EACH FACE |
| EL | ELEVATION |
| EW | EXTRACTION WELL |
| FCO | FORCEMAIN CLEANOUT |
| FT | FEET |
| GWTP | GROUNDWATER TREATMENT PLANT |
| HDPE | HIGH DENSITY POLYETHYLENE |
| H:V | HORIZONTAL TO VERTICAL LENGTH RATIO FOR A SLOPE |
| HWY | HIGHWAY |
| IN | INCH |
| INV | INVERT |
| LL | LAND LOT |
| LOD | LIMITS OF DISTURBANCE |
| MAX | MAXIMUM |
| MIN | MINIMUM |
| MSL | MEAN SEA LEVEL |
| N | NORTH OR NORTHING |
| NAD | NORTH AMERICAN DATUM |
| NAVD88 | NORTH AMERICAN VERTICAL DATUM OF 1988 |
| NCDEQ | NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY |
| NO. | NUMBER |
| NOF | NOW OR FORMERLY |
| NPDES | NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM |
| N.S.A. | NATIONAL STONE ASSOCIATION |
| NTS | NOT TO SCALE |
| OC | ON CENTER |
| OTP | OPEN-TOP PIPE |
| OZ | OUNCE |
| P.B. | PLAT BOOK |
| PFAS | PER- AND POLYFLUOROALKYL SUBSTANCES |
| P.O.R. | POINT OF REFERENCE |
| PROJ | PROJECT |
| RCP | REINFORCED CONCRETE PIPE |
| RD | ROAD |
| REV | REVISION |
| S | SOUTH |
| SCH | SCHEDULE |
| SDR | STANDARD DIMENSIONAL RATIO |
| STA | STATION |
| STD | STANDARD |
| SWP | STORMWATER PIPE |
| TYP | TYPICAL |
| U.S. | UNITED STATES |
| USEPA | UNITED STATES ENVIRONMENTAL PROTECTION AGENCY |
| W | WEST |
| W.S. | WATER SURFACE |
| % | PERCENT OR PERCENTILE |

## DETAIL AND SECTION IDENTIFICATION LEGEND

DETAIL NUMBER
2 / 13
DRAWING ON WHICH ABOVE DETAIL IS PRESENTED

DETAIL NUMBER — 2 / 5 — DRAWING ON WHICH ABOVE DETAIL WAS FIRST REFERENCED

DETAIL
TITLE OF DETAIL
SCALE: 1" = 1'

EXAMPLE: DETAIL NUMBER 2 WHICH IS PRESENTED ON DRAWING NO. 13 WAS FIRST REFERENCED ON DRAWING NO. 5.

START OF SECTION (0+00) — A / 9 ——— A / 9 — SECTION LETTER; END OF SECTION
DRAWING ON WHICH ABOVE SECTION IS PRESENTED

SECTION LETTER — A / 5 — DRAWING ON WHICH ABOVE SECTION WAS FIRST REFERENCED

SECTION
TITLE OF SECTION
SCALE: 1" = 100' (HORIZONTAL); 1" = 20' (VERTICAL)

EXAMPLE: SECTION LETTER "A" WHICH IS PRESENTED ON DRAWING NO. 9 WAS FIRST REFERENCED ON DRAWING NO. 5.

## GENERAL NOTES

SCOPE AND SEQUENCE OF WORK

1. WORK CONSISTS OF REPLACING THE EXISTING STEPPED SPILLWAY CHUTE WITH A NEW REINFORCED CONCRETE CHUTE WITH SUBDRAINAGE, WATERSTOPS, AND JOINT DETAILS, AND A NEW STILLING BASIN AT THE BASE OF THE CHUTE. THE NEW CHUTE SHALL CONNECT WITH THE EXISTING REINFORCED SLAB BENEATH THE WILDERNESS PARKWAY BRIDGE. THE EXISTING WEIR AND OTHER COMPONENTS OF THE EXISTING CONTROL STRUCTURE AND BRIDGES SHALL BE PROTECTED DURING ALL PHASES OF CONSTRUCTION. THE FINAL CONDITIONS SHALL PROVIDE A SMOOTH TRANSITION FROM THE BRIDGE TO THE NEW CHUTE AND DOWN TO THE STILLING BASIN WHERE THE ENERGY FROM FLOW WILL BE DISSIPATED PRIOR TO CONTINUING TOWARDS LAKE SCONTI.

2. SEQUENCE OF WORK:

STEP 1: THE CONTRACTOR SHALL MOBILIZE EQUIPMENT AND MATERIALS TO THE AREAS DESIGNATED IN THE DRAWINGS.

STEP 2: INSTALL 'INITIAL CONDITIONS' EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPS) AROUND THE LIMIT OF CONSTRUCTION, LAYDOWN AREAS, AND LIMIT OF DISTURBANCES, AS REQUIRED IN THE DRAWINGS.

STEP 3: CONTRACTOR SHALL DESIGN AND CONSTRUCT NEW ACCESS ROADS, AS REQUIRED, TO THE SPILLWAY CHUTE AND LAYDOWN AREAS. THROUGHOUT THE PROJECT, THE ROADS SHALL BE MAINTAINED.

STEP 4: CONTRACTOR SHALL COORDINATE WITH THE LOCAL UTILITIES TO TEMPORARILY REROUTE UNDERGROUND UTILITIES ALONG WILDERNESS PARKWAY TO MITIGATE DAMAGE BY SPILLWAY DEMOLITION AND EXCAVATION.

STEP 5: CLEAR AND GRUB REQUIRED AREAS. REMOVE TREES AND VEGETATION FROM EACH SIDE OF THE SPILLWAY CHUTE. THIS TASK MAY BE PERFORMED IN PHASES, IF DESIRED.

STEP 6: EXTEND THE SIPHON PIPES FROM APPROXIMATELY STATION 6+50 THROUGH THE DOWNSTREAM END OF THE WORK AREA. THEN, LOWER THE RESERVOIR LEVEL TO BETWEEN EL. 1635.0 AND EL. 1630.5 FT, AS DIRECTED BY THE ENGINEER OR OWNER, USING THE EXISTING SIPHON SYSTEM IN COORDINATION WITH THE OWNER TO PREVENT FLOWS IN THE WORKING AREA

STEP 7: INSTALL 'INTERIM CONDITIONS' BMPS AT THE LOCATION OF THE STILLING BASIN. WATER MANAGEMENT SHALL BE PERFORMED TO DIVERT WATER FROM THE STILLING BASIN EXCAVATION AREA. WATER FLOW SHALL BE DIVERTED TOWARDS SCONTI LAKE.

STEP 8: EXCAVATE AND DEMOLISH EXISTING SPILLWAY FEATURES AT THE LOCATION OF THE STILLING BASIN AND ALONG THE STEPPED CHUTE UP TO STATION 6+50. CARE SHALL BE TAKEN TO NOT UNDERMINE THE FOUNDATIONS OF THE EXISTING BRIDGE ABUTMENTS. THE CONTRACTOR SHALL PERFORM MONITORING OF THE BRIDGE ABUTMENTS FOR THE DURATION OF EXCAVATION UNTIL THE ADJACENT CHUTE WALLS ARE CONSTRUCTED IN ACCORDANCE WITH THE DESIGN DRAWINGS AND NOTES.

STEP 9: CONSTRUCT STILLING BASIN INCLUDING UNDERDRAIN SYSTEM, SLAB, ENERGY DISSIPATORS, AND TRAINING WALLS. WORK SHALL GENERALLY PROGRESS FROM DOWNSTREAM TO UPSTREAM. AS CONSTRUCTION PROGRESSES UPSTREAM, THE CONTRACTOR SHALL MAINTAIN PROTECTION OF THE EXCAVATIONS AND COMPLETED WORKS FROM STORMWATER RUNOFF AND SEDIMENTATION. FOULING OF COMPLETED FILTER SAND OR FILTER STONE SHALL NOT BE PERMITTED AND WILL REQUIRE REWORK AND/OR REPLACEMENT OF MATERIALS.

STEP 10: INSTALL 'INTERIM CONDITIONS' BMPS ALONG THE SPILLWAY CHUTE.

STEP 11: FILL AND BACKFILL, INSTALLATION OF COLLECTOR DRAINS, AND INSTALLATION OF FENCE DETAILS AROUND THE COMPLETED STILLING BASIN AND PORTIONS OF THE CHUTE MAY COMMENCE CONCURRENTLY WITH CONSTRUCTION OF UNCOMPLETED PORTIONS OF THE CHUTE. THE CONTRACTOR MUST PROTECT COMPLETED WORKS FROM FLOODING OR FOULING OR BE READY TO REPLACE OR REPAIR ANY DAMAGED WORKS AS DETERMINED BY THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.

STEP 12: EXCAVATE AND DEMOLISH EXISTING SPILLWAY CHUTE STARTING FROM THE DOWNSTREAM END (STATION 6+50) TOWARDS THE UPSTREAM END OF THE CHUTE SPILLWAY. AS EXCAVATION PROGRESSES TOWARDS STATION 4+50, THE CONTRACTOR SHALL PROTECT THE STRUCTURES IDENTIFIED ON PARCEL 046A 356 AND INSTALL SOIL NAILS AS SHOWN ON THE DRAWINGS TO MITIGATE IMPACTS TO ADJACENT STRUCTURES.

STEP 13: CONSTRUCT A PERMANENT UNDERGROUND ELECTRICAL DUCT BANK FOR THE HIGH-VOLTAGE UNDERGROUND ELECTRICAL POWERLINES. THE CONCRETE DUCT BANK SHALL BE CONSTRUCTED OF CONCRETE DYED RED FOR CLEAR IDENTIFICATION OF THE STRUCTURE DURING FUTURE INTENTIONAL OR ACCIDENTAL EXCAVATIONS.

STEP 14: INSTALL TEMPORARY SHORING DOWNSTREAM OF THE WILDERNESS PARKWAY BRIDGE ABUTMENTS, AS DETERMINED NECESSARY AND DESIGNED BY THE CONTRACTOR, BEFORE PROCEEDING TO THE FINAL EXCAVATION REQUIRED TO CONNECT THE NEW CHUTE WITH THE EXISTING BRIDGE SLAB.

STEP 15: CONNECT THE NEW WATERLINE ALONG THE RIGHT SIDE OF THE NEW CHUTE WALLS WITH A SHUTOFF VALVE AT THE TOP OF THE SPILLWAY.

STEP 16: CONSTRUCT THE REMAINING SPILLWAY CHUTE SLABS AND WALLS INCLUDING UNDERDRAIN SYSTEM, SLAB, AND TRAINING WALLS AND FINAL CONNECTION SLAB.

STEP 17: NOTIFY THE ENGINEER OF SUBSTANTIAL COMPLETION OF THE NEW CHUTE AND BEGIN REFILLING THE RESERVOIR TO EL. 1635.5 FT BY MEANS OF DISCONTINUING CONTROLLED DRAWDOWN.

STEP 18: BACKFILL THE EXCAVATED AREA AROUND THE TRAINING WALLS TO REACH FINAL GRADINGS.

STEP 19: CONSTRUCTION 'FINAL CONDITIONS' BMPS.

STEP 20: COMPLETE SITE RESTORATION ACTIVITIES, INCLUDING GRADING, VEGETATION, AND INSTALLATION OF PERMANENT OF STORMWATER FEATURES.

STEP 21: PERFORM FINAL SITE WALKTHROUGH WITH THE OWNER AND ENGINEER AND REMOVE REMAINING BMPS ONCE VEGETATION IS ESTABLISHED.

STEP 22: THE CONTRACTOR SHALL DEMOBILIZE ALL EQUIPMENT FROM THE SITE.

GENERAL MAPPING NOTES

1. HORIZONTAL COORDINATE SYSTEM CORRESPONDS TO NORTH AMERICAN DATUM OF 1983 (NAD83), GEORGIA STATE PLANE, WEST ZONE IN US SURVEY FEET. ELEVATIONS CORRESPOND TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) IN US SURVEY FEET. CONTRACTOR SHALL NOTIFY THE ENGINEER IN THE EVENT OF A DISCREPANCY.
2. EXISTING GROUND SURFACE CONTOURS SHOWN ON THIS DRAWING SET, EXCEPT THOSE NOTED BELOW, WERE OBTAINED FROM A LIDAR SURVEY PERFORMED BY JORDAN ENGINEERING ON APRIL 2021. ELEVATIONS OF INVERTS OF EXISTING DRAINGAGE FEATURES, AND INSTRUMENT LOCATIONS WERE OBTAINED BY JORDAN ENGINEERING ON APRIL 2021.
3. CONTOURS WITHIN THE LAKE PETIT RESERVOIR WERE OBTAINED FROM A BATHYMETRIC SURVEY PERFORMED BY SEASIDE ENGINEERING AND SURVEYING, LLC IN MARCH 2022.
4. ALL EXISTING UTILITY TYPES AND LOCATIONS AND SUBSURFACE PIPING SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR IS RESPONSIBLE TO CONFIRM AND FIELD-LOCATE ALL UTILITIES IN THE WORK AREA PRIOR TO EXCAVATION.

GENERAL WORK NOTES

1. THE REGULATIONS OF ALL LOCAL, STATE, OR FEDERAL GOVERNMENTAL BODIES HAVING JURISDICTION OVER THE WORKING AREAS SHALL BE OBSERVED AT ALL TIMES.
2. ALL “WORK” SHALL BE PERFORMED IN A MANNER CONSISTENT WITH BEST PRACTICES.
3. ALL EROSION CONTROL MEASURES SHALL BE IN CONFORMANCE WITH THE "MANUAL FOR EROSION AND SEDIMENT CONTROL OF GEORGIA", CURRENT EDITION.
4. ALL WORK SHALL BE IN COMPLIANCE WITH CURRENT OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS.
5. CONTRACTOR SHALL OBTAIN FROM THE PURCHASER DESIGNATED ACCESS ROUTE/DIRECTIONS ACROSS THE PROPERTY. EXISTING ACCESS ROADS LOCATED IN THE PROPERTY SHALL BE MAINTAINED AND REPAIRED AS NECESSARY DURING CONSTRUCTION BY THE CONTRACTOR TO THE SATISFACTION OF THE PURCHASER, IF DAMAGED.
6. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES, THE LIMITS OF DISTURBANCE AND STREAM/WETLAND BUFFERS SHALL BE CLEARLY FLAGGED AND STAKED. THESE MARKERS SHALL BE MAINTAINED UNTIL COMPLETION OF CONSTRUCTION ACTIVITIES. SHOULD ANY OF THE MARKERS BE DISTURBED, CONTRACTOR SHALL NOTIFY THE PURCHASER IMMEDIATELY. ALL CONSTRUCTION PERSONNEL SHALL BE SHOWN THE LOCATIONS OF THE DISTURBANCE LIMITS AND BUFFERS AS WELL AS THE WETLAND AND/OR STREAM AREAS TO PREVENT ENCROACHMENT FROM HEAVY EQUIPMENT INTO PROHIBITED AREAS.
7. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH THE SITE, THE SITE CONDITIONS, AND ALL PORTIONS OF THE WORK AS SHOWN ON THIS DRAWING SET AND TECHNICAL SPECIFICATIONS

## UTILITIES NOTES

1. ALL EXISTING UTILITY TYPES AND LOCATIONS AND SUBSURFACE PIPING SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY LOCATION & SIZE OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMMEDIATE REPAIR OF ANY AND ALL DAMAGES TO EXISTING UTILITY LINES CAUSED BY THE CONTRACTOR'S CONSTRUCTION ACTIVITIES AT NO ADDITIONAL COST TO THE PROJECT.
2. CONTRACTOR SHALL MAINTAIN AND PROTECT EXISTING PIEZOMETERS, DRAIN LINES, AND STORMWATER PIPES THROUGHOUT CONSTRUCTION. PIEZOMETERS SHALL REMAIN ACCESSIBLE THROUGH CONSTRUCTION. LOCATIONS OF EXISTING PIEZOMETERS ARE APPROXIMATE.
3. THE CONTRACTOR SHALL BE REQUIRED TO USE THE CALL BEFORE YOU DIG 811 OR TELEPHONE NUMBER (800) 282-7411 FOR THE PURPOSE OF COORDINATING THE MARKING OF UNDERGROUND UTILITIES.
4. THE CONTRACTOR MUST COLLECT VISUAL EVIDENCE OF EXISTING CONDITIONS OF ANY UTILITIES OR STRUCTURES THAT COULD BE CONSTRUED AS DAMAGE CAUSED BY CONSTRUCTION. VISUAL EVIDENCE MUST BE COLLECTED USING VIDEO AND STILL PHOTOGRAPHY TO ALLOW INSPECTION OF EXISTING CONDITIONS PRIOR TO BEGINNING OF CONSTRUCTION. CONTRACTOR SHALL REPAIR ANY EXISTING CONDITIONS DAMAGED DUE TO CONSTRUCTION.

FOR REVIEW PURPOSES ONLY
DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| REV | DATE | DESCRIPTION | DRN | APP |
|---|---|---|---|---|
| A | 02/20/2025 | ISSUE FOR PERMITTING | TAW | JWB |

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044253 02/20/2025 JOHN W. BARRETT



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|---|---|
| DESIGN BY: | JWB |
| DRAWN BY: | TW/SV/KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: GENERAL NOTES, SYMBOLS, AND ABBREVIATIONS

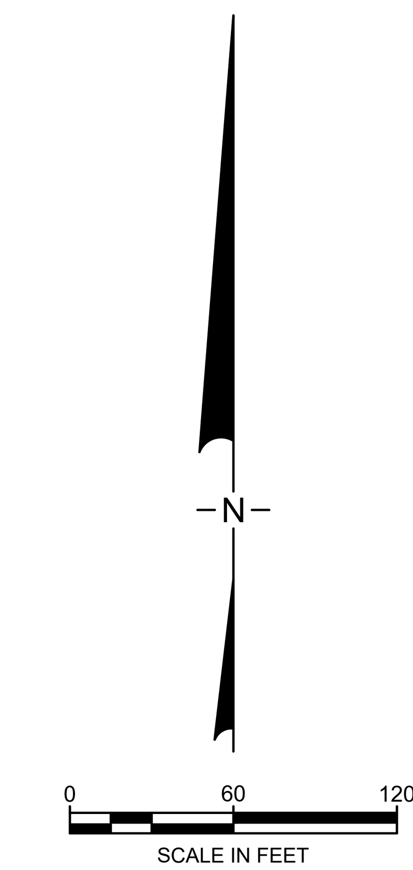
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C02 |
| SHEET NO.: | 2 OF 41 |


## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- SURVEY CONTROL POINT - JORDAN ENGINEERING, APRIL 2021
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- WETLAND DELINEATION
- STREAM
- WETLAND
- PERMANENT STREAM IMPACTS
- TEMPORARY STREAM IMPACTS

NOTE:

1. FOR GENERAL NOTES SEE SHEET 2.

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025

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| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: OVERALL EXISTING PLAN

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| SHEET NO.: | 3 OF 41 |

C:_GEO-ACC\ACCDOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CAD\D01_SPILLWAY DESIGN\DWGS\SHEETS\TJD10771.01 C03


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SCALE IN FEET

## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
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- EXISTING STORM DRAIN CULVERT
- SURVEY CONTROL POINT - JORDAN ENGINEERING, APRIL 2021
- PROPERTY BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- STREAM
- WETLAND
- PERMANENT STREAM IMPACTS
- TEMPORARY STREAM IMPACTS
- PROPOSED LAYDOWN AREA
- PROPOSED TEMPORARY STOCKPILE
- CLEARING AREA
- PROPOSED EXCAVATION
- PROPOSED DEMOLITION
- PROPOSED ACCESS ROAD

NOTES:

1. FOR GENERAL NOTES SEE SHEET 2.
2. EXTENT OF LAND CLEARING SHOWN IS APPROXIMATE AND MAY VARY DEPENDING ON THE CONTRACTORS MEANS AND METHODS AND SPECIFIC SEQUENCE OF CONSTRUCTION.
3. AT THE START OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN SIGNAGE AND ANY ADDITIONAL PUBLIC ACCESS RESTRICTIONS, AS REQUIRED, FOR THE DURATION OF THE PROJECT.

FOR REVIEW PURPOSES ONLY
DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| REV | DATE | DESCRIPTION | DRN | APP |
|---|---|---|---|---|
| A | 02/20/2025 | ISSUE FOR PERMITTING | TAW | JWB |

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025

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| DESIGN BY: | JWB |
| DRAWN BY: | TW/SV |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: SITE ACCESS, STAGING, AND CLEARING

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

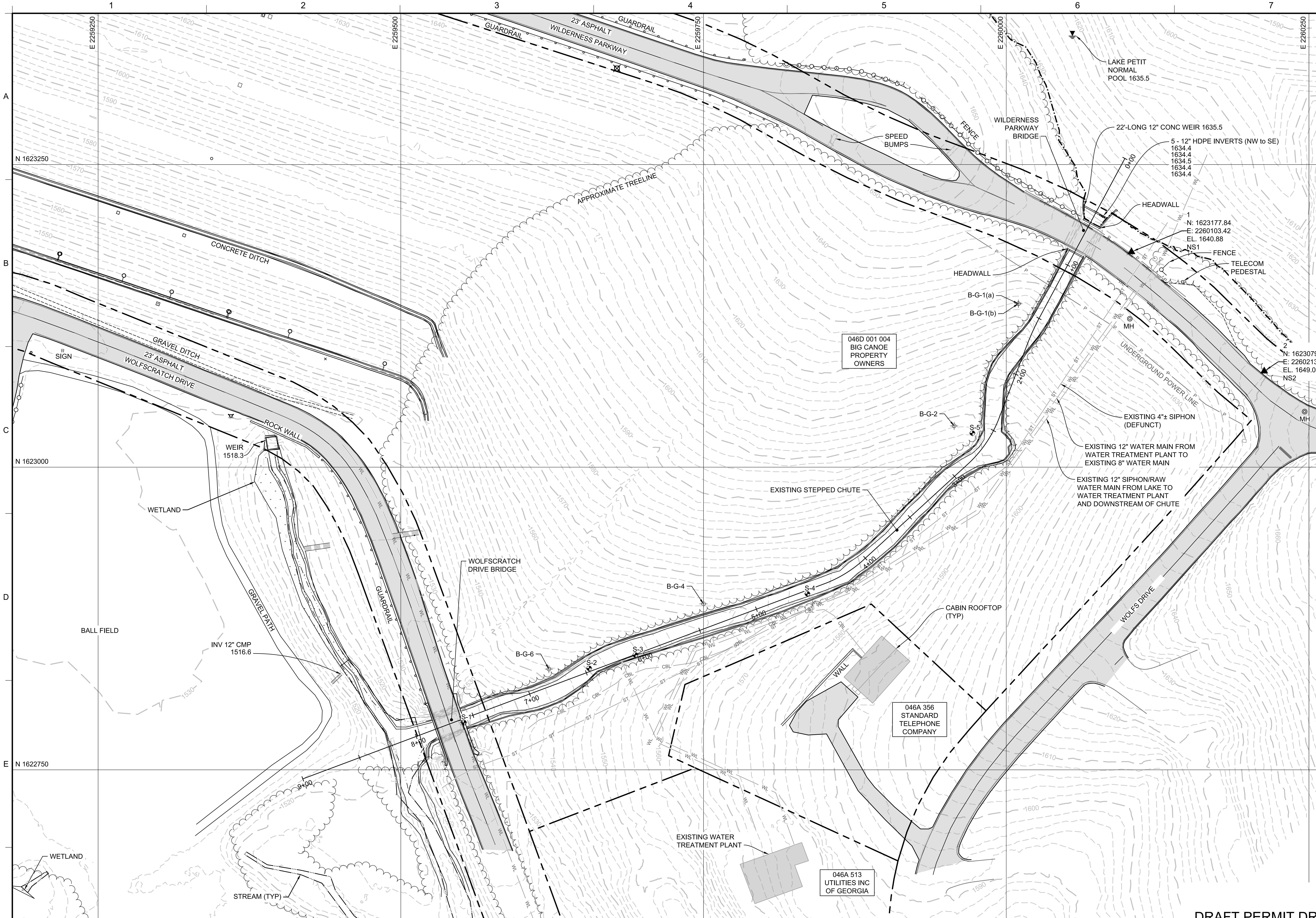
SITE: LAKE PETIT DAM JASPER, GEORGIA

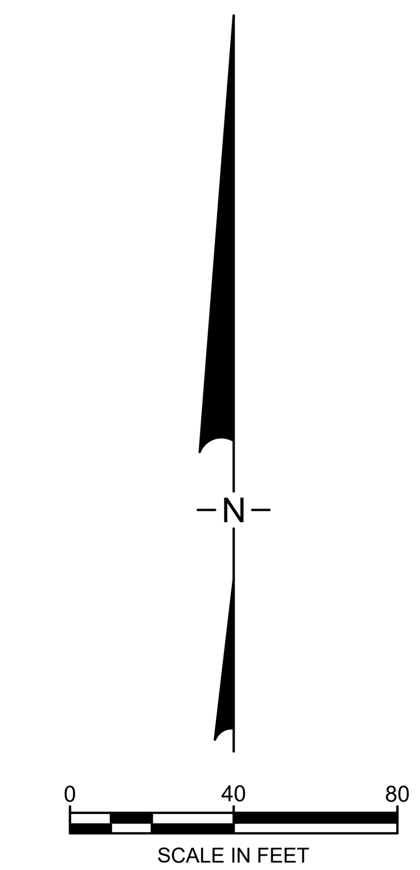
Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500 CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C04 |
| SHEET NO.: | 4 OF 41 |

C:_GEO-ACCADOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CAD\01_SPILLWAY DESIGN\DWG\SHEETS\TJD10771.01 C04




## LEGEND

| | |
|---|---|
| 1650 | EXISTING GROUND ELEVATION (FEET) |
| | EXISTING LAKE SHORELINE |
| | EXISTING CREEK SHORELINE |
| | EXISTING VEGETATION |
| | EXISTING PAVED ROAD |
| | BORING - BALDWIN & CRANSTON, 1971 |
| | EXISTING CURRENT BORINGS |
| P | EXISTING UNDERGROUND POWER LINE |
| T | EXISTING UNDERGROUND TELEPHONE LINE |
| CBL | EXISTING UNDERGROUND CABLE TRANSMISSION LINE |
| WL | EXISTING WATER LINE |
| ST | EXISTING 4"± SIPHON (DEFUNCT) |
| ▲ | SURVEY CONTROL POINT - JORDAN ENGINEERING, APRIL 2021 |
| | EXISTING STORM DRAIN CULVERT |
| | PROPERTY BOUNDARY |
| | STREAM |
| | WETLAND |

NOTE:

1. FOR GENERAL NOTES SEE SHEET 2.
2. THE CONTRACTOR SHALL ESTABLISH SURVEY CONTROL POINTS AT THE START OF CONSTRUCTION AND MAINTAIN THEM THROUGHOUT CONSTRUCTION. THE SURVEY CONTROL POINTS SHALL BE A BRASS CAP EMBEDDED IN AN APPROXIMATELY 8" DIAMETER, MINIMUM 3 FEET DEEP CONCRETE MONUMENT.
3. THE CONTRACTOR SHALL ESTABLISH PROJECT STATION SIGNAGE EVERY 50 FEET ALONG THE CHUTE PROFILE. STATION LETTERING SHALL BE A MINIMUM OF 2 FEET TALL AND LABELED ON BOTH SIDES OF THE CHUTE, APPROXIMATELY 30 FEET FROM THE CENTERLINE.

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| REV | DATE | DESCRIPTION | DRN | APP |
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| A | 02/20/2025 | ISSUE FOR PERMITTING | TAW | JWB |

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025



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|---|---|
| DESIGN BY: | JWB |
| DRAWN BY: | TW/SV |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: EXISTING SITE PLAN, SUBSURFACE EXPLORATION, AND SURVEY CONTROLS

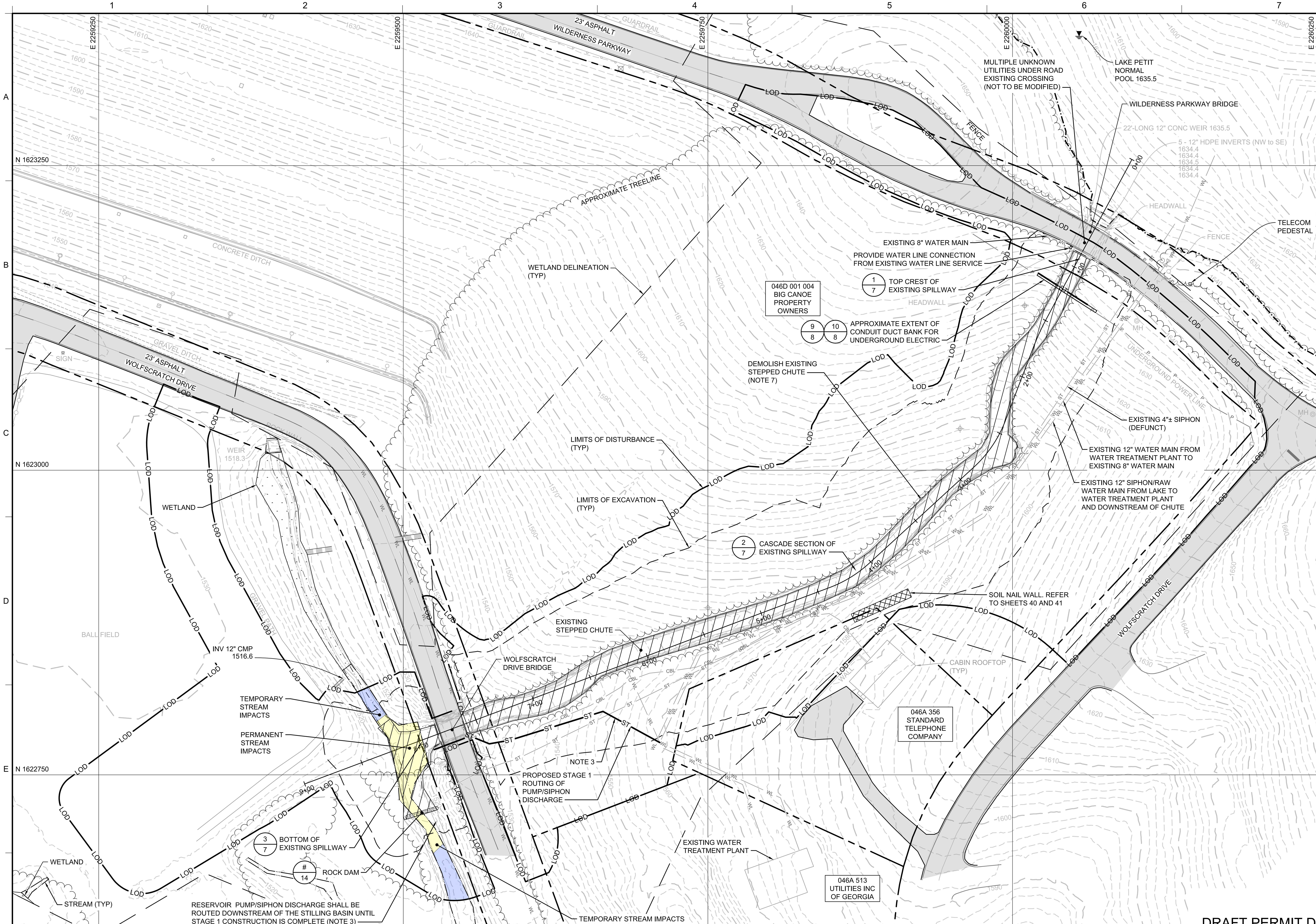
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C05 |
| SHEET NO.: | 5 OF 41 |




N

0 40 80
SCALE IN FEET

## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- WETLAND DELINEATION
- LOD — LIMITS OF DISTURBANCE
- LIMITS OF EXCAVATION
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- STREAM
- WETLAND
- PERMANENT STREAM IMPACTS
- TEMPORARY STREAM IMPACTS
- PROPOSED EXCAVATION
- PROPOSED DEMOLITION
- CHECK DAM

NOTES:

1. FOR GENERAL NOTES SEE SHEET 2.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE RESERVOIR LEVEL AT THE DRAWDOWN LEVEL DIRECTED BY THE OWNER OR ENGINEER, ± 0.5 FT.
3. CONTRACTOR SHALL ROUTE THE RESERVOIR PUMPING OR SIPHON DISCHARGE DOWNSTREAM OF THE WORK AREA. AS CONSTRUCTION PROCEEDS, DIVERTED FLOW MAY DISCHARGE INTO COMPLETED PORTIONS OF THE SPILLWAY AS APPROVED BY THE ENGINEER.
4. THE CONTRACTOR SHALL DIRECTLY COORDINATE WITH THE LOCAL UTILITY TO DE-ENERGIZE UNDERGROUND ELECTRIC LINES. TEMPORARY ABOVE GROUND ELECTRIC WILL BE INSTALLED BY THE LOCAL UTILITY AND SHALL BE PROTECTED BY THE CONTRACTOR.
5. THE CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE THE UNDERGROUND ELECTRIC, EXCAVATE AND EXPOSE THE DIRECT BURIAL LINE, AND CUT/REMOVE THE LINE WITHIN THE LIMITS OF THE CHUTE EXCAVATION. THE CONTRACTOR SHALL INSTALL NEW PVC CONDUIT ENCASED IN CONCRETE AS SHOWN.

FOR REVIEW PURPOSES ONLY
DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| REV | DATE | DESCRIPTION | DRN | APP |
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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044253 02/20/2025 JOHN W. BARRETT



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| DESIGN BY: | JWB |
| DRAWN BY: | TW/SV |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: SPILLWAY DEMOLITION AND UTILITY PLAN

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

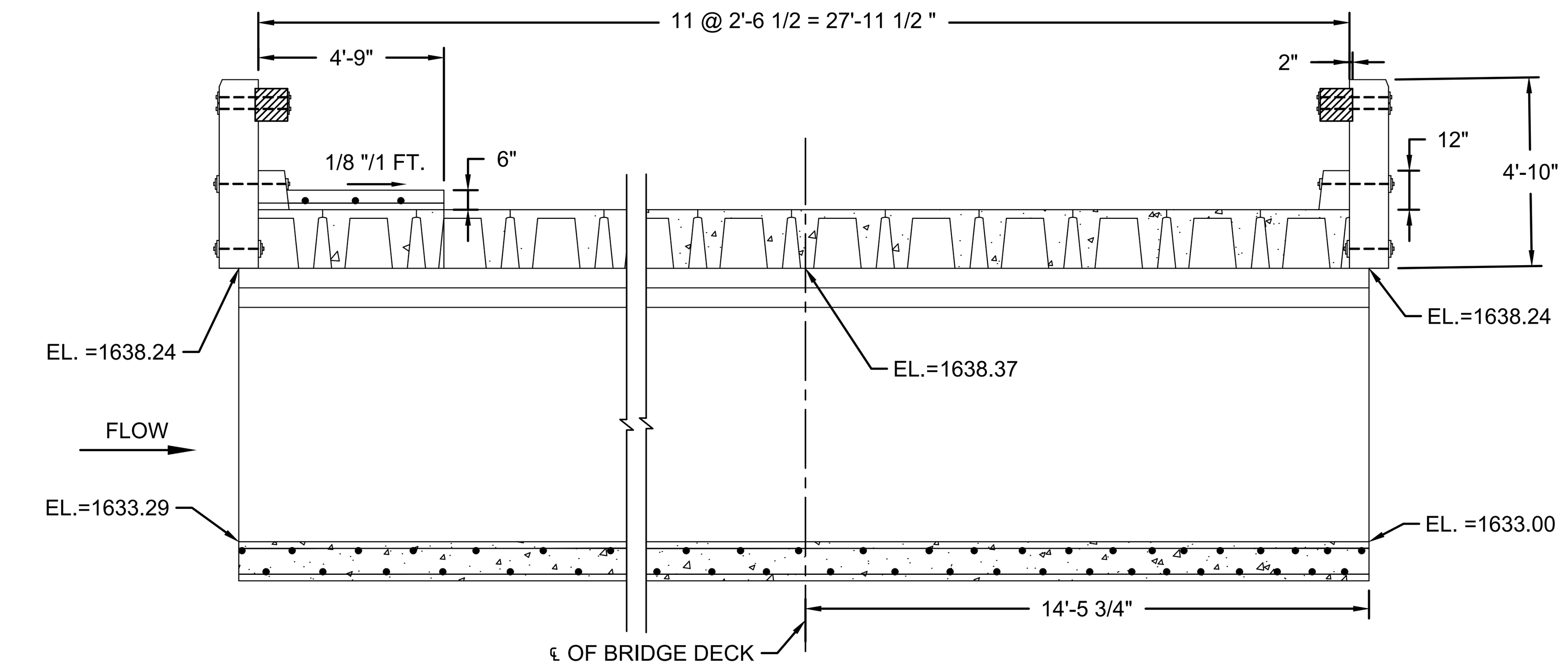
Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C06 |
| SHEET NO.: | 6 OF 41 |

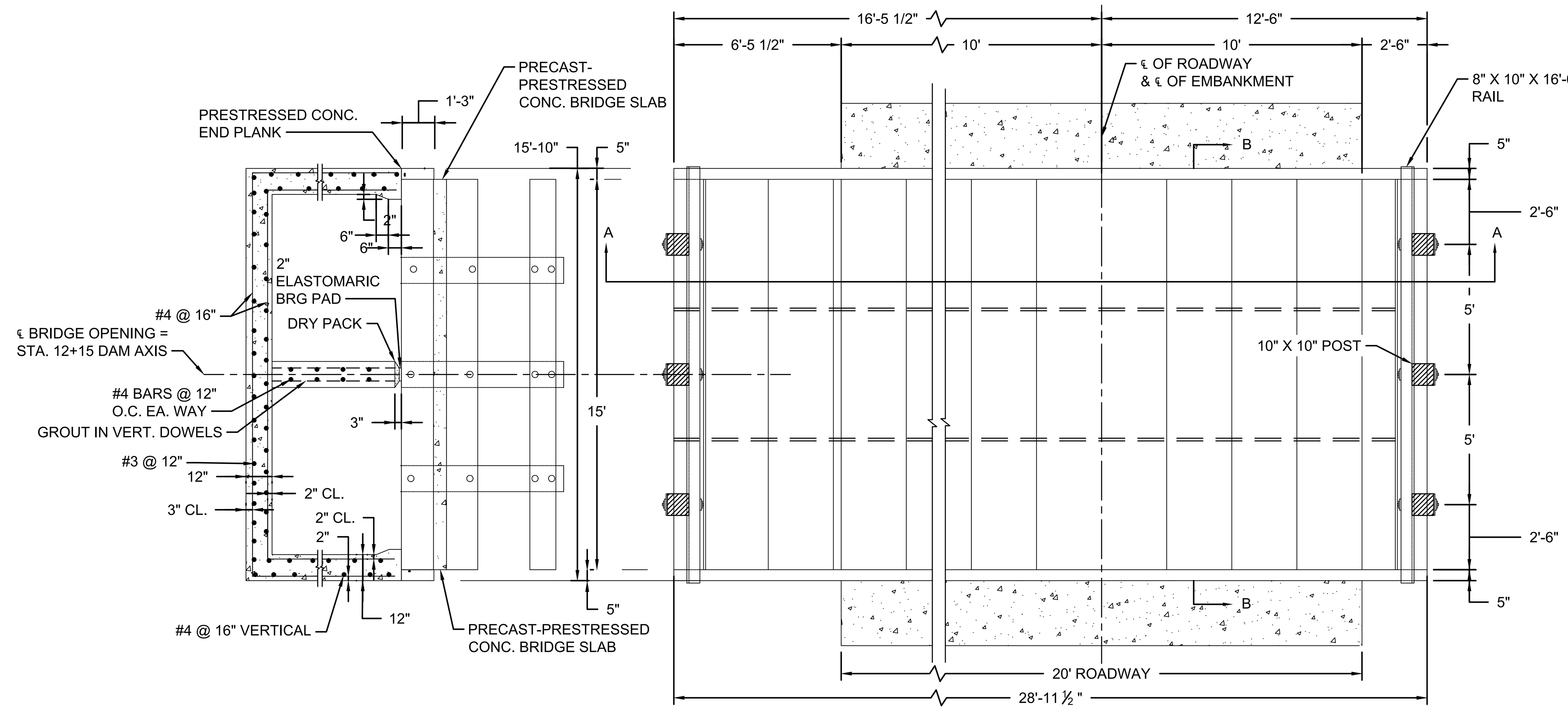
1/6 EXISTING CONDITIONS
TOP CREST OF SPILLWAY

2/6 EXISTING CONDITIONS
CASCADE SECTION OF SPILLWAY

3/6 EXISTING CONDITIONS
BOTTOM OF SPILLWAY




SECTION A-A

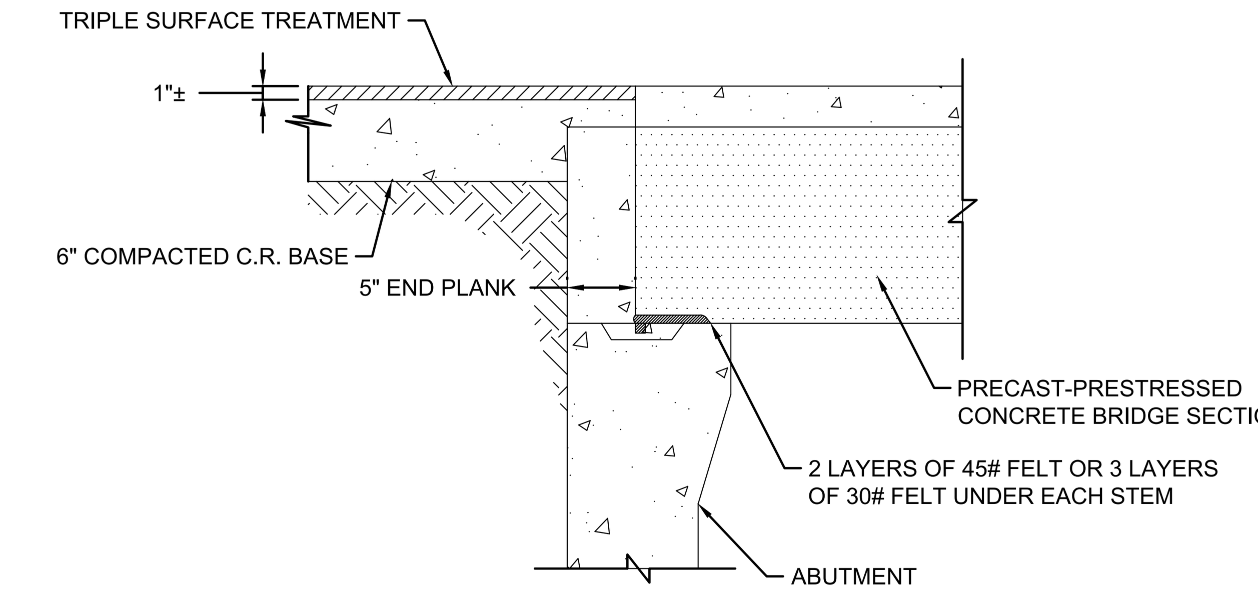



NOTES - BASED ON HISTORIC DRAWINGS:

1. PRECAST-PRESTRESSED CONCRETE SLAB WILL CONFORM TO GA. HWY. DPT. SPECIFICATION, SECTION 900, FOR H-15 LOADING.
2. BOLTS, NUTS, AND WASHERS SHALL CONFORM TO GA. HWY. DEPT. STANDARD SPECIFICATIONS NO. 852 MISC. STEEL MATERIALS,-FOR GALVANIZED MATERIALS.
3. GUARD RAILS AND POSTS SHALL BE OF SOUTHERN YELLOW PINE AND CONFORM TO GA. HWY. DEPT. SPECIFICATION 862, EXCEPT THAT ALL EXPOSED SURFACES SHALL BE ROUGH SOWN. MATERIAL SHALL BE PRESERVED IN ACCORDANCE WITH HWY. DEPT. SPECIFICATION 863 FOR OIL BORNE PRESERVATIVE-PENTOCHOROPHENOL-FOR STRUCTURAL TIMBER.

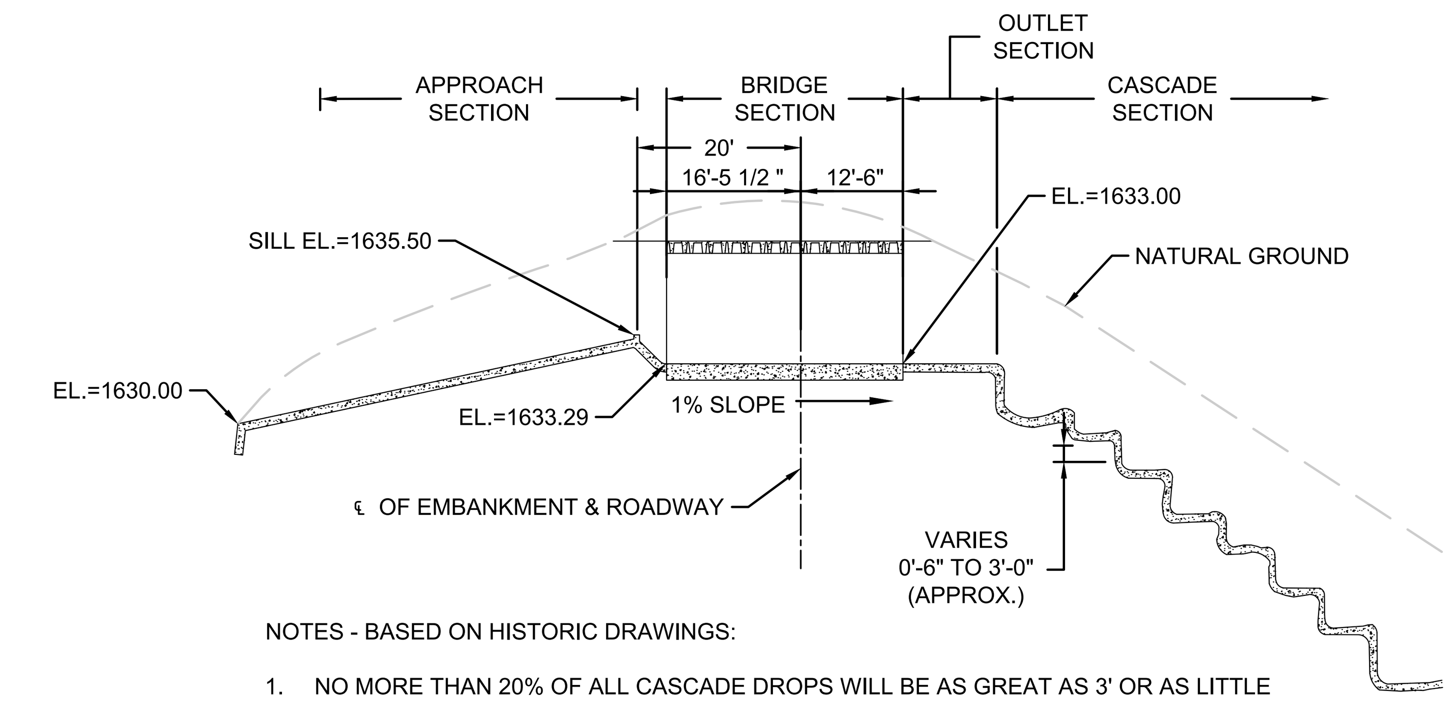
4/7 DETAIL
SPILLWAY BRIDGE

SCALE: 1" = 4'




5/7 DETAIL
CURB SLAB ANCHORAGE

SCALE: 1" = 1'

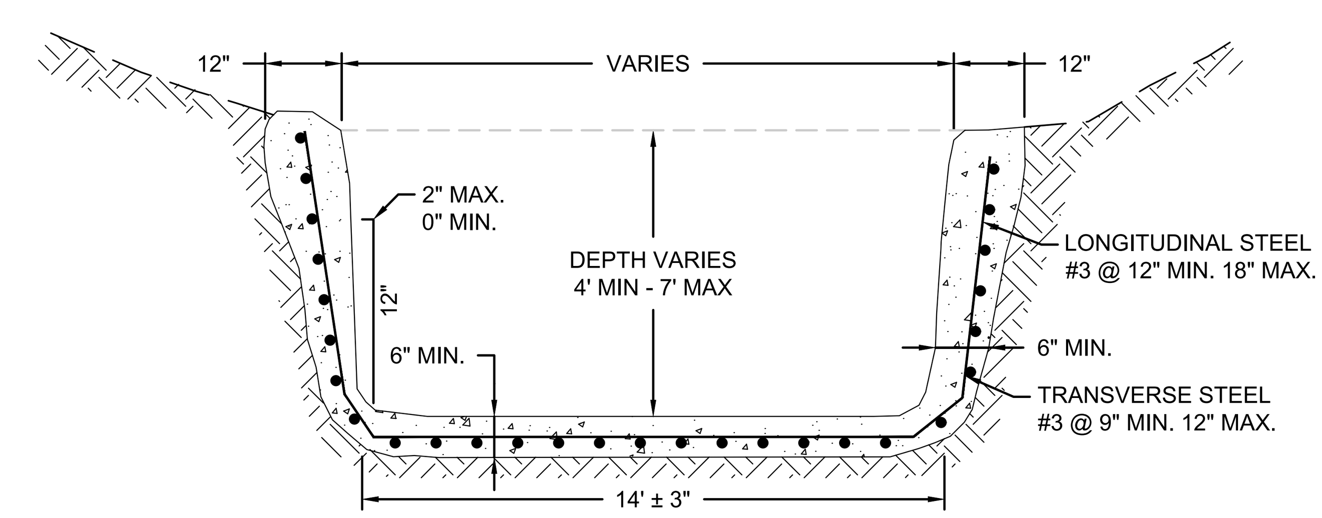



NOTES - BASED ON HISTORIC DRAWINGS:

1. NO MORE THAN 20% OF ALL CASCADE DROPS WILL BE AS GREAT AS 3' OR AS LITTLE AS 6".
2. A THALWEG WILL BE BUILD INTO EACH LEDGE LIP, APPROXIMATELY 2" WIDE, TO CHANNEL LOW FLOWS AT RANDOM FROM ONE SIDE OF THE CHANNEL TO ANOTHER.
3. ABOVE EACH LEDGE, A DEPRESSION WILL POOL LOW FLOWS 1" TO 6" DEEP, DEPENDING ON THE LENGTH AVAILABLE.
4. OUTLET SECTION WILL MAINTAIN 1% SLOPE THROUGH BRIDGE TO FIRST LEDGE.

6/7 DETAIL
SPILLWAY CHANNEL AT CREST

SCALE: 1" = 20'

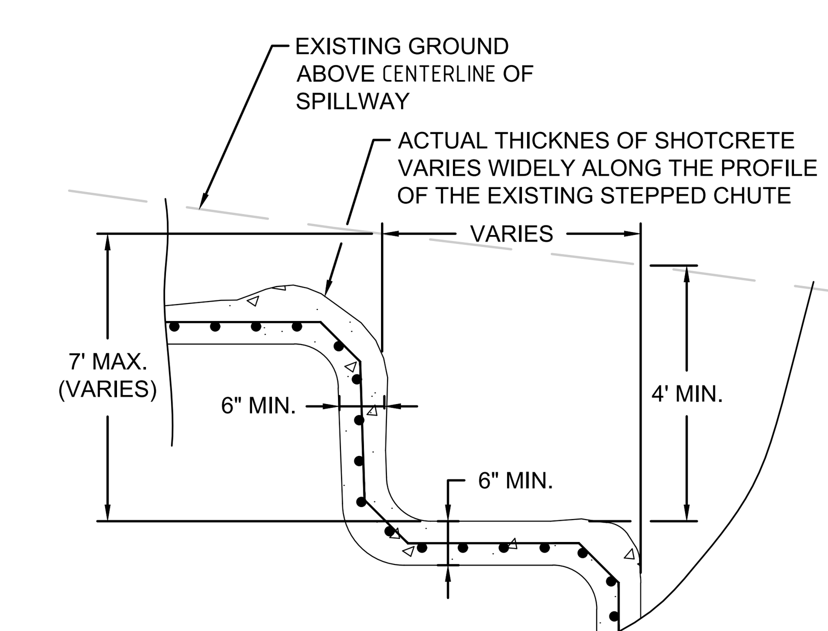



NOTE - FROM HISTORIC DRAWINGS:

CONCRETE TO BE CLASS 5000, PNEUMATICALLY APPLIED TO SHAPED EXCAVATION OVER REINFORCING STEEL.

7/7 DETAIL
TRANSVERSE SECTION (TYPICAL)

SCALE: NTS




8/7 DETAIL
CASCADE SPILLWAY (TYPICAL)

SCALE: NTS

NOTES:

1. LOCATIONS AND KNOWN DETAILS OF PAST REPAIRS TO THE STEPPED CHUTE ARE PROVIDED IN ADDENDUM 01, STEPPED CHUTE REPAIRS.

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044285 JOHN W. BARRETT 02/20/2025

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| DESIGN BY: | JWB |
| DRAWN BY: | TW/KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: EXISTING SPILLWAY AND BRIDGE DETAILS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

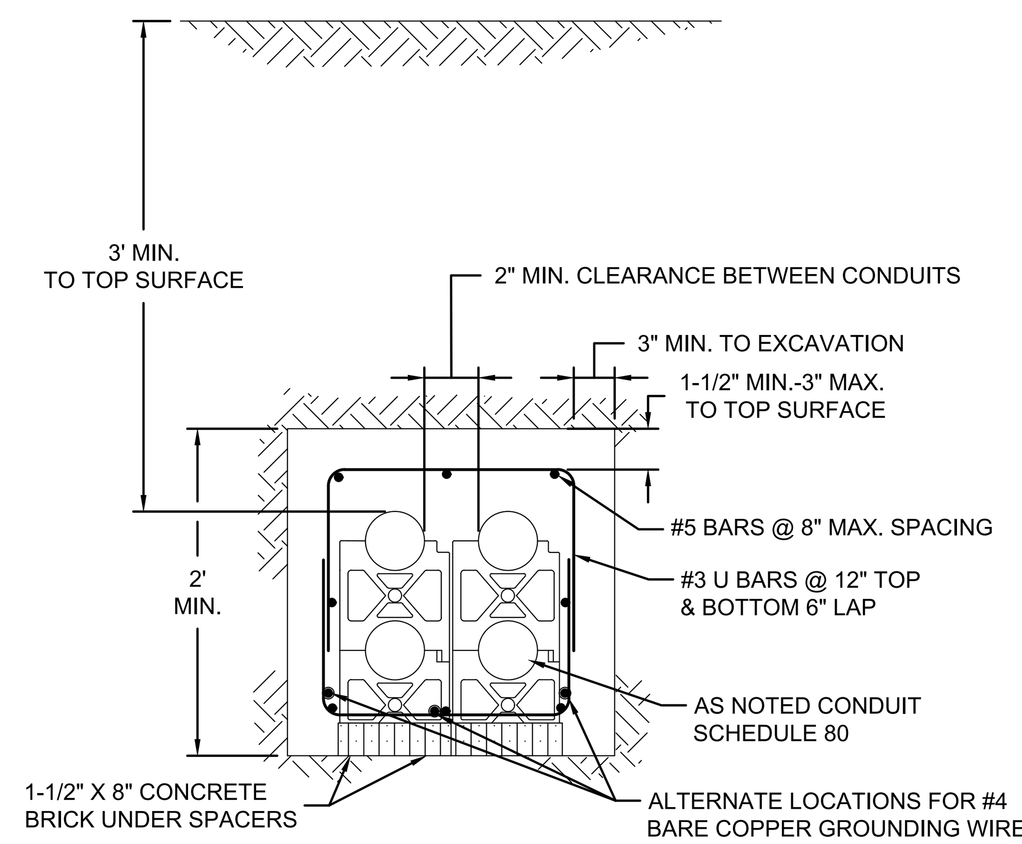
SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C07 |
| SHEET NO.: | 7 OF 41 |

C:_GEO-ACCADDOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CADD\01_SPILLWAY DESIGN\DWGS\SHEETS\TJD10771.01 C07

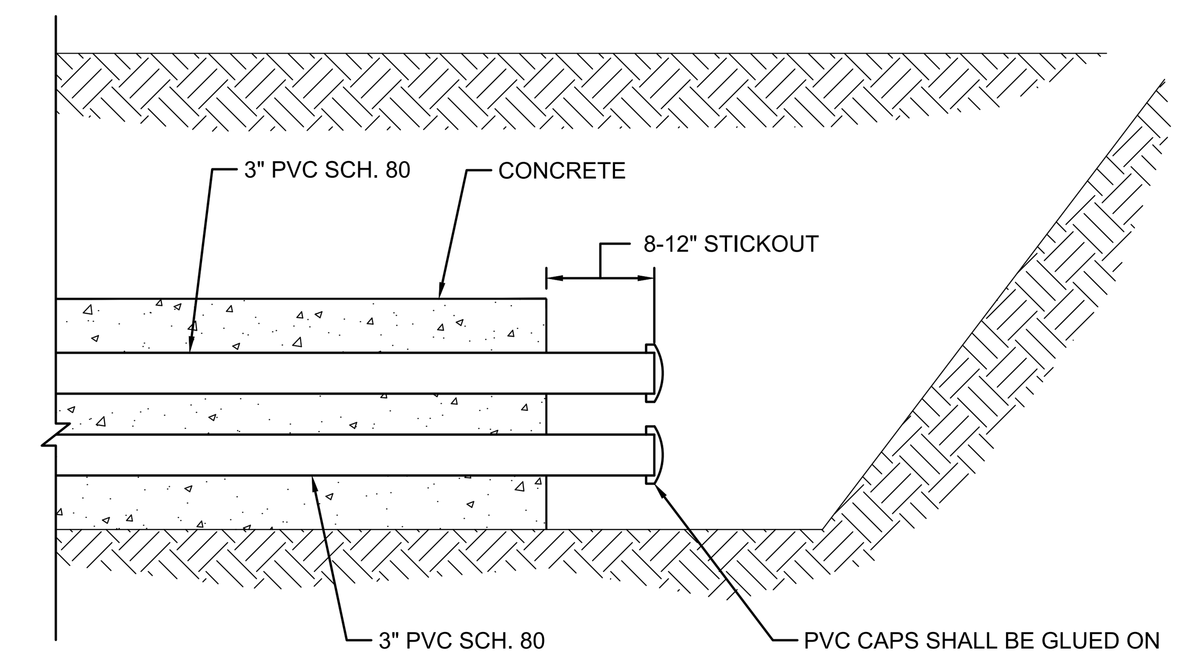



NOTES:

1. CONDUIT FOR 4 CONDUIT DUCTBANK TO BE 3" DIAMETER.
2. 1" MINIMUM CLEARANCE BETWEEN CONDUITS AND REBAR.
3. FOR ALL DUCTBANK, CONCRETE AND FLOWABLE FILL (IF USED FOR FOUNDATION) SHALL BE DYED RED.
4. CONCRETE SHALL BE MINIMUM 4,000 PSI.
5. SINGLE GROUND WIRE REQUIRED AT ONE OF THE SHOWN LOCATIONS.

9/6 DETAIL
UTILITY DUCTBANK

SCALE: 1" = 1'

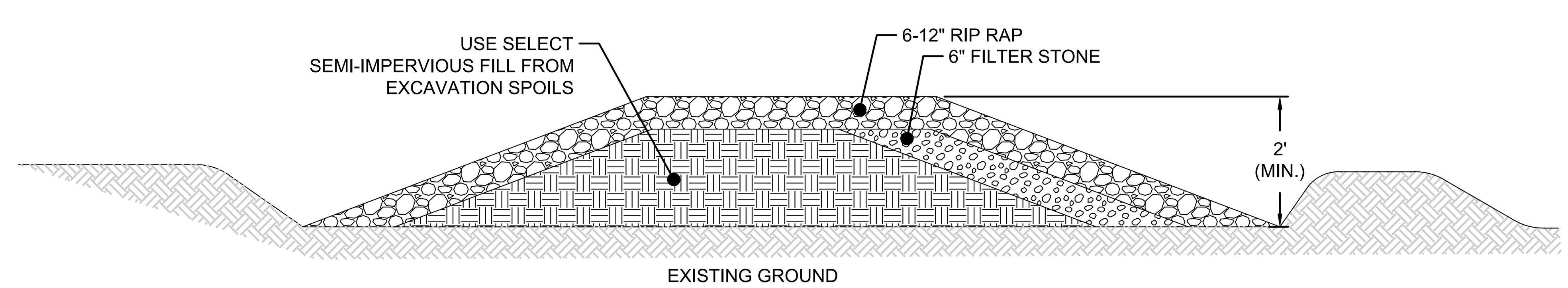



NOTES:

1. CONTRACTOR SHALL PROVIDE 3" PVC SCH. 80 CONDUITS FOR SERVICE ELECTRIC TO BE INSTALLED BY THE LOCAL UTILITY.

10/6 DETAIL
UTILITY DUCTBANK TERMINATIONS

SCALE: 1" = 1'




NOTES:

1. THE PURPOSE OF THE ROCK DAM IS TO PREVENT BACKFLOW OF WATER INTO THE CONSTRUCTION AREA.
2. REMOVE SURFICIAL ORGANIC AND/OR SOFT SOILS WITHIN CHANNEL PRIOR TO PLACEMENT OF ROCK DAM FILL MATERIAL.

11/8 DETAIL
ROCK DAM

SCALE: 1" = 2'

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025

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| DESIGN BY: | JWB |
| DRAWN BY: | TW/KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: UTILITIES REMOVAL AND DEMOLITION DETAILS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C08 |
| SHEET NO.: | 8 OF 41 |

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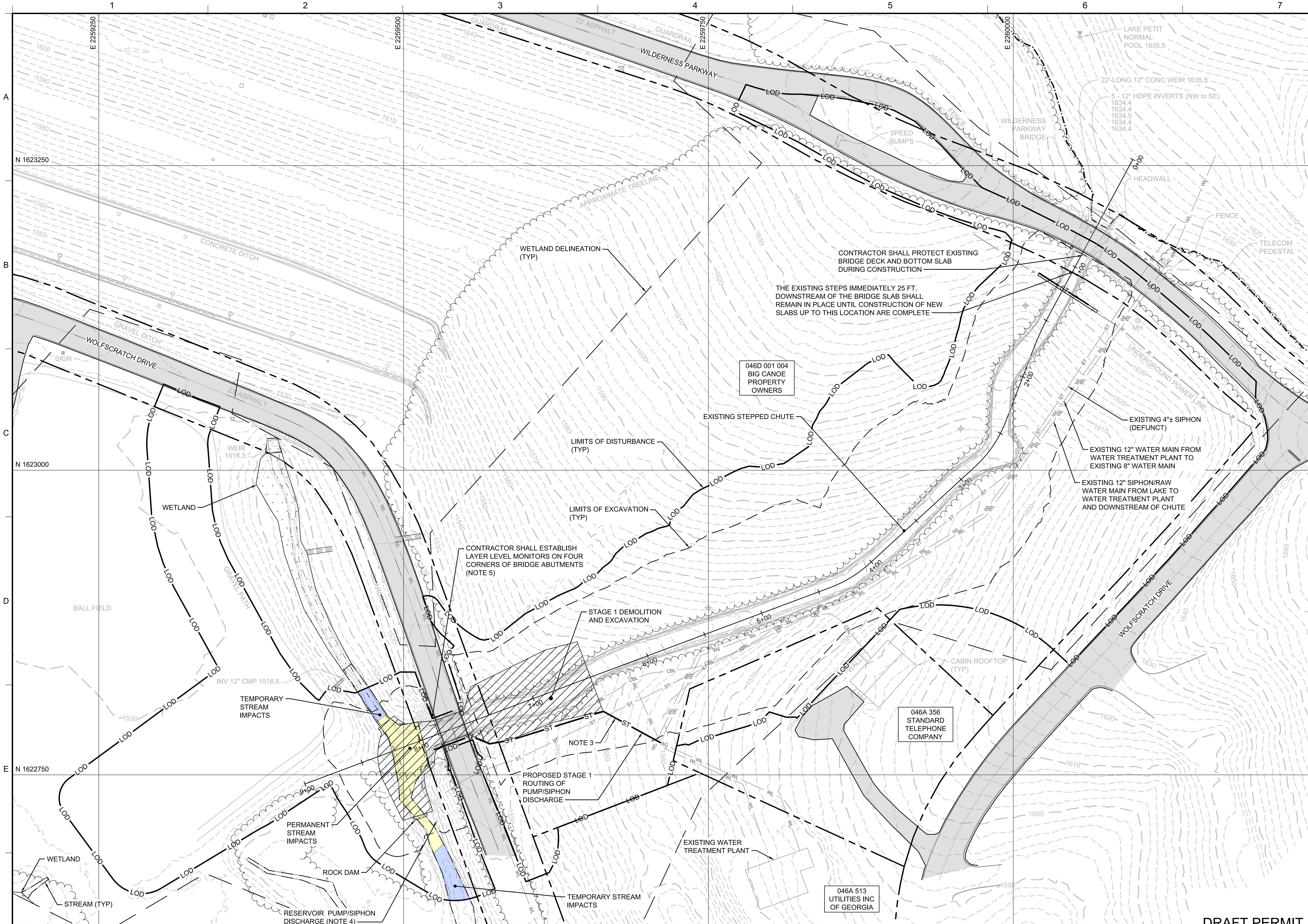


SCALE IN FEET: 0 40 80

## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- WETLAND DELINEATION
- LOD — LIMITS OF DISTURBANCE
- LIMITS OF EXCAVATION
- 1570 — FINISHED GRADE SURFACE ELEVATION (FEET)
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- STREAM
- WETLAND
- PERMANENT STREAM IMPACTS
- TEMPORARY STREAM IMPACTS
- PROPOSED DEMOLITION AND EXCAVATION

NOTES:

1. FOR GENERAL NOTES SEE SHEET 2.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE RESERVOIR LEVEL AT THE DRAWDOWN LEVEL DIRECTED BY THE OWNER OR ENGINEER, ± 0.5 FT. DETAILS OF THE EXISTING SIPHON SYSTEM ARE SHOWN ON ADDENDUM 01.
3. CONTRACTOR SHALL LOCATE EXISTING UTILITIES. THE CONTRACTOR SHALL INSTALL CONDUITS FOR COMMUNICATION CABLES. THE CONTRACTOR SHALL REROUTE EXISTING WATER LINES.
4. CONTRACTOR SHALL ROUTE FLOW FROM THE RESERVOIR TO DISCHARGE DOWNSTREAM OF THE WORK AREA. AS CONSTRUCTION PROCEEDS, THE FLOW MAY DISCHARGE ONTO COMPLETED PORTIONS OF THE SPILLWAY AS APPROVED BY THE ENGINEER.
5. CONTRACTOR SHALL PROTECT BRIDGE ABUTMENTS FROM DAMAGE, EROSION, OR DISPLACEMENT DURING CONSTRUCTION.

   CONTRACTOR SHALL CONSTRUCT PEDESTALS FOR LASER LEVELS OR AUTOMATIC TOTAL STATION AWAY FROM THE INFLUENCE OF CONSTRUCTION ACTIVITIES.

   AT MINIMUM, CONTRACTOR SHALL MONITOR STRUCTURE USING SIX REFERENCE POINTS ON THE FOUNDATIONS ON EITHER SIDE OF THE FOUNDATIONS. REFERENCE POINTS SHALL BE CHECKED A MINIMUM OF THREE TIMES DAILY UNTIL WORK WITHIN 100 FEET OF THE BRIDGE ABUTMENTS IS COMPLETE. MOVEMENTS GREATER THAN 1/4 INCH SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.

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| REV | DATE | DESCRIPTION | DRN | APP |
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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025

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| DESIGN BY: | JWB |
| DRAWN BY: | TW/SV |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CONSTRUCTION SEQUENCE 1, CHUTE BASIN CONSTRUCTION

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

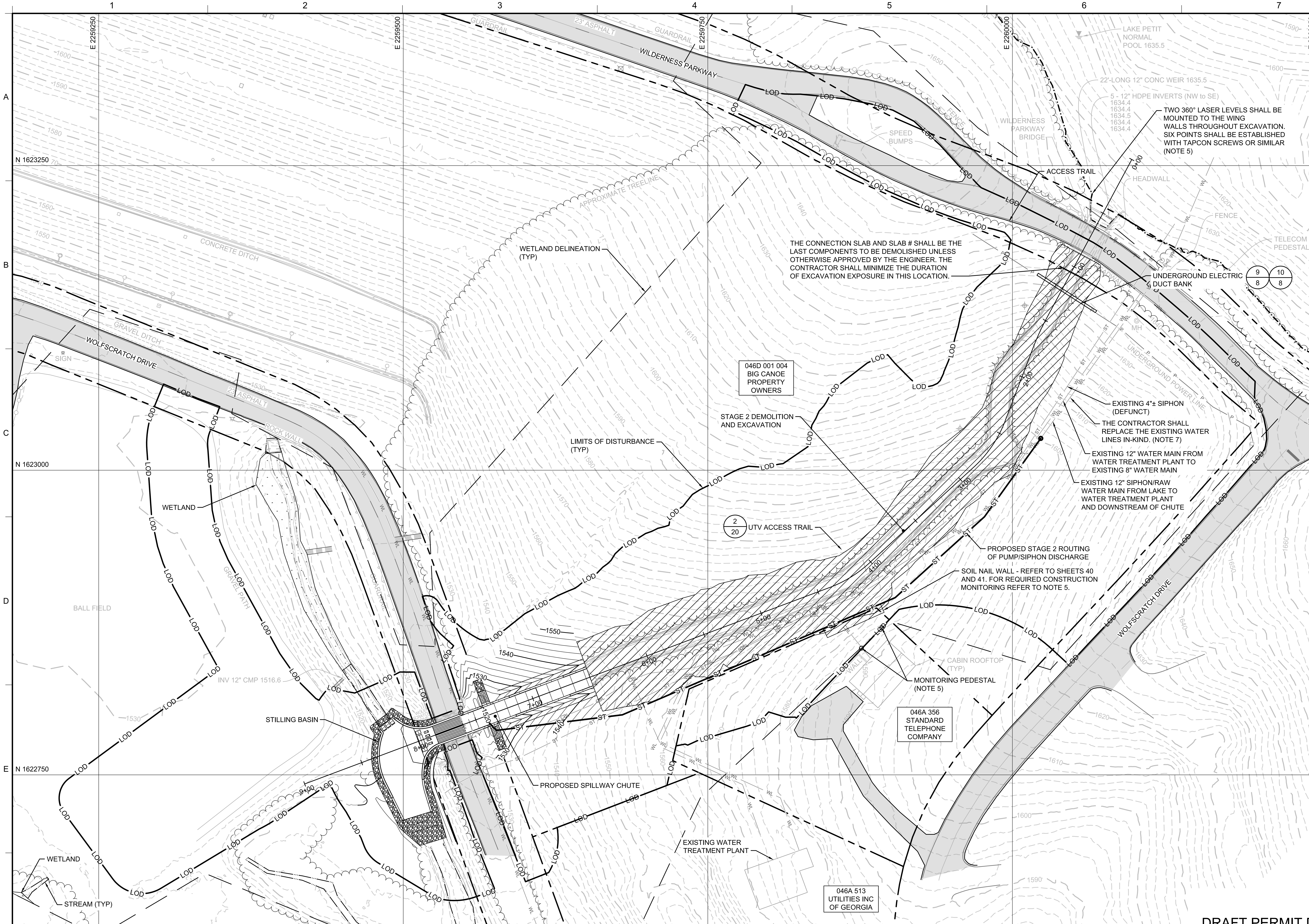
SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C09 |
| SHEET NO.: | 9 OF 41 |

C:_GEO-ACCDOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CADD\01_SPILLWAY DESIGN\DWGS\SHEETS\TJD10771.01 C09




## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- WETLAND DELINEATION
- LOD — LIMITS OF DISTURBANCE
- LIMITS OF EXCAVATION
- 1570 — FINISHED GRADE SURFACE ELEVATION (FEET)
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- STREAM
- WETLAND
- PROPOSED UTV ACCESS TRAIL
- PROPOSED DEMOLITION AND EXCAVATION

NOTES:

1. FOR GENERAL NOTES SEE SHEET 2.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE RESERVOIR LEVEL AT THE DRAWDOWN LEVEL DIRECTED BY THE OWNER OR ENGINEER, ± 0.5 FT. DETAILS OF THE EXISTING SIPHON SYSTEM ARE SHOWN ON ADDENDUM 01.
3. CONTRACTOR SHALL LOCATE EXISTING UTILITIES. THE CONTRACTOR SHALL INSTALL CONDUITS FOR COMMUNICATION CABLES. THE CONTRACTOR SHALL REROUTE EXISTING WATER LINES.
4. CONTRACTOR SHALL ROUTE FLOW FROM THE RESERVOIR TO DISCHARGE DOWNSTREAM OF THE WORK AREA. AS CONSTRUCTION PROCEEDS, THE FLOW MAY DISCHARGE ONTO COMPLETED PORTIONS OF THE SPILLWAY AS APPROVED BY THE ENGINEER.
5. CONTRACTOR SHALL PROTECT ADJACENT PROPERTY AND STRUCTURES. CONTRACTOR SHALL PROTECT BRIDGE ABUTMENTS FROM DAMAGE, EROSION, OR DISPLACEMENT DURING CONSTRUCTION.

   CONTRACTOR SHALL CONSTRUCT PEDESTALS FOR LASER LEVELS OR AUTOMATIC TOTAL STATION AWAY FROM THE INFLUENCE OF CONSTRUCTION ACTIVITIES.

   AT MINIMUM, CONTRACTOR SHALL MONITOR STRUCTURE USING SIX REFERENCE POINTS ON THE FOUNDATIONS ON EITHER SIDE OF THE FOUNDATIONS. REFERENCE POINTS SHALL BE CHECKED A MINIMUM OF THREE TIMES DAILY UNTIL WORK WITHIN 100 FEET OF THE BRIDGE ABUTMENTS IS COMPLETE. MOVEMENTS GREATER THAN 1/4 INCH SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY.
6. THE EXISTING WATER LINES SHOWN ARE BELIEVED TO BE 12" STEEL OR DUCTILE IRON PIPES. ONE IS BELIEVED TO BE PRESSURIZED, ORIGINATES FROM THE PROPERTY OF THE UTILITIES INC. OF GEORGIA, AND CONNECTS TO THE 8" SERVICE LINE WHICH PASSES BENEATH THE WILDERNESS PARKWAY BRIDGE. THE SECOND PIPE IS BELIEVED TO BE A 12" SIPHON DISCHARGE LINE WITH A VALVE NEAR THE CROSSING AT WILDERNESS PARKWAY.
7. THE CONTRACTOR SHALL COORDINATE WITH THE LOCAL UTILITY TEMPORARILY REROUTE THE EXISTING WATER LINE PRIOR TO EXCAVATION OF THE STEPPED CHUTE. ALL WATER LINES AND UTILITIES WITHIN THE FOOTPRINT OF THE EXCAVATION MUST BE REPLACED AT THE END OF THE CONSTRUCTION, EXCEPT WHERE EXPLICITLY SHOWN. THE CONTRACTOR SHALL DIRECTLY COORDINATE WITH LOCAL UTILITIES TO RETURN THESE LINES TO SERVICE, IF REQUIRED.

FOR REVIEW PURPOSES ONLY
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| REV | DATE | DESCRIPTION | DRN | APP |
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| A | 02/20/2025 | ISSUE FOR PERMITTING | TAW | JWB |

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025



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| DESIGN BY: | JWB |
| DRAWN BY: | TW/TR/SV |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CONSTRUCTION SEQUENCE 2, CHUTE BASIN CONSTRUCTION

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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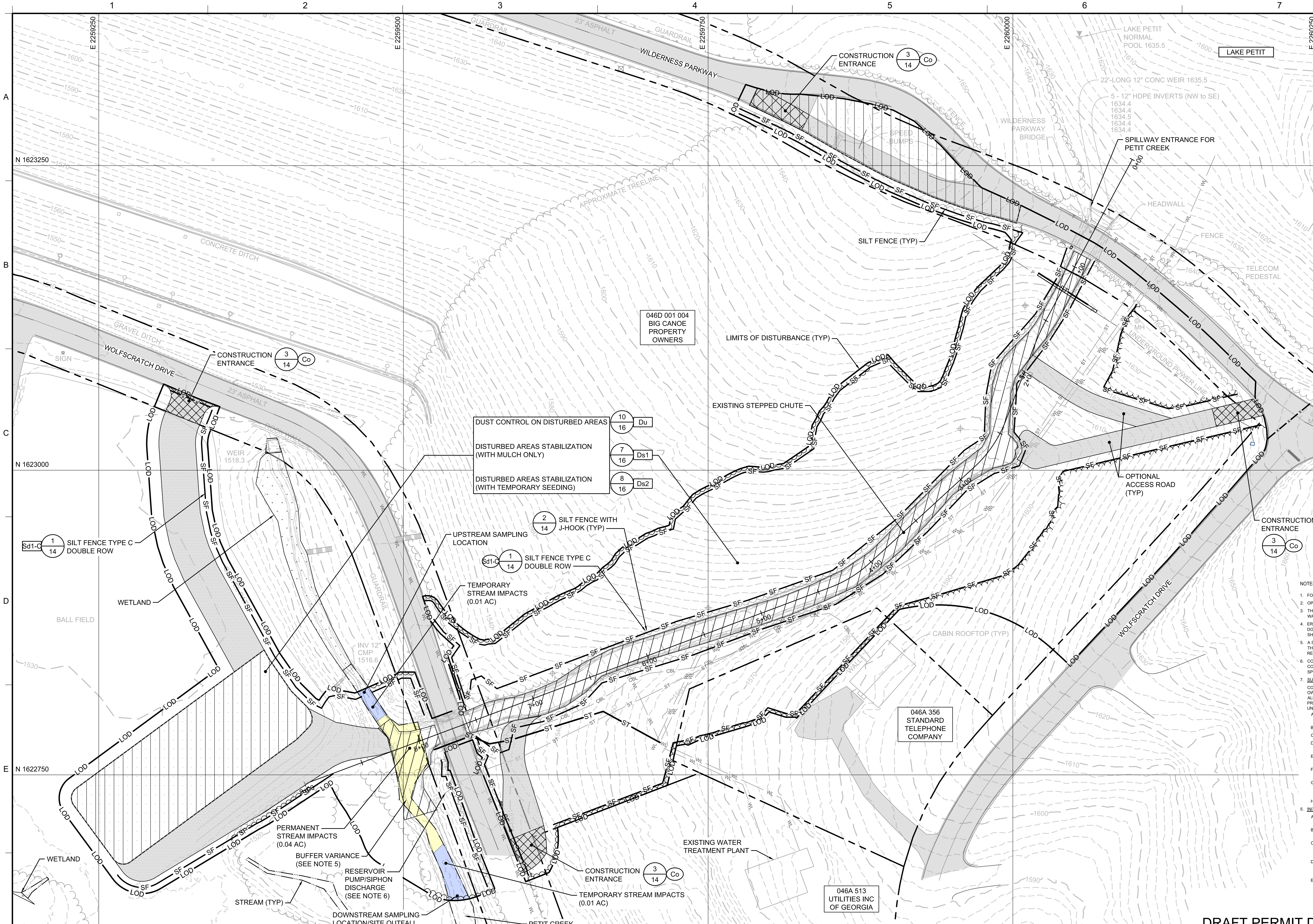
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C10 |
| SHEET NO.: | 10 OF 41 |




## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- 1570 — FINISHED GRADE SURFACE ELEVATION (FEET)
- SF — SILT FENCE
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- LIMITS OF VEGETATION
- STREAM
- WETLAND
- PERMANENT STREAM IMPACTS
- TEMPORARY STREAM IMPACTS
- PROPOSED LAYDOWN AREA
- PROPOSED TEMPORARY STOCKPILE
- PROPOSED DEMOLITION
- PROPOSED ACCESS ROAD
- PROPOSED CONSTRUCTION ENTRANCE

NOTES:

1. FOR GENERAL NOTES, SEE SHEET 2.
2. OPTIONAL ACCESS ROAD, AND ASSOCIATED DRAINAGE TO BE DESIGNED BY CONTRACTOR, IF REQUIRED.
3. THE LOCATION OF STREAMS AND WETLANDS NOTED ON THIS PLAN WERE IDENTIFIED AS PART OF A WETLAND AND WATERBODY DELINEATION STUDY CONDUCTED BY GEOSYNTEC IN NOVEMBER 2024.
4. EROSION CONTROL MEASURES SHALL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT SEDIMENT SOURCE.
5. A STREAM BUFFER VARIANCE AROUND PETIT CREEK IS REQUIRED FOR CONSTRUCTING A STILLING BASIN (LOCATED AT THE DOWNSTREAM END OF THE NEW SPILLWAY DOWNCHUTE) THAT DISCHARGES INTO PETIT CREEK AND WOULD RESULT IN TEMPORARY AND PERMANENT STREAM IMPACTS.
6. CONTRACTOR SHALL ROUTE FLOW FROM THE RESERVOIR PUMPING DOWNSTREAM OF THE WORK AREA. AS CONSTRUCTION PROGRESSES, THE PUMPS, SIPHON MAY DISCHARGE INTO THE COMPLETED PORTIONS OF THE SPILLWAY UPON ENGINEER'S APPROVAL.
7. SUMMARY OF SCOPE OF WORK / CONSTRUCTION SEQUENCE

   CONTRACTOR SHALL PERFORM WORK AND COORDINATE THE CONSTRUCTION SCHEDULE AND OPERATIONS WITH THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE ACTIVITIES LISTED BELOW IN A MANNER SUCH THAT ALL ACTIVITIES ARE COMPLETED EFFICIENTLY IN ACCORDANCE WITH PROJECT REQUIREMENTS, INCLUDING THE PROJECT COMPLETION DATE. THE GENERAL CATEGORIES AND SEQUENCE OF WORK THAT ARE TO BE PERFORMED UNDER THIS PROJECT INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

   A. SUBMIT NOTICE OF INTENT (NOI) TO THE GEORGIA ENVIRONMENTAL PROTECTION DIVISION AND A LAND DISTURBING PERMIT (LDP) APPLICATION TO PICKENS COUNTY.
   B. FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND INCIDENTALS REQUIRED.
   C. MOBILIZE CONSTRUCTION EQUIPMENT AND PERSONNEL.
   D. ESTABLISH SURVEY CONTROL OF SITE AND UPDATE AS NECESSARY DURING CONSTRUCTION. CLEARLY MARK THE LIMITS OF DISTURBANCE (LOD) AND MAINTAIN MARKINGS THROUGHOUT CONSTRUCTION.
   E. LOCATE AND VISIBLY MARK LOCATION OF EXISTING CULVERTS, STORMWATER PIPES, UTILITIES, AND DAM INSTRUMENTATION TO MITIGATE DAMAGE DURING EXCAVATION.
   F. DISPOSE OF ANY PIPES, BACKFILL MATERIAL AND CONCRETE OFFSITE, IN ACCORDANCE WITH LOCAL REGULATIONS.
   G. UPON COMPLETION OF WORK, RESTORE DISTURBED AREAS INCLUDING TEMPORARY ACCESS ROADS TO EXISTING GRADES, VEGETATE BARE AREAS WITH PERMANENT SEEDING TO RESTORE SOIL COVER, AND REMOVE TEMPORARY PERIMETER CONTROLS.
   H. ONCE STABILIZATION IS ACHIEVED, SUBMIT NOTICE OF TERMINATION (NOT).
5. INITIAL E&SC PLAN SEQUENCE
   A. INSTALL TWO (2) CONSTRUCTION EXITS AT WOLFSCRATCH DRIVE AND 2 AT WILDERNESS PARKWAY AS SHOWN ON THIS PLAN.
   B. PERIMETER SILT FENCE SHALL BE INSTALLED IN A DOUBLE ROW WITH AT LEAST FIVE FEET BETWEEN EACH ROW. INSTALL SILT FENCE WITH J-HOOK ALONG THE DOWNSLOPE/FACE OF THE DAM.
   C. DEMARCATE THE LOCATION OF THE STOCKPILE AREAS. INSTALL SINGLE ROW OF SILT FENCE AROUND THE STOCKPILES AS SHOWN ON THE PLAN. SOILS BEING STOCKPILED WITHOUT FURTHER DISTURBANCE FOR MORE THAN 14 DAYS SHALL BE STABILIZED WITH MULCH AND TEMPORARY SEEDING.
   D. DUST CONTROL SHALL BE PROVIDED THROUGHOUT THE DURATION THE PROJECT IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'DUST CONTROL ON DISTURBED AREAS' ON SHEET 16 FOR ADDITIONAL INFORMATION.
   E. DISTURBED AREAS STABILIZATION (WITH TEMPORARY SEEDING/MULCHING) SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO CORRESPONDING DETAILS ON SHEET 16 FOR ADDITIONAL INFORMATION.

# FOR REVIEW PURPOSES ONLY
# DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| REV | DATE | DESCRIPTION | DRN | APP |
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| DESIGN BY: | JWB |
| DRAWN BY: | TW/SV |
| CHECKED BY: | SS |
| REVIEWED BY: | JA |
| APPROVED BY: | JWB |

TITLE: EROSION & SEDIMENT CONTROL PLAN - INITIAL CONDITIONS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: TJD10771 LAKE PETIT SPWY JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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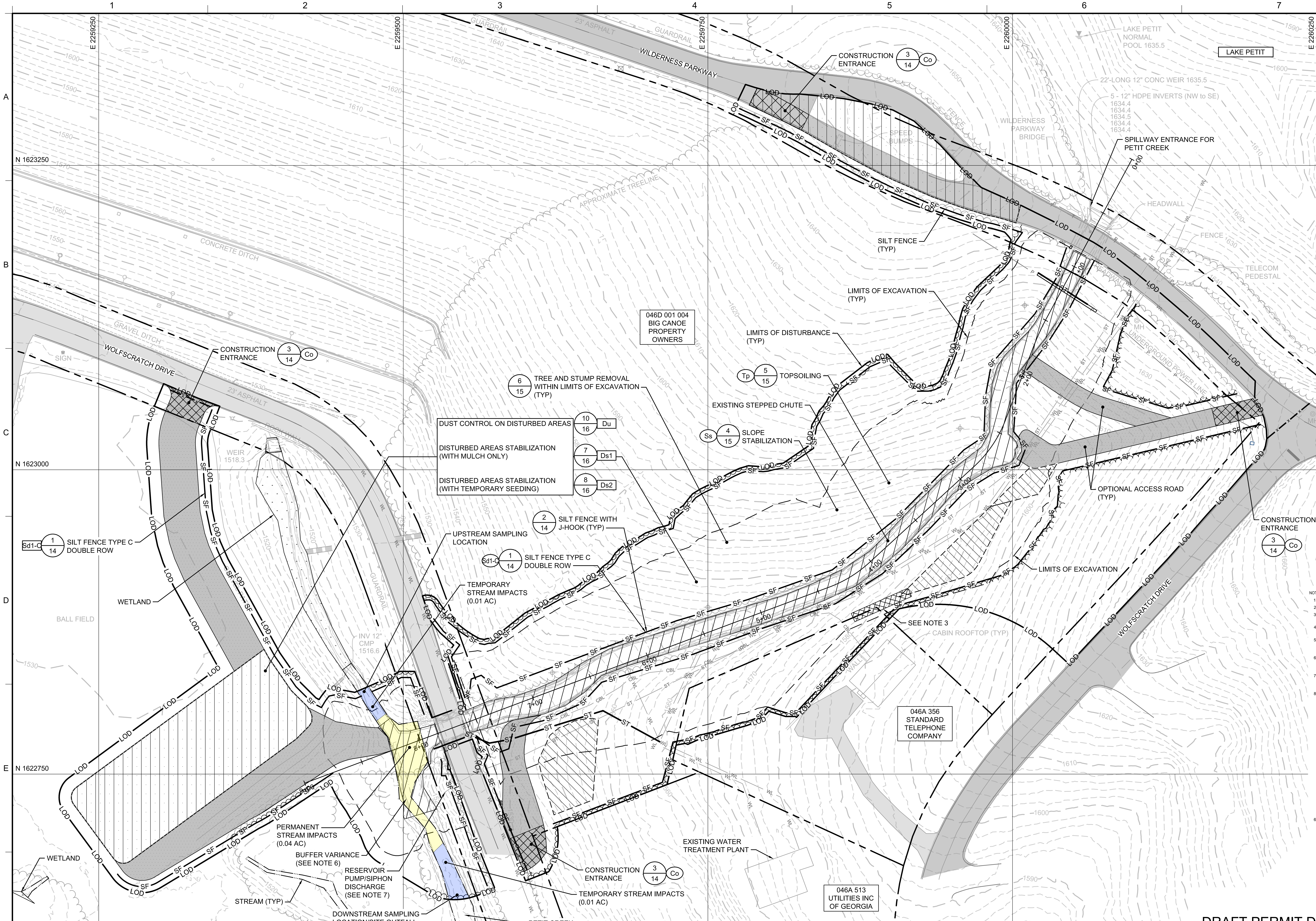
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C11 |
| SHEET NO.: | 11 OF 41 |




## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
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- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- LIMITS OF EXCAVATION
- 1570 — FINISHED GRADE SURFACE ELEVATION (FEET)
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- SF — SILT FENCE
- LIMITS OF VEGETATION
- STREAM
- WETLAND
- PERMANENT STREAM IMPACTS
- TEMPORARY STREAM IMPACTS
- PROPOSED LAYDOWN AREA
- PROPOSED TEMPORARY STOCKPILE
- PROPOSED DEMOLITION
- PROPOSED ACCESS ROAD
- PROPOSED CONSTRUCTION ENTRANCE

NOTES:

1. FOR GENERAL NOTES, SEE SHEET 2.
2. OPTIONAL ACCESS ROAD, AND ASSOCIATED DRAINAGE TO BE DESIGNED BY CONTRACTOR, IF REQUIRED.
3. CONTRACTOR SHALL MINIMIZE EXCAVATION IN THIS AREA TO PROTECT THE PROPERTY UPSLOPE. TEMPORARY SHORING SHALL BE PROVIDED AND DESIGNED BY THE CONTRACTOR, AS NEEDED.
4. THE LOCATION OF STREAMS AND WETLANDS NOTED ON THIS PLAN WERE IDENTIFIED AS PART OF A WETLAND AND WATERBODY DELINEATION STUDY CONDUCTED BY GEOSYNTEC IN NOVEMBER 2024.
5. EROSION CONTROL MEASURES SHALL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT SEDIMENT SOURCE.
6. A STREAM BUFFER VARIANCE AROUND PETIT CREEK IS REQUIRED FOR CONSTRUCTING A STILLING BASIN (LOCATED AT THE DOWNSTREAM END OF THE NEW SPILLWAY DOWNCHUTE) THAT DISCHARGES INTO PETIT CREEK AND WOULD RESULT IN TEMPORARY AND PERMANENT STREAM IMPACTS.
7. CONTRACTOR SHALL ROUTE FLOW FROM THE RESERVOIR PUMPING DOWNSTREAM OF THE WORK AREA. AS CONSTRUCTION PROGRESSES, THE PUMPS, SIPHON MAY DISCHARGE INTO THE COMPLETED PORTIONS OF THE SPILLWAY UPON ENGINEER'S APPROVAL.
8. SUMMARY OF SCOPE OF WORK / CONSTRUCTION SEQUENCE

   CONTRACTOR SHALL PERFORM WORK AND COORDINATE THE CONSTRUCTION SCHEDULE AND OPERATIONS WITH THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE ACTIVITIES LISTED BELOW IN A MANNER SUCH THAT ALL ACTIVITIES ARE COMPLETED EFFICIENTLY IN ACCORDANCE WITH PROJECT REQUIREMENTS, INCLUDING THE PROJECT COMPLETION DATE. THE GENERAL CATEGORIES AND SEQUENCE OF WORK THAT ARE TO BE PERFORMED UNDER THIS PROJECT INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

   A. SUBMIT NOTICE OF INTENT (NOI) TO THE GEORGIA ENVIRONMENTAL PROTECTION DIVISION AND A LDP APPLICATION TO PICKENS COUNTY.
   B. FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND INCIDENTALS REQUIRED.
   C. MOBILIZE CONSTRUCTION EQUIPMENT AND PERSONNEL.
   D. ESTABLISH SURVEY CONTROL OF SITE AND UPDATE AS NECESSARY DURING CONSTRUCTION. CLEARLY MARK THE LIMITS OF DISTURBANCE (LOD) AND MAINTAIN MARKINGS THROUGHOUT CONSTRUCTION.
   E. LOCATE AND VISIBLY MARK LOCATION OF EXISTING CULVERTS, STORMWATER PIPES, UTILITIES, AND DAM INSTRUMENTATION TO MITIGATE DAMAGE DURING EXCAVATION.
   F. DISPOSE OF ANY PIPES, BACKFILL MATERIAL AND CONCRETE OFFSITE, IN ACCORDANCE WITH LOCAL REGULATIONS.
   G. UPON COMPLETION OF WORK, RESTORE DISTURBED AREAS INCLUDING TEMPORARY ACCESS ROADS TO EXISTING GRADES, VEGETATE BARE AREAS WITH PERMANENT SEEDING TO RESTORE SOIL COVER, AND REMOVE TEMPORARY PERIMETER CONTROLS.
   H. ONCE STABILIZATION IS ACHIEVED, SUBMIT NOTICE OF TERMINATION (NOT).
6. INTERIM E&SC PLAN SEQUENCE
   A. SLOPE STABILIZATION MEASURES SHALL BE IMPLEMENTED WITHIN THE LIMITS OF DISTURBANCE IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'SLOPE STABILIZATION' ON SHEET 15 FOR ADDITIONAL INFORMATION.
   B. TOPSOILING SHALL BE IMPLEMENTED WITHIN THE LIMITS OF DISTURBANCE IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'TOPSOILING' ON SHEET 15 FOR ADDITIONAL INFORMATION.
   C. DUST CONTROL SHALL BE PROVIDED THROUGHOUT THE DURATION THE PROJECT IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'DUST CONTROL ON DISTURBED AREAS' ON SHEET 16 FOR ADDITIONAL INFORMATION.
   D. DISTURBED AREAS STABILIZATION (WITH TEMPORARY SEEDING/MULCHING) SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO CORRESPONDING DETAILS ON SHEET 16 FOR ADDITIONAL INFORMATION.

# FOR REVIEW PURPOSES ONLY
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| DRAWN BY: | TW/SV |
| CHECKED BY: | SS |
| REVIEWED BY: | JA |
| APPROVED BY: | JWB |

TITLE: EROSION & SEDIMENT CONTROL PLAN - INTERIM CONDITIONS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: TJD10771 LAKE PETIT SPWY JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C12 |
| SHEET NO.: | 12 OF 41 |

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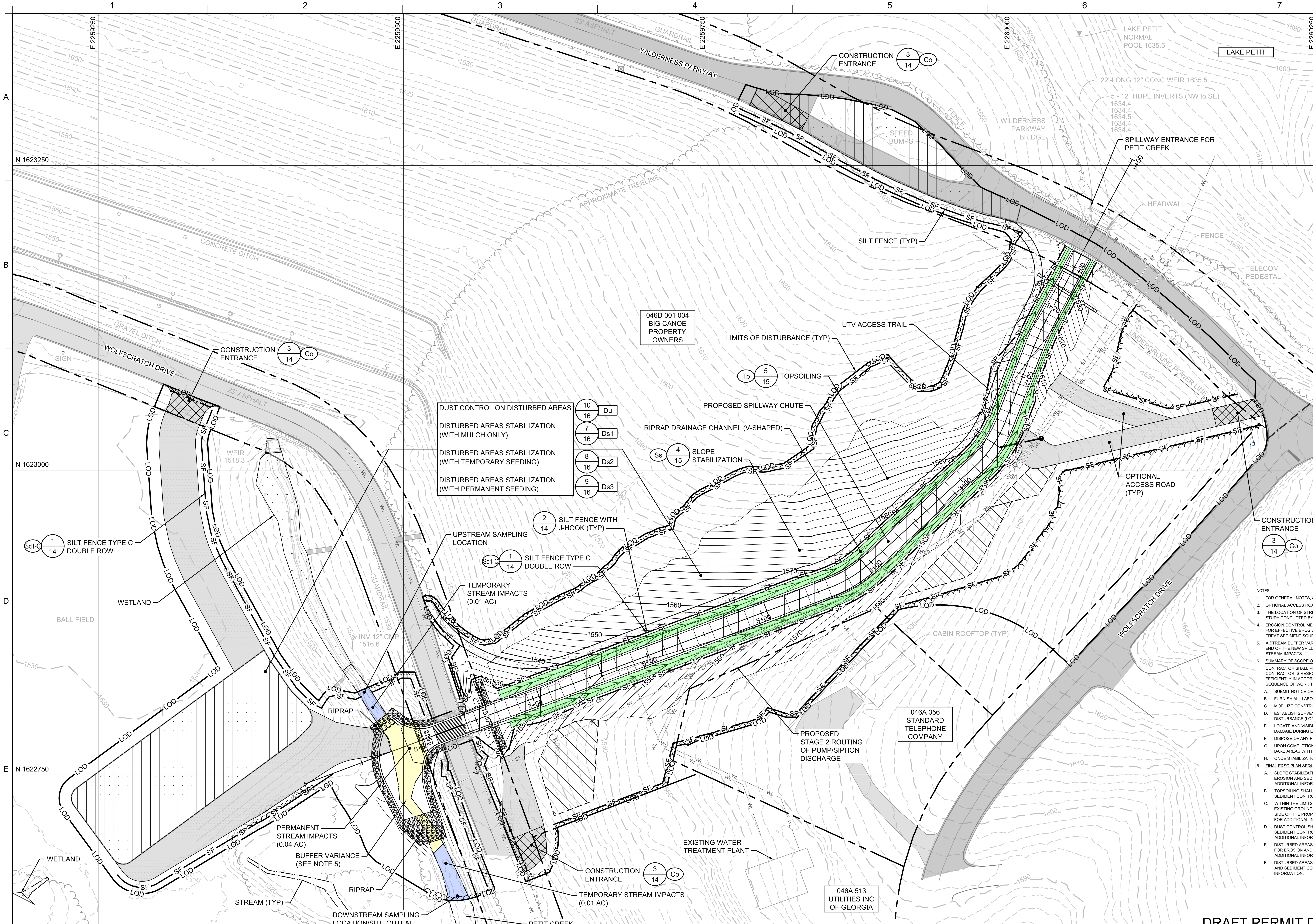


SCALE IN FEET: 0 – 40 – 80

## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING PAVED ROAD
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- PROPOSED DEMOLITION
- PROPOSED ACCESS ROAD
- PROPOSED CONSTRUCTION ENTRANCE
- PROPOSED DRAINAGE DITCH

NOTES:

1. FOR GENERAL NOTES, SEE SHEET 2.
2. OPTIONAL ACCESS ROAD, AND ASSOCIATED DRAINAGE TO BE DESIGNED BY CONTRACTOR, IF REQUIRED.
3. THE LOCATION OF STREAMS AND WETLANDS NOTED ON THIS PLAN WERE IDENTIFIED AS PART OF A WETLAND AND WATERBODY DELINEATION STUDY CONDUCTED BY GEOSYNTEC IN NOVEMBER 2024.
4. EROSION CONTROL MEASURES SHALL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT SEDIMENT SOURCE.
5. A STREAM BUFFER VARIANCE AROUND PETIT CREEK IS REQUIRED FOR CONSTRUCTING A STILLING BASIN (LOCATED AT THE DOWNSTREAM END OF THE NEW SPILLWAY DOWNCHUTE) THAT DISCHARGES INTO PETIT CREEK AND WOULD RESULT IN TEMPORARY AND PERMANENT STREAM IMPACTS.
6. SUMMARY OF SCOPE OF WORK / CONSTRUCTION SEQUENCE

   CONTRACTOR SHALL PERFORM WORK AND COORDINATE THE CONSTRUCTION SCHEDULE AND OPERATIONS WITH THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE ACTIVITIES LISTED BELOW IN A MANNER SUCH THAT ALL ACTIVITIES ARE COMPLETED EFFICIENTLY IN ACCORDANCE WITH PROJECT REQUIREMENTS, INCLUDING THE PROJECT COMPLETION DATE. THE GENERAL CATEGORIES AND SEQUENCE OF WORK THAT ARE TO BE PERFORMED UNDER THIS PROJECT INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

   A. SUBMIT NOTICE OF INTENT (NOI) TO THE GEORGIA ENVIRONMENTAL PROTECTION DIVISION AND A LDP APPLICATION TO PICKENS COUNTY.
   B. FURNISH ALL LABOR, MATERIALS, EQUIPMENT, AND INCIDENTALS REQUIRED.
   C. MOBILIZE CONSTRUCTION EQUIPMENT AND PERSONNEL.
   D. ESTABLISH SURVEY CONTROL OF SITE AND UPDATE AS NECESSARY DURING CONSTRUCTION. CLEARLY MARK THE LIMITS OF DISTURBANCE (LOD) AND MAINTAIN MARKINGS THROUGHOUT CONSTRUCTION.
   E. LOCATE AND VISIBLY MARK LOCATION OF EXISTING CULVERTS, STORMWATER PIPES, UTILITIES, AND DAM INSTRUMENTATION TO MITIGATE DAMAGE DURING EXCAVATION.
   F. DISPOSE OF ANY PIPES, BACKFILL MATERIAL AND CONCRETE OFFSITE, IN ACCORDANCE WITH LOCAL REGULATIONS.
   G. UPON COMPLETION OF WORK, RESTORE DISTURBED AREAS INCLUDING TEMPORARY ACCESS ROADS TO EXISTING GRADES, VEGETATE BARE AREAS WITH PERMANENT SEEDING TO RESTORE SOIL COVER, AND REMOVE TEMPORARY PERIMETER CONTROLS.
   H. ONCE STABILIZATION IS ACHIEVED, SUBMIT NOTICE OF TERMINATION (NOT).
6. FINAL E&SC PLAN SEQUENCE
   A. SLOPE STABILIZATION MEASURES SHALL BE IMPLEMENTED WITHIN THE LIMITS OF DISTURBANCE IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'SLOPE STABILIZATION' ON SHEET 15 FOR ADDITIONAL INFORMATION.
   B. TOPSOILING SHALL BE IMPLEMENTED WITHIN THE LIMITS OF DISTURBANCE IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'TOPSOILING' ON SHEET 15 FOR ADDITIONAL INFORMATION.
   C. WITHIN THE LIMITS OF EXCAVATION (THAT LIES WITHIN LOD), TREE AND STUMP REMOVAL SHALL BE UNDERTAKEN FOR THE AREA WHERE EXISTING GROUND WILL BE REGRADED TO INSTALL THE TWO V-SHAPED DRAINAGE CHANNELS THAT WILL BE CONSTRUCTED ON EITHER SIDE OF THE PROPOSED OVERFLOW SPILLWAY. REFER TO DETAIL TITLED 'TREE AND STUMP REMOVAL (WHERE REQUIRED) ON SHEET 15 FOR ADDITIONAL INFORMATION.
   D. DUST CONTROL SHALL BE PROVIDED THROUGHOUT THE DURATION THE PROJECT IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO DETAIL TITLED 'DUST CONTROL ON DISTURBED AREAS' ON SHEET 16 FOR ADDITIONAL INFORMATION.
   E. DISTURBED AREAS STABILIZATION (WITH TEMPORARY SEEDING/MULCHING) SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO CORRESPONDING DETAILS ON SHEET 16 FOR ADDITIONAL INFORMATION.
   F. DISTURBED AREAS STABILIZATION (WITH PERMANENT SEEDING) SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION. REFER TO CORRESPONDING DETAILS ON SHEET 16 FOR ADDITIONAL INFORMATION.

**FOR REVIEW PURPOSES ONLY**

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| DRAWN BY: | TW/TR/SV |
| CHECKED BY: | SS |
| REVIEWED BY: | JA |
| APPROVED BY: | JWB |

TITLE: EROSION & SEDIMENT CONTROL PLAN - FINAL CONDITIONS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: TJD10771 LAKE PETIT SPWY JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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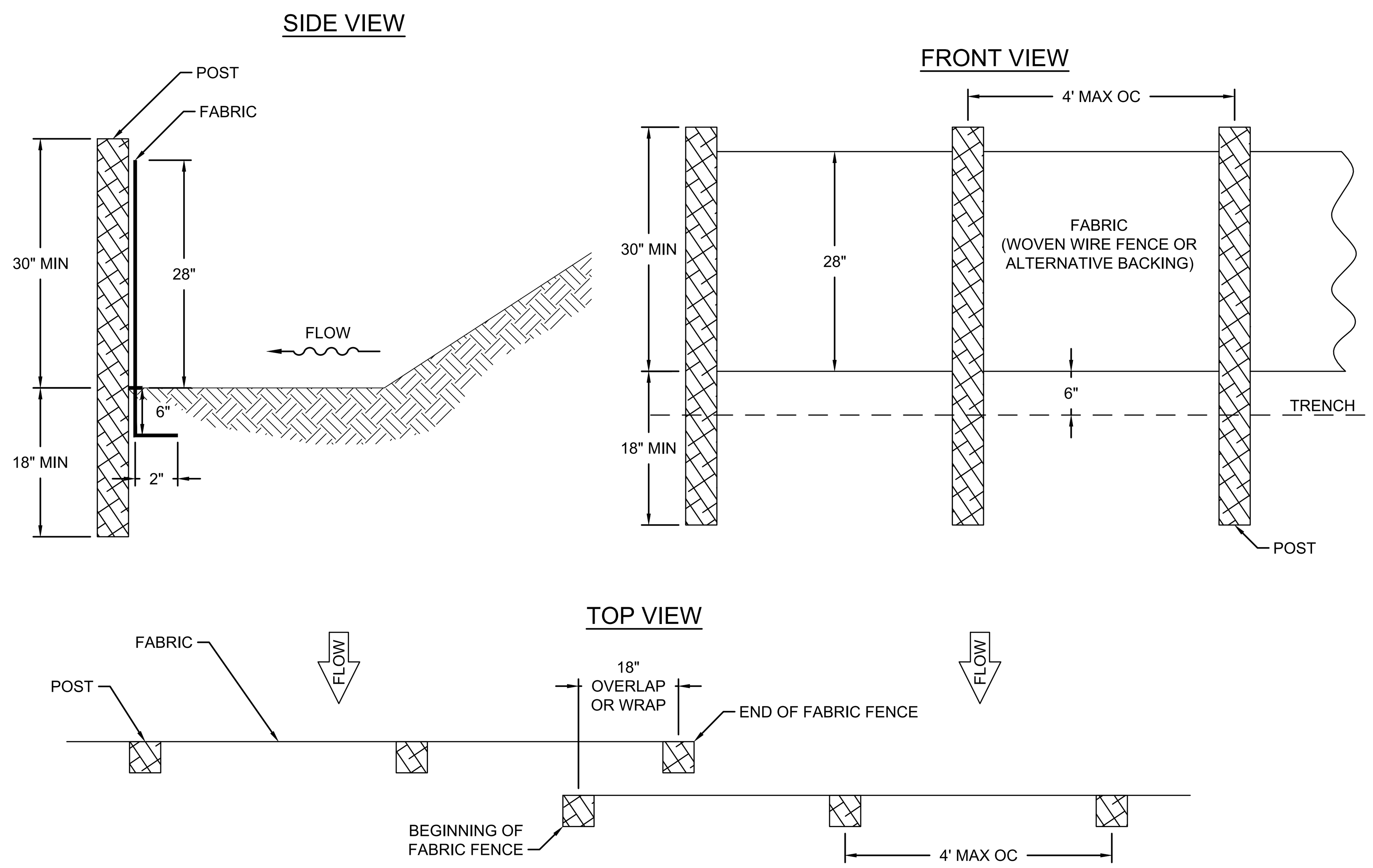
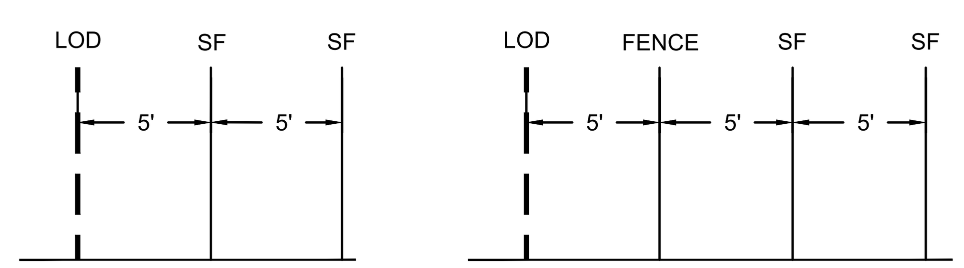
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C13 |
| SHEET NO.: | 13 OF 41 |




## SILT FENCE SPACING




| CRITERIA FOR SILT FENCE PLACEMENT | |
|---|---|
| LAND SLOPE (PERCENT) | MAXIMUM LENGTH OF SLOPE ABOVE FENCE (FEET) |
| <2 | 100 |
| 2 TO 5 | 75 |
| 5 TO 10 | 50 |
| 10 TO 20 | 25 |
| >20 | 15 |

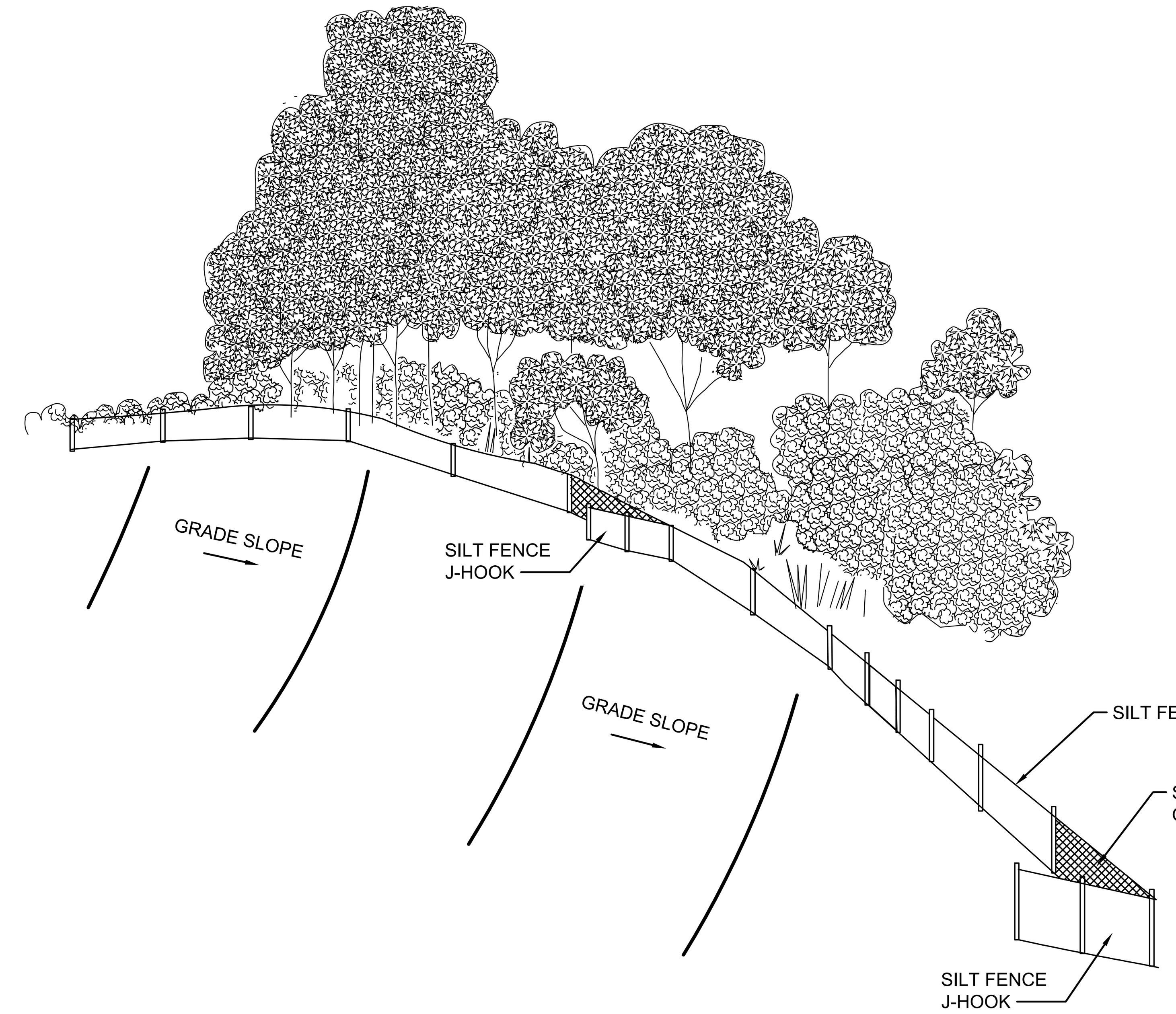
NOTES:

1. FENCE WILL BE MAINTAINED DURING CONSTRUCTION UNTIL FINAL SURFACE TREATMENTS HAVE BEEN APPLIED AND A SUFFICIENT STAND OF GRASS HAS BEEN ESTABLISHED. ACCUMULATED SEDIMENT SHALL BE REMOVED ONCE IT REACHES ONE-HALF THE HEIGHT OF THE SILT FENCE.
2. SILT FENCE SHALL BE INSTALLED AS A DOUBLE ROW AROUND THE SITE PERIMETER AND AS A SINGLE ROW AROUND STOCKPILES.

INSTALLATION:

1. MAXIMUM SLOPE LENGTH WILL NOT EXCEED VALUES SHOWN IN THE TABLE. THE DRAINAGE AREA WILL NOT EXCEED 1/4 ACRE PER 100 FEET OF SILT FENCE.
2. INSTALL ALONG CONTOURS TO THE EXTENT POSSIBLE WITH ENDS POINTING UPHILL. SILT FENCE WITH J-HOOKS SHALL BE UTILIZED WHERE SILT FENCE WILL BE INSTALLED ACROSS CONTOURS.
3. DO NOT PLACE IN WATERWAYS OR AREAS OF CONCENTRATED FLOW.
4. PROVIDE A RIPRAP SPLASH PAD OR OTHER OUTLET PROTECTION DEVICE FOR ANY POINT WHERE FLOW MAY TOP THE SILT FENCE. ENSURE THAT THE MAXIMUM HEIGHT OF THE FENCE AT A PROTECTED, REINFORCED OUTLET DOES NOT EXCEED 1 FT.
5. POSTS WILL BE STEEL AND HAVE A MINIMUM LENGTH OF 4 FEET. POSTS WILL BE "U", "T", OR "C" SHAPED AND HAVE A MINIMUM WEIGHT OF 1.3 LB/FT. THE POSTS WILL HAVE PROJECTIONS FOR FASTENING THE WOVEN WIRE AND FILTER FABRIC. MAXIMUM SPACING BETWEEN POSTS WILL BE 4 FEET FOR TYPE "C" SILT FENCE.
6. SAFETY CAPS ARE REQUIRED FOR ALL STEEL POSTS.
7. A WOVEN WIRE SUPPORT FENCE WILL BE USED WITH TYPE "C" FENCE. THE WIRE FENCE FABRIC WILL BE AT LEAST 36 INCHES HIGH AND WILL HAVE AT LEAST 6 HORIZONTAL WIRES. VERTICAL WIRES WILL HAVE A MAXIMUM SPACING OF 12 INCHES. THE TOP AND BOTTOM WIRES WILL BE AT LEAST 10 GAUGE AND ALL OTHER WIRES WILL BE AT LEAST 12 1/2 GAUGE.
8. APPROVED SILT FENCE FABRICS ARE LISTED IN THE GEORGIA DEPARTMENT OF TRANSPORTATION QUALIFIED PRODUCTS LIST #36 (QPL-36).
9. SPECIFICATIONS FOR SILT FENCE SHALL BE IN GENERAL ACCORDANCE WITH THE CURRENT EDITION OF THE GEORGIA EROSION AND SEDIMENT CONTROL HANDBOOK OR AS APPROVED BY THE ENGINEER.

Sd1-C 1/11 DETAIL
SILT FENCE - TYPE C
SOURCE: GSWCC
SCALE: NTS



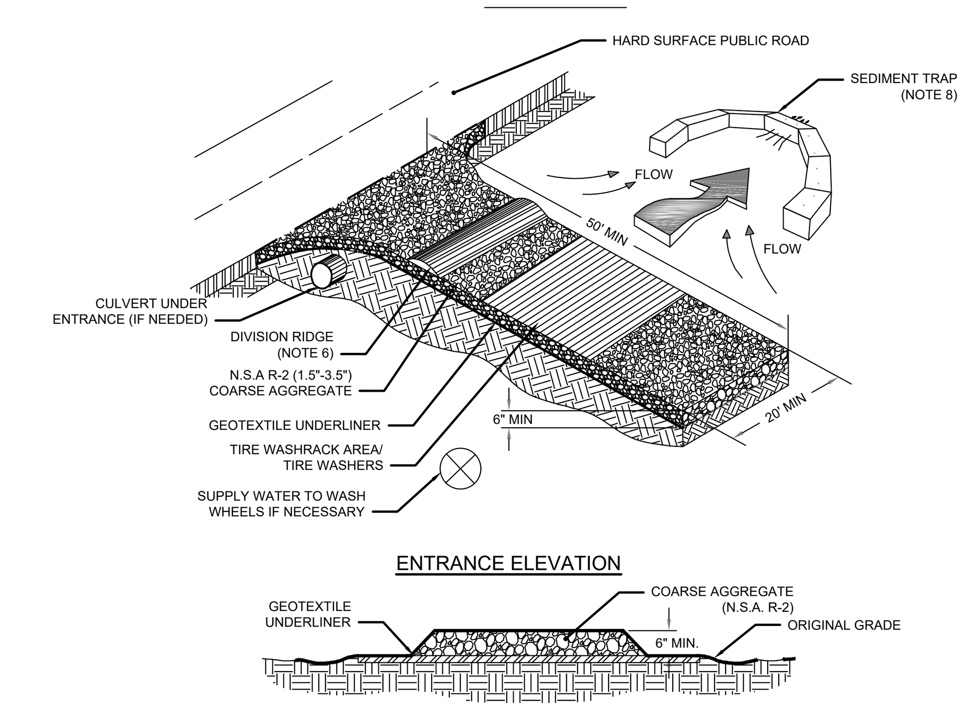

GENERAL NOTES:

1. SILT FENCE SHALL BE UPTURNED UP THE SLOPE TO PROMOTE CONTAINMENT AND TO PREVENT CONCENTRATION OF FLOW ALONG THE DEVICE AT INCREMENTS OF 100 FEET. UPTURN (J-HOOK) LENGTHS SHALL EXTEND APPROXIMATELY 4 VERTICAL FEET UP-SLOPE.
2. J-HOOKS SHALL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.

INSPECTION AND MAINTENANCE NOTES

1. INSPECT SILT FENCING AT LEAST WEEKLY AND AFTER EACH RAIN FALL EVENT.
2. SILT FENCE SHALL BE MAINTAINED FOR THE DURATION OF THE PROJECT. SILT FENCE SHALL BE REPLACED IF OBSERVED TO BE RIPPED, DETERIORATED, BECOMES OTHERWISE INEFFECTIVE, OR DOES NOT MEET THE DESIGN INTENT.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED WHEN DEPOSITS REACH ONE-HALF THE HEIGHT OF THE BARRIER TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE DEPOSITS AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE IS REMVED SHALL BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED AND SEEDED.

2/11 DETAIL
SILT FENCE J-HOOK
SCALE: NTS




NOTES:

1. AVOID LOCATION ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS. THE CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR PREVENTING TRACKOUT ONTO PUBLIC ROADS. IF TRACKOUT IS OBSERVED, IT SHOULD BE REMOVED BY THE END OF THE WORK DAY.
2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
3. AGGREGATE SIZE SHALL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5"-3.5" STONE).
4. GRAVEL PAD SHALL HAVE A MINIMUM THICKNESS OF 6".
5. PAD WIDTH SHALL EQUAL FULL WIDTH AT ALL POINTS OF VEHICULAR EGRESS, BUT NO LESS THAN 20'.
6. A DIVERSION RIDGE SHOULD BE CONSTRUCTED WHEN GRADE TOWARD PAVED AREA IS GREATER THAN 2%.
7. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES.
8. WHEN WASHING IS REQUIRED, IT SHOULD BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN (DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE).
9. WASHRACKS AND/OR TIRE WASHERS MAY BE REQUIRED DEPENDING ON SCALE AND CIRCUMSTANCE. IF NECESSARY, WASHRACK DESIGN MAY CONSIST OF ANY MATERIAL SUITABLE FOR TRUCK TRAFFIC THAT REMOVES MUD AND DIRT.
10. MAINTAIN AREA IN A WAY THAT PREVENTS TRACKING AND/OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
11. GEOTEXTILE UNDERLINE SHALL BE PLACED UNDERNEATH THE FULL LENGTH AND WIDTH OF THE ENTRANCE. GEOTEXTILE SELECTION SHALL BE BASED ON AASHTO M288-06 SECTION 7.3, SEPARATION REQUIREMENTS.

Co 3/11 DETAIL
CONSTRUCTION ENTRANCE
SOURCE: GSWCC
SCALE: NTS

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| DESIGN BY: | JWB |
| DRAWN BY: | KL |
| CHECKED BY: | SS |
| REVIEWED BY: | JA |
| APPROVED BY: | JWB |

TITLE: EROSION & SEDIMENT CONTROL DETAILS 1

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: TJD10771 LAKE PETIT SPWY
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C14 |
| SHEET NO.: | 14 OF 41 |

## Slope Stabilization (Ss)

**DEFINITION**
A protective covering used to prevent erosion and establish temporary or permanent vegetation on steep slopes, shore lines, or channels.

**PURPOSE**
To provide a cover layer that stabilizes the soil and acts as a rain drop impact dissipater while providing a microclimate that protects young vegetation and promotes its establishment. If using slope stabilization to reinforce channels, please refer to specification, **Ch- Channel Stablization**.

**CONDITIONS**
Slope stabilization can be applied to flat areas or slopes where the erosion hazard is high and slope protection is needed during the establishment of vegetation.

**PLANNING CONSIDERATIONS**
Care must be taken to choose the type of slope stabilization product that is most appropriate for the specific needs of a project. Two general types of slope stabilization products are discussed within this specification.

**Rolled Erosion Control Products (RECP)**
A natural fiber blanket with single or double photodegradable or biodegradable nets.

**Hydraulic Erosion Control Products (HECP)**
HECP shall utilize straw, cotton, wood or other natural based fibers held together by a soil binding agent that works to stabilize soil particles. Paper mulch should not be used for erosion control.

**CRITERIA**
Rolled Erosion Control Products (RECPs) and Hydraulic Erosion Control Products (HECPs):

- Installation and stapling of RECPs and application rates for the HECPs shall conform to manufacturer's guidelines for application
- Short-Term RECPs as a minimum shall be used to stabilize concentrated flow areas with a velocity less than 5ft/sec on slopes 3:1 or greater with a height of 10 feet or greater.

**Materials – HECP**
Hydraulic erosion control products shall be prepackaged from the manufacturer. Field mixing of performance enhancing additives will not be allowed. Fiberous components should be all natural or biodegradable.

Products shall be determined to be non-toxic in accordance with EPA-821-R-02-012.

**Materials – RECP**
Blankets shall be nontoxic to vegetation, seed, or wildlife. Products shall be determined to be non-toxic in accordance with EPA-821-R-02-012. At minimum, the plastic or biodegradable netting shall be stitched to the fibrous matrix to maximize strength and provide for ease of handling.

**RECPs are categorized as follows:**

**a. Short-Term**
(functional longevity 12 mo.)

i. Photodegradable
Straw blankets with a top and bottom side photo degradable net. The maximum size of the mesh should be openings of ½" X ½". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.35" and minimum density should be 0.5 lbs per square yard.

ii. Biodegradable
Straw blanket with a top and bottom side biodegradable jute net. The top side net should consist of machine direction strands that are



twisted together and then interwoven with cross direction strands (leno weave). The bottom net may be leno weave or otherwise to meet requirements. The approximate size of the mesh should be openings of 0.5" X 1.0". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.25" and minimum density should be 0.5 lbs per square yard.

**b. Extended-Term**
(functional longevity 24 mo.)

i.Photodegradable
Blankets that consist of 70% straw and 30% coconut with a top and bottom side photodegradable net. The top net should have ultraviolet additives to delay breakdown. The maximum size of the mesh should be openings of 0.65" X 0.65". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.35" and minimum density should be 0.6 lbs per square yard.

ii.Biodegradable
Blankets that consist of 70% straw and 30% coconut with a top and bottom side biodegradable jute net. The top side net should consist of machine direction strands that are twisted together and then interwoven with cross direction strands (leno weave). The bottom net may be leno weave or otherwise to meet requirements. The approximate size of the mesh should be openings of 0.5" X 1.0". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.25" and minimum density should be 0.65 lbs per square yard.

**c. Long-Term**
(functional longevity 36 mo.)

i. Photodegradable
Blankets that consist of 100% coconut with a top and bottom side photodegradable net. Each net should have ultraviolet additives to delay breakdown. The maximum size of the mesh should be openings of 0.65" X 0.65". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.3" and minimum density should be 0.5 lbs per square yard.

iii. Biodegradable
Blankets that consist of 100% coconut with a top and bottom side biodegradable jute net. The top side net should consist of machine direction strands that are twisted together and then interwoven with cross direction strands (leno weave). The bottom net may be leno weave or otherwise to meet requirements. The approximate size of the mesh should be openings of 0.5" X 1.0". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.25" and minimum density should be 0.5 lbs per square yard.

**NOTES**
It is the intention of this section to allow interchangeable use of RECPs and HECPs for erosion protection on slopes. The project engineer should select the type of erosion control product that best fits the need of the particular site.

**Site Preparation**
After the site has been shaped and graded to the approved design, prepare a friable seedbed relatively free from clods and rocks more than one inch in diameter, and any foreign material that will prevent contact of the soil stabilization mat with the soil surface. Surface must be smooth to ensure proper contact of blankets or matting to the soil surface. If necessary, redirect any runoff from the ditch or slope during installation.

**MAINTENANCE**
All erosion control blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope or ditch. Continue to monitor these areas until they become permanently stabilized.



## TYPICAL INSTALLATION GUIDELINES FOR ROLLED EROSION CONTROL PRODUCTS (RECP)

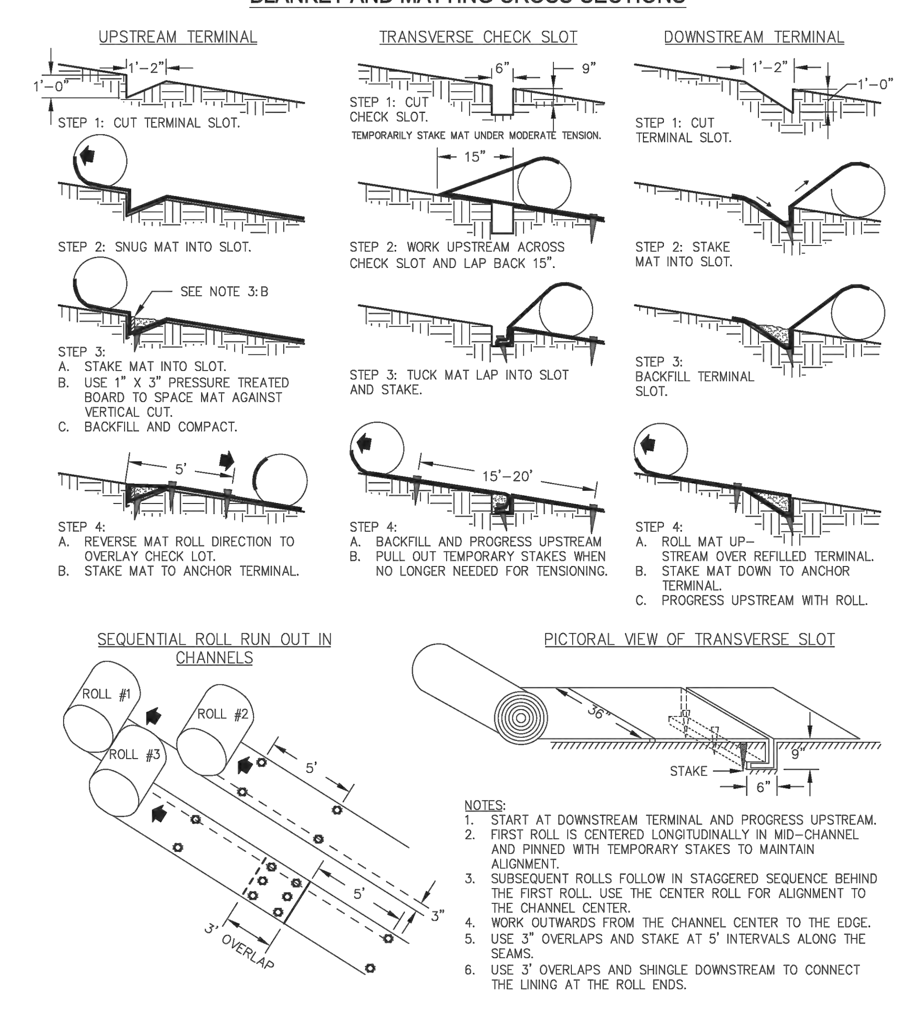



**Figure 6-10.1 - Typical Installation Guidelines for Matting and Blankets**



Ss 4/13 DETAIL
SOIL STABLIZATION
SOURCE: GSWCC
SCALE: NTS

## Topsoiling (Tp)

**DEFINITION**
Stripping off the more fertile top soil, storing it, then spreading it over the disturbed area after completion of construction activities.

**PURPOSE**
To provide a suitable soil medium for vegetative growth on areas where other measures will not produce or maintain a desirable stand.

**CONDITIONS**
This practice is recommended for sites of 2:1 or flatter slopes where:

1. The texture of the exposed subsoil or parent material is not suitable to produce adequate vegetative growth.
2. The soil material is so shallow that the rooting zone is not deep enough to support plants with continuing supplies of moisture and food.
3. The soil to be vegetated contains material toxic to plant growth.

**CONSTRUCTION SPECIFICATIONS**
**Materials**
Topsoil should be friable and loamy, free of debris, objectionable weeds and stones and contain no toxic substance that may be harmful to plant growth. A pH range of 5.0-7.5 is acceptable. Soluble salts should not exceed 500 ppm.

**Testing**
Field exploration should be made to determine whether the quantity and quality of surface soil justifies stripping.

**Stripping**
Stripping should be confined to the immediate construction area.

A 4 to 6 inch stripping depth is common, but may vary depending on the particular soil.

**Topsoil pH**
If pH value is less than 6.0, lime shall be applied and incorporated with the topsoil to adjust the pH to 6.5 or higher. Topsoils containing soluble salts greater than 500 parts per million shall not be used.

**Stockpiles**
The location of topsoil stockpiles should not obstruct natural drainage or cause off-site environmental damage.

**Stabilization**
Stockpiles shall be contained by sediment barriers to prevent sedimentation on adjacent areas. Stockpiles shall be stabilized in accordance with specifications **Ds1 and Ds2 - Disturbed Area Stabilization (With Mulching) and (With Temporary Grassing),** respectively, or T**ac-Tackifiers.**

**Site Preparation**
**(Where topsoil is to be added)**

**Topsoiling** - When topsoiling, maintain needed erosion control practices such as diversions, grade stabilization structures, berms, dikes, level spreaders, waterways, sediment basins, etc.

**Grading** - Grades on the areas to be topsoiled that have been previously established shall be maintained.

**Liming** - Soil tests should be used to determine the pH of the soil. Where the pH of the subsoil is 5.0 or less or composed of heavy clays, agricultural limestone shall be spread at the rate of 100 pounds per 1,000 square feet. Lime shall be distributed uniformly over designated areas and worked into the soil in conjunction with tillage operations as described in the following procedure.

Bonding - Use one of the following methods to insure bonding of topsoil and subsoil:

1. Tilling. After the areas to be topsoiled have



been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 3 inches to permit bonding of the topsoil to the subsoil.

2. Tracking. Passing a bulldozer over the entire surface area of the slope to leave horizontal depressions.

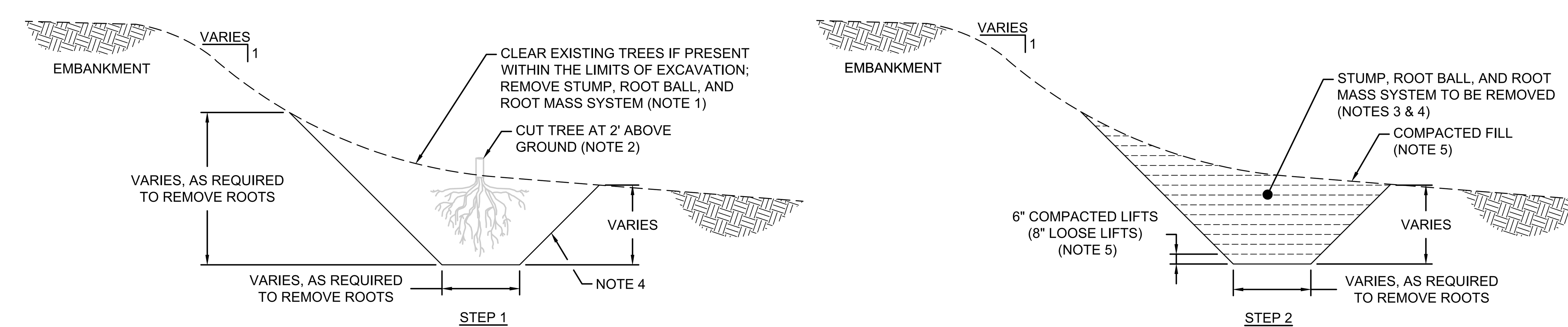
**Applying Topsoil**
1. Topsoil should be handled only when it is dry enough to work without damaging soil structure.
2. A uniform application of 5 inches (unsettled) is recommended, but may be adjusted at the discretion of the design professional.

Table 6-37.1. Cubic Yards Of Topsoil Required For Application To Various Depths

| Depth (Inches) | Per 1,000 Square Feet | Per Acre |
|---|---|---|
| 1 | 3.1 | 134 |
| 2 | 6.2 | 268 |
| 3 | 9.3 | 403 |
| 4 | 12.4 | 537 |
| 5 | 15.5 | 672 |
| 6 | 18.6 | 806 |



Tp 5/11 DETAIL
TOPSOILING
SOURCE: GSWCC
SCALE:NTS




VEGETATION REMOVAL NOTES

1. ANY TREE OR WOODY VEGETATION OVER THE DIAMETER OF 8 IN. SHALL BE REMOVED INCLUDING THE STUMP, ROOTBALL, AND ROOT SYSTEM.
2. CUT THE TREE APPROXIMATELY 2 FT ABOVE GROUND LEAVING A WELL-DEFINED STUMP THAT CAN BE USED IN THE ROOTBALL REMOVAL PROCESS.
3. REMOVE THE STUMP AND ROOTBALL BY PULLING THE STUMP, OR BY USING A TRACK-MOUNTED BACKHOE TO FIRST LOOSEN THE ROOTBALL BY PULLING ON THE STUMP AND THEN EXTRACTING THE STUMP AND ROOTBALL TOGETHER.
4. REMOVE THE REMAINING ROOT SYSTEM AND LOOSE SOIL FROM THE ROOTBALL CAVITY BY EXCAVATING THE SIDES OF THE CAVITY TO SLOPES NO STEEPER THAN 1H:1V AND THE BOTTOM OF THE CAVITY APPROXIMATELY HORIZONTAL.
5. BACKFILL THE EXCAVATION WITH WELL-COMPACTED SOIL PLACED IN RELATIVELY THIN LIFTS NOT GREATER THAN 8 IN. IN LOOSE LIFT THICKNESS. COMPACTION OF BACKFILLED SOILS IN THESE TREE STUMP AND ROOTBALL EXCAVATIONS SHALL BE PERFORMED WITH MECHANICAL METHODS, WITH EITHER THE USE OF MANUALLY OPERATED COMPACTION EQUIPMENT OR COMPACTION EQUIPMENT ATTACHED TO A BACKHOE.

6/11 DETAIL
TREE AND STUMP REMOVAL (WHERE REQUIRED)
SCALE: NTS

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DESIGN BY: JWB
DRAWN BY: KL
CHECKED BY: SS
REVIEWED BY: JA
APPROVED BY: JWB

TITLE: EROSION & SEDIMENT CONTROL DETAILS 2
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT
SITE: TJD10771 LAKE PETIT SPWY JASPER, GEORGIA

Big Canoe POA

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DATE: FEBRUARY 2025
PROJECT NO.: TJD10771
FILE: TJD10771.01 C15
SHEET NO.: 15 OF 41

DEFINITION
APPLYING PLANT RESIDUES OR OTHER SUITABLE MATERIALS, PRODUCED ON THE SITE IF POSSIBLE, TO THE SOIL SURFACE.

REQUIREMENT FOR REGULATORY COMPLIANCE
MULCH OR TEMPORARY GRASSING SHALL BE APPLIED TO ALL EXPOSED AREAS WITHIN 14 DAYS OF DISTURBANCE. MULCH CAN BE USED AS A SINGULAR EROSION CONTROL DEVICE FOR UP TO SIX MONTHS, BUT IT SHALL BE APPLIED AT THE APPROPRIATE DEPTH (DEPENDING ON THE MATERIAL USED), ANCHORED, AND HAVE A CONTINUOUS 90% COVER OR GREATER OF THE SOIL SURFACE.

MAINTENANCE SHALL BE REQUIRED TO MAINTAIN APPROPRIATE DEPTH AND 90% COVER. TEMPORARY VEGETATION MAY BE EMPLOYED INSTEAD OF MULCH IF THE AREA WILL REMAIN UNDISTURBED FOR LESS THAN SIX MONTHS.

IF ANY AREA WILL REMAIN UNDISTURBED FOR GREATER THAN SIX MONTHS, PERMANENT VEGETATIVE TECHNIQUES SHALL BE EMPLOYED. REFER TO Ds2-DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING), AND Ds3 - DISTURBED AREA STABILIZATION (WITH PERMANENT VEGETATION).

SPECIFICATIONS
MULCHING WITHOUT SEEDING:
THIS STANDARD APPLIES TO GRADED OR CLEARED AREAS WHERE SEEDINGS MAY NOT HAVE A SUITABLE GROWING SEASON TO PRODUCE AN EROSION RETARDANT COVER, BUT CAN BE STABILIZED WITH A MULCH COVER.

SITE PREPARATION
1. GRADE TO PERMIT THE USE OF EQUIPMENT FOR APPLYING AND ANCHORING MULCH.
2. INSTALL EROSION CONTROL MEASURES AS REQUIRED SUCH AS DIKES, DIVERSIONS, BERMS, TERRACES AND SEDIMENT BARRIERS.
3. LOOSEN COMPACTED SOIL TO A MINIMUM DEPTH OF 3 INCHES.

MULCHING MATERIALS
SELECT ONE OF THE FOLLOWING MATERIALS AND APPLY AT THE DEPTH INDICATED:
1. DRY STRAW OR HAY SHALL BE APPLIED AT A DEPTH OF 2 TO 4 INCHES PROVIDING COMPLETE SOIL COVERAGE. ONE ADVANTAGE OF THIS MATERIAL IS EASY APPLICATION.
2. WOOD WASTE (CHIPS, SAWDUST OR BARK) SHALL BE APPLIED AT A DEPTH OF 2 TO 3 INCHES. ORGANIC MATERIAL FROM THE CLEARING STAGE OF DEVELOPMENT REMAINING ON SITE CAN BE CHIPPED AND APPLIED AS MULCH. THIS METHOD OF MULCHING CAN GREATLY REDUCE EROSION CONTROL COSTS.
3. POLYETHYLENE FILM SHALL BE SECURED OVER BANKS OR STOCKPILED SOIL MATERIAL FOR TEMPORARY PROTECTION. THIS MATERIAL CAN BE SALVAGED AND RE-USED.

APPLYING MULCH
WHEN MULCH IS USED WITHOUT SEEDING, MULCH SHALL BE APPLIED TO PROVIDE FULL COVERAGE OF THE EXPOSED AREA.
1. DRY STRAW OR HAY MULCH AND WOOD CHIPS SHALL BE APPLIED UNIFORMLY BY HAND OR BY MECHANICAL EQUIPMENT.
2. IF THE AREA WILL EVENTUALLY BE COVERED WITH PERENNIAL VEGETATION, 20-30 POUNDS OF NITROGEN PER ACRE, IN ADDITION TO THE NORMAL AMOUNT, SHALL BE APPLIED TO OFFSET THE UPTAKE OF NITROGEN CAUSED BY THE DECOMPOSITION OF THE ORGANIC MULCHES.

ANCHORING MULCH
1. STRAW OR HAY MULCH CAN BE PRESSED INTO THE SOIL WITH A DISK HARROW WITH THE DISK SET STRAIGHT OR WITH A SPECIAL "PACKER DISK." DISKS MAY BE SMOOTH OR SERRATED AND SHOULD BE 20 INCHES OR MORE IN DIAMETER AND 8 TO 12 INCHES APART. THE EDGES OF THE DISK SHOULD BE DULL ENOUGH NOT TO CUT THE MULCH BUT TO PRESS IT INTO THE SOIL LEAVING MUCH OF IT IN AN ERECT POSITION. STRAW OR HAY MULCH SHALL BE ANCHORED IMMEDIATELY AFTER APPLICATION. STRAW OR HAY MULCH SPREAD WITH SPECIAL BLOWER-TYPE EQUIPMENT MAY BE ANCHORED. TACKIFERS, BINDERS AND HYDRAULIC MULCH WITH TACKIFIER SPECIFICALLY DESIGNED FOR TACKING STRAW CAN BE SUBSTITUTED FOR EMULSIFIED ASPHALT, REFER TO TACKIFERS-TAC. PLASTIC MESH OR NETTING WITH MESH NO LARGER THAN ONE INCH BY ONE INCH SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
2. NETTING OF THE APPROPRIATE SIZE SHALL BE USED TO ANCHOR WOOD WASTE. OPENINGS OF THE NETTING SHALL NOT BE LARGER THAN THE AVERAGE SIZE OF THE WOOD WASTE CHIPS.

Ds1 | 7 / 11 | DETAIL
DISTURBED AREA STABILIZATION (WITH MULCH ONLY)
SOURCE: GSWCC

DEFINITION
THE ESTABLISHMENT OF TEMPORARY VEGETATION COVER WITH FAST GROWING SEEDINGS FOR SEASONAL PROTECTION ON DISTURBED OR DENUDED AREAS.

CONDITIONS
TEMPORARY VEGETATIVE MEASURES SHOULD BE COORDINATED WITH PERMANENT MEASURES TO ASSURE ECONOMICAL AND EFFECTIVE STABILIZATION. NOTE: SOME TYPES OF TEMPORARY VEGETATION ARE IDEAL TO USE AS COMPANION CROPS UNTIL THE PERMANENT VEGETATION IS ESTABLISHED. NOTE: SOME SPECIES OF TEMPORARY VEGETATION ARE NOT APPROPRIATE FOR COMPANION CROP PLANTINGS BECAUSE OF THEIR POTENTIAL TO OUT-COMPETE THE DESIRED SPECIES (E.G. ANNUAL RYEGRASS). CONTACT NATURAL RESOURCE CONSERVATION SERVICE OR THE LOCAL SOIL WATER CONSERVATION DISTRICT FOR MORE INFORMATION.

SPECIFICATIONS
GRADING AND SHAPING
EXCESSIVE WATER RUNOFF SHALL BE REDUCED BY PROPERLY DESIGNED AND INSTALLED EROSION CONTROL PRACTICES SUCH AS CLOSED DRAINS, DITCHES, DIKES, DIVERSIONS, SEDIMENT BARRIERS AND OTHERS. NO SHAPING OR GRADING IS REQUIRED IF SLOPES CAN BE STABILIZED BY HAND-SEEDED VEGETATION OR IF HYDRAULIC SEEDING EQUIPMENT IS TO BE USED.

SEEDBED PREPARATION
WHEN A HYDRAULIC SEEDER IS USED, SEEDBED PREPARATION IS NOT REQUIRED. WHEN USING CONVENTIONAL OR HAND-SEEDING, SEEDBED PREPARATION IS NOT REQUIRED IF THE SOIL MATERIAL IS LOOSE AND NOT SEALED BY RAINFALL. WHEN SOIL HAS BEEN SEALED BY RAINFALL OR CONSISTS OF SMOOTH CUT SLOPES, THE SOIL SHALL BE PITTED, TRENCHED, OR OTHERWISE SCARIFIED TO PROVIDE A PLACE FOR SEED TO LEDGE AND GERMINATE.

LIME AND FERTILIZER
AGRICULTURAL LIME IS REQUIRED UNLESS SOIL TESTS INDICATE OTHERWISE. APPLY AGRICULTURAL LIME AT A RATE DETERMINED BY SOIL TEST FOR pH. QUICK ACTING LIME SHOULD BE INCORPORATED TO MODIFY pH DURING THE GERMINATION PERIOD. BIO STIMULANTS SHOULD ALSO BE CONSIDERED WHEN THERE IS LESS THAN 3% ORGANIC MATTER IN THE SOIL. GRADED AREAS REQUIRE LIME APPLICATION. SOILS MUST BE TESTED TO DETERMINE REQUIRED AMOUNTS OF FERTILIZER AND AMENDMENTS. FERTILIZER SHOULD BE APPLIED BEFORE LAND PREPARATION AND INCORPORATED WITH A DISK, RIPPER, OR CHISEL. ON SLOPES TOO STEEP FOR OR INACCESSIBLE TO EQUIPMENT, FERTILIZER SHALL BE HYDRAULICALLY APPLIED, PREFERABLY IN THE FIRST PASS WITH SEED AND SOME HYDRAULIC MULCH, THEN TOPPED WITH THE REMAINING REQUIRED APPLICATION RATE.

SEEDING
SELECT A GRASS OR GRASS-LEGUME MIXTURE SUITABLE TO THE AREA AND SEASON OF THE YEAR. SEED SHALL BE APPLIED UNIFORMLY BY HAND, CYCLONE SEEDER, DRILL, CULTIPACKER-SEEDER, OR HYDRAULIC SEEDER (SLURRY INCLUDING SEED AND FERTILIZER). DRILL OR CULTIPACKER SEEDERS SHOULD NORMALLY PLACE SEED ONE-QUARTER TO ONE-HALF INCH DEEP. APPROPRIATE DEPTH OF PLANTING IS TEN TIMES THE SEED DIAMETER. SOIL SHOULD BE "RAKED" LIGHTLY TO COVER SEED WITH SOIL IF SEEDED BY HAND. SEE THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION, FOR MORE INFORMATION.

MULCHING
TEMPORARY VEGETATION CAN, IN MOST CASES, BE ESTABLISHED WITHOUT THE USE OF MULCH, PROVIDED THERE IS LITTLE TO NO EROSION POTENTIAL. HOWEVER, THE USE OF MULCH CAN OFTEN ACCELERATE AND ENHANCE GERMINATION AND VEGETATION ESTABLISHMENT. MULCH WITHOUT SEEDING SHOULD BE CONSIDERED FOR SHORT TERM PROTECTION. REFER TO Ds1-DISTURBED AREA STABILIZATION (WITH MULCHING ONLY).

IRRIGATION
DURING TIMES OF DROUGHT, WATER SHALL BE APPLIED AT A RATE NOT CAUSING RUNOFF AND EROSION. THE SOIL SHALL BE THOROUGHLY WETTED TO A DEPTH THAT WILL INSURE GERMINATION OF THE SEED. SUBSEQUENT APPLICATIONS SHOULD BE MADE WHEN NEEDED.

PLANT SELECTION
CONTRACTOR SHALL RE-VEGETATE DISTURBED AREAS AS SHOWN ON THE DRAWINGS DEPENDING ON THE SEASON IN ACCORDANCE WITH BIG CANOE PROPERTY ASSOCIATION SEEDING AS FOLLOWS:
SUMMER – BERMUDA GRASS
SPRING AND FALL – 30% KENTUCKY BLUEGRASS, 60% KENTUCKY 31 FESCUE, AND 10% PERENNIAL RYEGRASS
WINTER – TALL FESCUE (ANNUAL RYEGRASS SHALL NOT BE USED)

Ds2 | 8 / 13 | DETAIL
DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING)
SOURCE: GSWCC

DEFINITION
THE PLANTING OF PERENNIAL VEGETATION SUCH AS TREES, SHRUBS, VINES, GRASSES, OR LEGUMES ON EXPOSED AREAS FOR FINAL PERMANENT STABILIZATION. PERMANENT PERENNIAL VEGETATION SHALL BE USED TO ACHIEVE FINAL STABILIZATION.

REQUIREMENT FOR REGULATORY COMPLIANCE
THIS PRACTICE SHALL BE APPLIED IMMEDIATELY TO ROUGH GRADED AREAS THAT WILL BE UNDISTURBED FOR LONGER THAN SIX MONTHS. THIS PRACTICE OR SODDING SHALL BE APPLIED IMMEDIATELY TO ALL AREAS AT FINAL GRADE. FINAL STABILIZATION MEANS THAT ALL SOIL DISTURBING ACTIVITIES AT THE SITE HAVE BEEN COMPLETED, AND THAT FOR UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES, 100% OF THE SOIL SURFACE IS UNIFORMLY COVERED IN PERMANENT VEGETATION WITH A DENSITY OF 70% OR GREATER. PERMANENT VEGETATION SHALL CONSIST OF A CROP OF PERENNIAL VEGETATION APPROPRIATE FOR THE REGION, SUCH THAT WITHIN THE GROWING SEASON A 70% COVERAGE BY PERENNIAL VEGETATION SHALL BE ACHIEVED. FINAL STABILIZATION APPLIES TO EACH PHASE OF CONSTRUCTION. UNTIL THIS STANDARD IS SATISFIED AND PERMANENT CONTROL MEASURES AND FACILITIES ARE OPERATIONAL, INTERIM STABILIZATION MEASURES AND TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL NOT BE REMOVED.

SPECIFICATIONS
GRADING AND SHAPING
GRADING AND SHAPING MAY NOT BE REQUIRED WHERE HYDRAULIC SEEDING AND FERTILIZING EQUIPMENT IS TO BE USED. VERTICAL BANKS SHALL BE SLOPED TO ENABLE PLANT ESTABLISHMENT. WHEN CONVENTIONAL SEEDING AND FERTILIZING ARE TO BE DONE, GRADE AND SHAPE WHERE FEASIBLE AND PRACTICAL, SO THAT EQUIPMENT CAN BE USED SAFELY AND EFFICIENTLY DURING SEEDBED PREPARATION, SEEDING, MULCHING AND MAINTENANCE OF THE VEGETATION.

CONCENTRATIONS OF WATER THAT WILL CAUSE EXCESSIVE SOIL EROSION SHALL BE DIVERTED TO A SAFE OUTLET. DIVERSIONS AND OTHER TREATMENT PRACTICES SHALL CONFORM WITH THE APPROPRIATE STANDARDS AND SPECIFICATIONS.

LIME AND FERTILIZER RATES AND ANALYSIS
AGRICULTURAL LIME IS REQUIRED AT THE RATE OF ONE TO TWO TONS PER ACRE UNLESS SOIL TESTS INDICATE OTHERWISE. GRADED AREAS REQUIRE LIME APPLICATION. IF LIME IS APPLIED WITHIN SIX MONTHS OF PLANTING PERMANENT PERENNIAL VEGETATION, ADDITIONAL LIME IS NOT REQUIRED. AGRICULTURAL LIME SHALL BE WITHIN THE SPECIFICATIONS OF THE GEORGIA DEPARTMENT OF AGRICULTURE.

LIME SPREAD BY CONVENTIONAL EQUIPMENT SHALL BE "GROUND LIMESTONE." GROUND LIMESTONE IS CALCITIC OR DOLOMITIC LIMESTONE GROUND SO THAT 90 PERCENT OF THE MATERIAL WILL PASS THROUGH A 10-MESH SIEVE, NOT LESS THAN 50 PERCENT WILL PASS THROUGH A 50-MESH SIEVE AND NOT LESS THAN 25 PERCENT WILL PASS THROUGH A 100-MESH SIEVE.

FAST-ACTING LIME SPREAD BY HYDRAULIC SEEDING EQUIPMENT SHOULD BE "FINELY GROUND LIMESTONE" SPANNING FROM THE 180 MICRON SIZE TO THE 5 MICRON SIZE. FINELY GROUND LIMESTONE IS CALCITIC OR DOLOMITIC LIMESTONE GROUND SO THAT 95 PERCENT OF THE MATERIAL WILL PASS THROUGH A 100-MESH SIEVE.

LIME AND FERTILIZER APPLICATION
WHEN HYDRAULIC SEEDING EQUIPMENT IS USED, THE INITIAL FERTILIZER SHALL BE MIXED WITH SEED, INOCULANT (IF NEEDED), AND WOOD CELLULOSE OR WOOD PULP FIBER MULCH AND APPLIED IN A SLURRY. THE INOCULANT, IF NEEDED, SHALL BE MIXED WITH THE SEED PRIOR TO BEING PLACED INTO THE HYDRAULIC SEEDER. THE SLURRY MIXTURE WILL BE AGITATED DURING APPLICATION TO KEEP THE INGREDIENTS THOROUGHLY MIXED. THE MIXTURE WILL BE SPREAD UNIFORMLY OVER THE AREA WITHIN ONE HOUR AFTER BEING PLACED IN THE HYDROSEEDER. FINELY GROUND LIMESTONE CAN BE APPLIED IN THE MULCH SLURRY OR IN COMBINATION WITH THE TOP DRESSING.

WHEN CONVENTIONAL PLANTING IS TO BE DONE, LIME AND FERTILIZER SHALL BE APPLIED UNIFORMLY IN ONE OF THE FOLLOWING WAYS:
1. APPLY BEFORE LAND PREPARATION SO THAT IT WILL BE MIXED WITH THE SOIL DURING SEEDBED PREPARATION.
2. MIX WITH THE SOIL USED TO FILL THE HOLES, DISTRIBUTE IN FURROWS.
3. BROADCAST AFTER STEEP SURFACES ARE SCARIFIED, PITTED, OR TRENCHED.
4. A FERTILIZER PELLET SHALL BE PLACED AT ROOT DEPTH IN THE CLOSING HOLE BESIDE EACH PINE TREE SEEDLING.

SEED QUALITY
THE TERM "PURE LIVE SEED" IS USED TO EXPRESS THE QUALITY OF SEED AND IS NOT SHOWN ON THE LABEL. PURE LIVE SEED, PLS, IS EXPRESSED AS A PERCENT- AGE OF THE SEEDS THAT ARE PURE AND WILL GERMINATE. INFORMATION ON PERCENT GERMINATION AND PURITY CAN BE FOUND ON SEED TAGS. PLS IS DETER- MINED BY MULTIPLYING THE PERCENT OF PURE SEED WITH THE PERCENT OF GERMINATION; I.E., (PLS = % GERMINATION X % PURITY)

EXAMPLE: COMMON BERMUDA SEED 70% GERMINATION, 80% PURITY
PLS = 70% GERMINATION X 80% PURITY PLS = 56%
THE PERCENT OF PLS HELPS YOU DETERMINE THE AMOUNT OF SEED YOU NEED. IF THE SEEDING RATE IS 10 POUNDS PLS AND THE BULK SEED IS 56 % PLS, THE BULK SEEDING RATE IS:
10 LBS. PLS/ACRE = 17.9 LBS/ACRE, 56% PLS
YOU WOULD NEED TO PLANT 17.9 LBS/ACRE TO PROVIDE 10 LBS/ACRE OF PURE LIVE SEED.

SEEDBED PREPARATION
SEEDBED PREPARATION MAY NOT BE REQUIRED WHERE HYDRAULIC SEEDING AND FERTILIZING EQUIPMENT IS TO BE USED (BUT IS STRONGLY RECOMMENDED FOR ANY SEEDING PROCESS, WHEN POSSIBLE). WHEN CONVENTIONAL SEEDING IS TO BE USED, SEEDBED PREPARATION FOR BROADCAST PLANTINGS WILL BE DONE AS FOLLOWS:

1. TILLAGE, AT A MINIMUM, SHALL ADEQUATELY LOOSEN THE SOIL TO A DEPTH OF 4 TO 6 INCHES; ALLEVIATE COMPACTION; INCORPORATE LIME AND FERTILIZER; SMOOTH AND FIRM THE SOIL; ALLOW FOR THE PROPER PLACEMENT OF SEED, SPRIGS, OR PLANTS; AND ALLOW FOR THE ANCHORING OF STRAW OR HAY MULCH IF A DISK IS TO BE USED.
2. TILLAGE MAY BE DONE WITH ANY SUITABLE EQUIPMENT.
3. TILLAGE SHOULD BE DONE ON THE CONTOUR WHERE FEASIBLE.
4. ON SLOPES TOO STEEP FOR THE SAFE OPERATION OF TILLAGE EQUIPMENT, THE SOIL SURFACE SHALL BE PITTED OR TRENCHED ACROSS THE SLOPE WITH APPROPRIATE HAND TOOLS TO PROVIDE TWO PLACES 6 TO 8 INCHES APART IN WHICH SEED MAY LODGE AND GERMINATE. HYDRAULIC SEEDING MAY ALSO BE USED.

INOCULANTS
ALL LEGUME SEED SHALL BE INOCULATED WITH APPROPRIATE NITROGEN-FIXING BACTERIA. THE INOCULANT SHALL BE A PURE CULTURE PREPARED SPECIFICALLY FOR THE SEED SPECIES AND USED WITHIN THE DATES ON THE CONTAINER.
A MIXING MEDIUM RECOMMENDED BY THE MANUFACTURER SHALL BE USED TO BOND THE INOCULANT TO THE SEED. FOR CONVENTIONAL SEEDING, USE TWICE THE AMOUNT OF INOCULANT RECOMMENDED BY THE MANUFACTURER. FOR HYDRAULIC SEEDING, FOUR TIMES THE AMOUNT OF INOCULANT RECOMMENDED BY THE MANUFACTURER SHALL BE USED.
ALL INOCULATED SEED SHALL BE PROTECTED FROM THE SUN AND HIGH TEMPERATURES AND SHALL BE PLANTED THE SAME DAY INOCULATED. NO INOCULATED SEED SHALL REMAIN IN THE HYDROSEEDER LONGER THAN ONE HOUR.
PLANTING
HYDRAULIC SEEDING
MIX THE SEED (INOCULATED IF NEEDED), FERTILIZER, AND WOOD CELLULOSE OR WOOD PULP FIBER MULCH WITH WATER AND APPLY IN A SLURRY UNIFORMLY OVER THE AREA TO BE TREATED. APPLY WITHIN ONE HOUR AFTER THE MIXTURE IS MADE.

CONVENTIONAL SEEDING
SEEDING WILL BE DONE ON A FRESHLY PREPARED AND FIRMED SEEDBED. FOR BROADCAST PLANTING, USE A CULTIPACKER-SEEDER, DRILL, ROTARY SEEDER, OTHER MECHANICAL SEEDER, OR HAND SEEDING TO DISTRIBUTE THE SEED UNIFORMLY OVER THE AREA TO BE TREATED. COVER THE SEED LIGHTLY WITH 1/8 TO 1/4 INCH OF SOIL FOR SMALL SEED AND 1/2 TO 1 INCH FOR LARGE SEED WHEN USING A CULTIPACKER OR OTHER SUITABLE EQUIPMENT.

NO-TILL SEEDING
NO-TILL SEEDING IS PERMISSIBLE INTO ANNUAL COVER CROPS WHEN PLANTING IS DONE FOLLOWING MATURITY OF THE COVER CROP OR IF THE TEMPORARY COVER STAND IS SPARSE ENOUGH TO ALLOW ADEQUATE GROWTH OF THE PERMANENT (PERENNIAL) SPECIES. NO-TILL SEEDINGS SHALL BE DONE WITH APPROPRIATE NO-TILL SEEDING EQUIPMENT. THE SEED MUST BE UNIFORMLY DISTRIBUTED AND PLANTED AT THE PROPER DEPTH.

MULCHING
MULCH IS REQUIRED FOR ALL PERMANENT VEGETATION APPLICATIONS. MULCH APPLIED TO SEEDED AREAS SHALL RECEIVE 75% TO 100% SOIL COVER. WHEN SELECTING A MULCH, DESIGN PROFESSIONALS SHOULD CONSIDER THE MULCH'S FUNCTIONAL LONGEVITY, VEGETATION ESTABLISHMENT ENHANCEMENT, AND EROSION CONTROL EFFECTIVENESS. SELECT THE MULCHING MATERIAL FROM THE FOLLOWING AND APPLY AS INDICATED:
1. DRY STRAW OR HAY OF GOOD QUALITY AND FREE OF WEED SEEDS CAN BE USED. DRY STRAW SHALL BE APPLIED AT THE RATE OF 2 TONS PER ACRE. DRY HAY SHALL BE APPLIED AT A RATE OF 2 1/2 TONS PER ACRE.
2. WOOD CELLULOSE MULCH OR WOOD PULP FIBER SHALL BE USED WITH HYDRAULIC SEEDING. IT SHALL BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE. DRY STRAW OR DRY HAY SHALL BE APPLIED (AT THE RATE INDICATED ABOVE) AFTER HYDRAULIC SEEDING.
3. ONE THOUSAND POUNDS OF WOOD CELLULOSE OR WOOD PULP FIBER, WHICH INCLUDES A TACKIFIER, SHALL BE USED WITH HYDRAULIC SEEDING ON SLOPES 1/4:1 OR STEEPER.
4. SERICEA LESPEDEZA HAY CONTAINING MATURE SEED SHALL BE APPLIED AT A RATE OF THREE TONS PER ACRE.
5. PINE STRAW OR PINE BARK SHALL BE APPLIED AT A THICKNESS OF 3 INCHES FOR BEDDING PURPOSES. OTHER SUITABLE MATERIALS IN SUFFICIENT QUANTITY MAY BE USED WHERE ORNAMENTALS OR OTHER GROUND COVERS ARE PLANTED. THIS IS NOT APPROPRIATE FOR SEEDED AREAS.
6. WHEN USING TEMPORARY EROSION CONTROL BLANKETS OR BLOCK SOD, MULCH IS NOT REQUIRED.
7. BITUMINOUS TREATED ROVING MAY BE APPLIED ON PLANTED AREAS, SLOPES, IN DITCHES, OR DRY WATERWAYS TO PREVENT EROSION. BITUMINOUS TREATED ROVING SHALL BE APPLIED WITHIN 24 HOURS AFTER AN AREA HAS BEEN PLANTED. APPLICATION RATES AND MATERIALS MUST MEET GEORGIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS. WOOD CELLULOSE AND WOOD PULP FIBERS SHALL NOT CONTAIN GERMINATION OR GROWTH INHIBITING FACTORS. THEY SHALL BE EVENLY DISPERSED WHEN AGITATED IN WATER. THE FIBERS SHALL CONTAIN A DYE TO ALLOW VISUAL METERING AND AID IN UNIFORM APPLICATION DURING SEEDING.

APPLYING MULCH
STRAW OR HAY MULCH WILL BE SPREAD UNIFORMLY WITHIN 24 HOURS AFTER SEEDING AND/OR PLANTING. THE MULCH MAY BE SPREAD BY BLOWER-TYPE SPREADING EQUIPMENT, OTHER SPREADING EQUIPMENT OR BY HAND. MULCH SHALL BE APPLIED TO COVER 75% OF THE SOIL SURFACE. WOOD CELLULOSE OR WOOD FIBER MULCH SHALL BE APPLIED UNIFORMLY WITH HYDRAULIC SEEDING EQUIPMENT.

ANCHORING MULCH
ANCHOR STRAW OR HAY MULCH IMMEDIATELY AFTER APPLICATION BY ONE OF THE FOLLOWING METHODS:
1. HAY AND STRAW MULCH SHALL BE PRESSED INTO THE SOIL IMMEDIATELY AFTER THE MULCH IS SPREAD. A SPECIAL "PACKER DISK" OR DISK HARROW WITH THE DISKS SET STRAIGHT MAY BE USED. THE DISKS MAY BE SMOOTH OR SERRATED AND SHOULD BE 2 INCHES OR MORE IN DIAMETER AND 8 TO 12 INCHES APART. THE EDGES OF THE DISKS SHALL BE DULL ENOUGH TO PRESS THE MULCH INTO THE GROUND WITHOUT CUTTING IT, LEAVING MUCH OF IT IN AN ERECT POSITION. MULCH SHALL NOT BE PLOWED INTO THE SOIL.
2. SYNTHETIC TACKIFIERS, FINDERS OR HYDRAULIC MULCH SPECIFICALLY DESIGNED TO TACK STRAW, SHALL BE APPLIED IN CONJUNCTION WITH OR IMMEDIATELY AFTER THE MULCH IS SPREAD. SYNTHETIC TACKIFIERS SHALL BE MIXED AND APPLIED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. ALL TACKIFIERS, FINDERS OR HYDRAULIC MULCH SPECIFICALLY DESIGNED TO TACK STRAW SHOULD BE VERIFIED NONTOXIC THROUGH EPA 2021.0 TESTING. REFER TO TACKIFIERS-TAC IN THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION.
3. RYE OR WHEAT CAN BE INCLUDED WITH FALL AND WINTER PLANTINGS TO STABILIZE THE MULCH. THEY SHALL BE APPLIED AT A RATE OF ONE-QUARTER TO ONE-HALF BUSHED PER ACRE.
4. PLASTIC MESH OR NETTING WITH MESH NO LARGER THAN ONE INCH BY ONE INCH MAY BE NEEDED TO ANCHOR STRAW OR HAY MULCH ON UNSTABLE SOILS AND CONCENTRATED FLOW AREAS. THESE MATERIALS SHALL BE INSTALLED AND ANCHORED ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

PLANT SELECTION
CONTRACTOR SHALL RE-VEGETATE DISTURBED AREAS AS SHOWN ON THE DRAWINGS DEPENDING ON THE SEASON IN ACCORDANCE WITH BIG CANOE PROPERTY ASSOCIATION SEEDING AS FOLLOWS:
SUMMER - BERMUDA GRASS AT A BROADCAST RATE OF 10 POUNDS PER ACRE (0.2 LB PLS PER 1,000 SQUARE FEET)
SPRING AND FALL - 40% KENTUCKY BLUEGRASS AND 60% KENTUCKY 31 FESCUE (SEE MANUFACTURER INSTRUCTIONS FOR RECOMMENDED SEEDING RATES IN MIXTURES)
WINTER - TALL FESCUE AT A BROADCAST RATE OF 50 POUNDS PER ACRE (1.1 PLS PER 1,000 SQUARE FEET)
RYEGRASS SHALL NOT BE USED ON THE DAM.

IRRIGATION
IRRIGATION WILL BE APPLIED AT A RATE THAT DOES NOT CAUSE RUNOFF.

Ds3 | 9 / 13 | DETAIL
DISTURBED AREA STABILIZATION (WITH PERMANENT SEEDING)
SOURCE: GSWCC

CONDITIONS
THIS PRACTICE IS APPLICABLE TO AREAS SUBJECT TO SURFACE AND AIR MOVEMENT OF DUST WHERE ON AND OFF-SITE DAMAGE MAY OCCUR WITHOUT TREATMENT.

METHOD AND MATERIALS

A. TEMPORARY METHODS

MULCHES
REFER TO Ds1- DISTURBED AREA STABILIZATION (WITH MULCHING ONLY). SYNTHETIC RESINS MAY BE USED INSTEAD OF ASPHALT TO BIND MULCH MATERIAL. REFER TO TO SPECIFICATIONS TAC-TACKIFIERS IN THE MANUAL FOR EROSION AND AND SEDIMENT CONTROL IN GEORGIA , LATEST EDITION.
RESINS SUCH AS CURASOL OR TERRATACK SHOULD BE USED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

VEGETATIVE COVER
REFER TO Ds2-DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING).

IRRIGATION
THIS IS GENERALLY DONE AS AN EMERGENCY TREATMENT. SITE IS SPRINKLED WITH WATER UNTIL THE SURFACE IS WET. REPEAT AS NEEDED.

B. PERMANENT METHODS
PERMANENT VEGETATION
REFER TO Ds3-DISTURBED AREA STABILIZATION (WITH PERMANENT VEGETATION). EXISTING TREES AND LARGE SHRUBS MAY AFFORD VALUABLE PROTECTION IF LEFT IN PLACE.

STONE
COVER SURFACE WITH CRUSHED STONE OR COARSE GRAVEL. SEE SPECIFICATION cR-CONSTRUCTION ROAD STABILIZATION IN THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION.

Du | 10 / 11 | DETAIL
DUST CONTROL ON DISTURBED AREAS
SOURCE: GSWCC

FOR REVIEW PURPOSES ONLY
DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| REV | DATE | DESCRIPTION | DRN | APP |
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| DESIGN BY: | JWB |
| DRAWN BY: | KL |
| CHECKED BY: | SS |
| REVIEWED BY: | JA |
| APPROVED BY: | JWB |

TITLE: EROSION & SEDIMENT CONTROL DETAILS 3
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT
SITE: TJD10771 LAKE PETIT SPWY
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C16 |
| SHEET NO.: | 16 OF 41 |

# EROSION & SEDIMENT CONTROL NOTES I

CERTIFICATIONS

BY ENGINEER: GEOSYNTEC CONSULTANTS

GSWCC LEVEL II CERTIFICATION INFORMATION:

SHAURYA SOOD CERTIFICATION NUMBER 0000095438

"I CERTIFY THAT THE PERMITTEE'S EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN PROVIDES FOR AN APPROPRIATE AND COMPREHENSIVE SYSTEM OF BEST MANAGEMENT PRACTICES REQUIRED BY THE GEORGIA WATER QUALITY CONTROL ACT AND THE DOCUMENT "MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA" (MANUAL) PUBLISHED BY THE GEORGIA SOIL AND WATER CONSERVATION COMMISSION AS OF JANUARY 1 OF THE YEAR IN WHICH THE LAND-DISTURBING ACTIVITY WAS PERMITTED, PROVIDES FOR THE SAMPLING OF THE RECEIVING WATER(S) OR THE SAMPLING OF THE STORM WATER OUTFALLS AND THAT THE DESIGNED SYSTEM OF BEST MANAGEMENT PRACTICES AND SAMPLING METHODS IS EXPECTED TO MEET THE REQUIREMENTS CONTAINED IN THE GENERAL NPDES PERMIT NO. GAR100001."

SIGNATURE: ______________________________ SHAURYA SOOD.

"I CERTIFY UNDER PENALTY OF LAW THAT THIS PLAN WAS PREPARED AFTER A VISIT TO THE PROJECT SITE AT THE LOCATIONS DESCRIBED HEREIN BY MYSELF OR MY AUTHORIZED AGENT, UNDER MY SUPERVISION."

SIGNATURE: ______________________________ SHAURYA SOOD.

BY PRIMARY PERMITTEE: THE NAME, ADDRESS, AND PHONE NUMBER OF PRIMARY PERMITTEE IS:

NAME: BIG CANOE PROPERTY OWNERS ASSOCIATION
CONTACT: LYDELL MACK
ADDRESS: 10586 BIG CANOE, JASPER, GA 30143
PHONE NO.: 678-758-9763
EMAIL ADDRESS: LMACK@BIGCANOEPOA.ORG

"I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT CERTIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS."

______________________ SIGNATURE OF PERMITTEE ______________________ PRINTED NAME OF PERMITTEE

STATE OF GEORGIA GENERAL PERMIT: STATE OF GEORGIA GENERAL PERMIT NO. GAR100001 IS REQUIRED FOR PROJECTS THAT RESULT IN LAND DISTURBANCE OF MORE THAN 1.0 ACRE. DISTURBED AREA FOR THIS PROJECT IS APPROXIMATELY 4.8 ACRES.

PROJECT DESCRIPTION

PROJECT NAME: LAKE PETIT DAM - OVERFLOW SPILLWAY REDESIGN

LOCATION: 10586 BIG CANOE, JASPER, GA 30143

ENTRANCE TO CONSTRUCTION AREA:

NORTH (LATITUDE: 34.462274N; LONGITUDE: 84.288744W)

SOUTH (LATITUDE: 34.460394N; LONGITUDE: 84.289298W)

EAST (LATITUDE: 34.461576N; LONGITUDE: 84.287353W)

WEST (LATITUDE: 34.461776N; LONGITUDE: 84.290761W)

OWNER: BIG CANOE PROPERTY OWNERS ASSOCIATION

THE WORK AREA CONSISTS OF 4.8 DISTURBED ACRES ON EITHER SIDE OF THE OVERFLOW SPILLWAY FOR LAKE PETIT DAM AND SELECT AREAS DOWNSTREAM AS SHOWN ON THE ES&PC PLANS

THE PROJECT PRIMARILY CONSISTS OF LAND/TREE CLEARING AND GRADING EFFORTS ASSOCIATED WITH CONSTRUCTING: (I) A NEW OVERFLOW SPILLWAY LOCATED ROUGHLY ALONG THE SAME FOOTPRINTS OF THE OLD SPILLWAY WITH SOME MINOR RE-ALIGNMENTS; AND (II) TWO DRAINAGE CHANNELS RUNNING PARALLEL TO THE NEW SPILLWAY TO COLLECT SHEET FLOW ALONG THE SLOPE. FOLLOWING THE CONSTRUCTION OF THESE FEATURES, EXCAVATED AREAS SHALL BE BACKFILLED AND THE SITE STABILIZED WITH PERMANENT VEGETATION.

THE WORK AREA IS SURROUNDED BY WILDERNESS PARKWAY AND THE LAKE PETIT RESERVOIR TO THE NORTH, AND WOLFSCRATCH DRIVE TO THE EAST AND SOUTH. TO THE WEST OF THE WORK AREA IS THE FACE OF LAKE PETIT DAM.

THE MAJORITY OF WORK AREA IS IN THE DOWNSLOPE DIRECTION FROM THE BERM (I.E., TOP OF THE DAM) AND DRAINS INTO THE OVERFLOW SPILLWAY. THE SPILLWAY DISCHARGES INTO PETIT CREEK WHICH EVENTUALLY DRAINS INTO SCONTI LAKE. A PORTION OF THE WORK AREA ON THE DOWNSTREAM SIDE DIRECTLY DISCHARGES INTO PETIT CREEK.

I. SITE DESCRIPTION

A. NATURE OF CONSTRUCTION ACTIVITY: LAND/TREE CLEARING, EXCAVATION, REGRADING/BACKFILLING AND STABILIZATION ACTIVITIES.

B. PROJECT SCHEDULING: A GENERAL DESCRIPTION OF THE INTENDED SEQUENCE OF MAJOR SOIL DISTURBING ACTIVITIES AND THEIR RESPECTIVE SCHEDULE ARE SHOWN ON SHEET 18.

C. AREA ESTIMATES:

1. ESTIMATED TOTAL SITE AREA: 4.8 ACRES

2. ESTIMATED TOTAL DISTURBED AREA: 4.8 ACRES

THE ESTIMATED TOTAL DISTURBED AREA IS BASED ON THE ASSUMPTION THAT ALL AREAS REQUIRING SOIL DISTURBANCE ACTIVITIES WILL BECOME DISTURBED OVER THE COURSE OF OVERFLOW SPILLWAY RECONSTRUCTION.

D. STREAM IMPACTS:

1. TEMPORARY IMPACTS: 0.02 ACRES (PETIT CREEK)

2. PERMANENT IMPACTS: 0.04 ACRES (PETIT CREEK)

E. SITE CHARACTERISTICS:

1. SOIL DESCRIPTION: BASED ON THE USDA NRCS SOIL SURVEY AREA OF PICKENS COUNTY, GEORGIA DATED JANUARY 14, 2025, THE SOILS FOR THE SITE CONSIST OF TALLAPOOSA SANDY LOAM (TBF - 81.4%; HSG TYPE D) AND TUSQUITEE STONY LOAM (TME - 18.6%; HSG TYPE B). SEE SOIL SURVEY MAP ON SHEET 18 FOR REFERENCE.

2. RUNOFF COEFFICIENT: PRE-CONSTRUCTION - 77
RUNOFF COEFFICIENT: POST-CONSTRUCTION - 79

3. RECEIVING WATERS: RUNOFF FROM THE SITE, INCLUDING OVERFLOW SPILLWAY FLOWS INTO PETIT CREEK THAT EVENTUALLY DRAINS INTO SCONTI LAKE FURTHER DOWNSTREAM (PART OF THE OVERALL COOSA RIVER BASIN).

4. IMPAIRED WATERS: THE PROJECT SITE DOES NOT DISCHARGE STORM WATER INTO, OR WITHIN 1 LINEAR MILE UPSTREAM OF AND WITHIN THE SAME WATERSHED AS, ANY PORTION OF A BIOTA IMPAIRED STREAM SEGMENT.

5. NON-EXEMPT ACTIVITIES SHALL NOT BE CONDUCTED WITHIN THE 25 OR 50-FOOT UNDISTURBED STREAM BUFFERS AS MEASURED FROM THE POINT OF WRESTED VEGETATION OR WITHIN 25-FEET OF THE COASTAL MARSHLAND BUFFER AS MEASURED FROM THE JURISDICTIONAL DETERMINATION LINE WITHOUT FIRST ACQUIRING THE NECESSARY VARIANCE AND PERMITS.

E. FLOOD HAZARD: A PORTION OF PROJECT AREA (I.E., PETIT CREEK INTO WHICH THE OVERFLOW SPILLWAY DISCHARGES) IS LOCATED IN ZONE A (I.E., 100-YEAR FLOOD PLAIN OR SPECIAL FLOOD HAZARD AREA) PER FEMA MAP 13227C0185C EFFECTIVE 9/29/2010.

F. STORMWATER MANAGEMENT POST CONSTRUCTION SHALL PRIMARILY INCLUDE SHEET FLOW FROM THE DOWNSLOPE DRAINING INTO THE PERIMETER CHANNELS AND EXCESS WATER DRAINING INTO THE NEW OVERFLOW SPILLWAY FROM LAKE PETIT. THE RUNOFF FROM BOTH THESE FEATURES WILL CONFLUENCE AT THE DOWNCHUTE LOCATED AT THE DOWNSTREAM END OF THE SPILLWAY BEFORE FLOWING INTO PETIT CREEK.

II. CONTROLS

A. EROSION AND SEDIMENT CONTROLS

1. THE ESCAPE OF SEDIMENT FROM THE SITE SHALL BE PREVENTED BY THE INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES AND PRACTICES PRIOR TO LAND DISTURBING ACTIVITIES.

2. ACCESS SHALL BE PROVIDED THROUGH DESIGNATED CONSTRUCTION ENTRANCES AS SHOWN ON THE ES&PC PLANS.

3. INITIAL PERIMETER CONTROL BMPS SHALL CONSIST OF CONSTRUCTION ENTRANCES, DOUBLE ROWS OF SILT FENCE AND SILT FENCE WITH J-HOOK, DISTURBED AREA STABILIZATION AND DUST CONTROL AS SHOWN ON THE ES&PC PLANS.

4. INITIAL SEDIMENT STORAGE REQUIREMENTS SHALL BE ACHIEVED THROUGH THE INSTALLATION OF SILT FENCE AS SEDIMENT BARRIERS. DEWATERING OF EXCAVATION AREAS SHALL PROVIDE TREATMENT OF SEDIMENT-LADEN STORMWATER THROUGH ON-SITE.

5. SINCE THE AREA OF DISTURBANCE AND PROJECT LIMITS ARE LOCATED ON A RELATIVELY STEEP SLOPE (ESSENTIALLY THE FACE OF A DAM THAT INCLUDES A SPILLWAY DOWNCHUTE), INSTALLING A TEMPORARY SEDIMENT BASIN AND/OR EXCAVATED SEDIMENT TRAP IS INFEASIBLE. INSTEAD, SEDIMENT STORAGE IS PROVIDED BY THE SILT FENCE. APPROXIMATELY 2,560 FEET OF SILT FENCE IS PROVIDED FOR THE 4.8 ACRE PROJECT.

SEDIMENT STORAGE REQUIRED: 67 CU YD X 4.8 ACRES = 321.6 CU YD

SEDIMENT STORAGE PROVIDED: 4 SQ FT PER FT OF SILT FENCE = 4 SQ FT X 2560 FT = 10,240 CU FT = 379.3 CU YD

6. STABILIZATION MEASURES SHALL INCLUDE FINAL STABILIZATION WITH PERMANENT VEGETATION. TEMPORARY STABILIZATION MEASURES SHALL CONSIST OF MULCHING OR TEMPORARY SEEDING. TEMPORARY STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE, BUT IN NO CASE MORE THAN 14 DAYS AFTER, IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, UNLESS CONSTRUCTION ACTIVITIES WILL RESUME WITHIN 21 DAYS FROM WHEN ACTIVITIES CEASED.

7. ANY DISTURBED AREA LEFT EXPOSED FOR A PERIOD GREATER THAN 14 DAYS SHALL BE STABILIZED WITH MULCH OR TEMPORARY SEEDING.

8. USE OF ALTERNATIVE BMPS WHOSE PERFORMANCE HAS BEEN DOCUMENTED TO BE EQUIVALENT TO OR SUPERIOR TO CONVENTIONAL BMPS AS CERTIFIED BY A DESIGN PROFESSIONAL MAY BE ALLOWED (UNLESS DISAPPROVED BY GA EPD OR THE GEORGIA SOIL AND WATER CONSERVATION COMMISSION). PLEASE REFER TO THE ALTERNATIVE BMP GUIDANCE DOCUMENT FOUND AT WWW.GASWCC.GEORGIA.GOV. REFER TO APPENDIX A-2 OF THE MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA, LATEST EDITION, FOR USE OF ALTERNATIVE BMPS.

B. GRADING

1. GRADING ACTIVITIES SHALL LIMITED TO AREAS WITHIN THE LIMITS OF DISTURBANCE.

2. ALL EXCAVATED SOIL MATERIAL THAT MUST BE TRANSPORTED OFF-SITE SHALL BE DISPOSED IN ACCORDANCE WITH THE TRANSPORTATION AND DISPOSAL PLAN.

3. BACKFILLED SOIL SHALL BE CONTAINED TO THE EXCAVATION AREAS AND PLACED TO MEET EXISTING GRADES OR RESTORE EXISTING DRAINAGE PATTERNS.

C. OTHER CONTROLS

1. WASTE DISPOSAL - LOCATE WASTE COLLECTION AREAS FROM STREETS, GUTTERS, WATERCOURSES AND STORM DRAINS. WASTE COLLECTIONS AREAS, SUCH AS DUMPSTERS ARE OFTEN BEST LOCATED NEAR CONSTRUCTION ENTRANCES TO MINIMIZE TRAFFIC ON DISTURBED SOILS. ALL WASTE CONTAINERS SHALL BE COVERED AND COVERS SHALL BE SECURED TO THE CONTAINERS TO PREVENT WASTE FROM LEAVING THE CONTAINER. FOR BUILDING MATERIALS, BUILDING PRODUCTS, CONSTRUCTION WASTES, LANDSCAPE MATERIALS, FERTILIZERS, PESTICIDES, HERBICIDES, DETERGENTS, SANITARY WASTE AND OTHER MATERIALS PRESENT ON THE SITE, PROVIDE COVER (E.G. PLASTIC SHEETING, TEMPORARY ROOFS) TO MINIMIZE THE EXPOSURE OF THESE PRODUCTS TO PRECIPITATION AND TO STORMWATER, OR A SIMILARLY EFFECTIVE MEANS DESIGNED TO MINIMIZE THE DISCHARGE OF POLLUTANTS FROM THESE AREAS. MINIMIZATION OF EXPOSURE IS NOT REQUIRED IN CASES WHERE EXPOSURE TO PRECIPITATION AND TO STORMWATER WILL NOT RESULT IN A DISCHARGE OF POLLUTANTS, OR WHERE EXPOSURE OF A SPECIFIC MATERIAL OR PRODUCT POSES LITTLE RISK TO STORMWATER CONTAMINATION (SUCH AS FINAL PRODUCTS AND MATERIALS INTENDED FOR OUTDOOR USE).

2. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE HAULED TO A PERMITTED DISPOSAL FACILITY. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON-SITE. NO WASTE WILL BE DISPOSED OF INTO STORM DRAIN INLETS OR WATERS OF THE STATE. PERSONNEL WILL RECEIVE INSTRUCTION REGARDING THE CORRECT PROCEDURE FOR WASTE DISPOSAL. EMPLOYEE WASTE AND OTHER LOOSE MATERIALS WILL BE COLLECTED SO AS TO PREVENT THE RELEASE OF "FLOATABLES" DURING RUNOFF EVENTS. NOTICES DESCRIBING THESE PRACTICES WILL BE POSTED ON-SITE. THE CONTRACTOR'S SITE SUPERINTENDENT WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED. WASTE MATERIALS SHALL NOT BE DISCHARGED TO WATERS OF THE STATE, EXCEPT AS AUTHORIZED BY A SECTION 404 PERMIT.

3. OFF-SITE VEHICLE TRACKING AND DUST GENERATION - STABILIZED CONSTRUCTION ENTRANCES WILL BE INSTALLED, AS SHOWN ON THE ES&PC PLANS. THE PAVED STREETS ADJACENT TO THE SITE SHALL BE SWEPT AND SCRAPED REGULARLY TO REMOVE ANY EXCESS MUD, DIRT, OR ROCK TRACKED FROM THE CONSTRUCTION AREA AS SOON AS PRACTICABLE.

4. SANITARY WASTE - ALL WORKERS THROUGHOUT THE LIFE OF THE PROJECT WILL BE PROVIDED PORTABLE SANITARY UNITS FOR USE; SECONDARY CONTAINMENT SHALL BE PROVIDED. A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR WILL REGULARLY COLLECT ALL SANITARY WASTE FROM THE PORTABLE UNITS.

5. MATERIAL STORAGE - ALL MATERIALS STORED ON-SITE SHOULD BE STORED IN A NEAT, ORDERLY MANNER IN THEIR APPROPRIATE CONTAINERS AND IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE. IF PETROLEUM PRODUCTS ARE STORED ON-SITE, SECONDARY CONTAINMENT SHALL BE PROVIDED. SAFETY DATA SHEETS (SDS) FOR ALL APPLICABLE MATERIALS SHALL BE MAINTAINED AT THE SITE FOR REVIEW AS WARRANTED.

6. SPILLS - CONTRACTOR SHALL MAINTAIN A SPILL KIT AND OTHER SPILL RESPONSE MEASURES IN A WELL-MARKED LOCATION. WHERE A SPILL CONTAINING A HAZARDOUS SUBSTANCE IN AN AMOUNT EQUAL TO OR IN EXCESS OF A REPORTING QUANTITY ESTABLISHED UNDER EITHER GEORGIA'S OIL OR HAZARDOUS MATERIAL SPILLS OR RELEASES ACT, 40 CFR 117 OR 40 CFR 302 OCCURS DURING A 24-HOUR PERIOD, THE PERMITTEE IS REQUIRED TO NOTIFY EPD AT (800) 241-4113 AND THE NATIONAL RESPONSE CENTER (NRC) AT (800) 424-8802 AS SOON AS THEY HAVE KNOWLEDGE OF THE DISCHARGE.

7. CONCRETE AND GROUT - CONCRETE AND GROUT MATERIAL SHALL NOT BE DISCHARGED TO RECEIVING WATERS. MATERIALS USED FOR CONCRETE AND GROUT ACTIVITIES SHALL BE WASHED WITHIN A CONTAINED WASHOUT AREA, AND WASHWATER WILL BE PUMPED FOR DISPOSAL OFF-SITE. WASHOUT OF THE CONCRETE DRUM ONSITE IS PROHIBITED.

III. INSPECTIONS

A. INITIAL INSPECTION - THE DESIGN PROFESSIONAL WHO PREPARED THIS ES&PC PLAN, OR AN ALTERNATE DESIGN PROFESSIONAL (FOR WHOM THE PERMITTEE WILL SEEK PRIOR WRITTEN APPROVAL FROM GA EPD), SHALL INSPECT AND CERTIFY THE INSTALLATION OF THE INITIAL SEDIMENT STORAGE REQUIREMENTS AND PERIMETER CONTROL BMPS WITHIN SEVEN (7) DAYS AFTER INSTALLATION. THE DESIGN PROFESSIONAL SHALL DETERMINE IF THESE BMPS HAVE BEEN INSTALLED AND ARE BEING MAINTAINED AS DESIGNED. THE DESIGN PROFESSIONAL SHALL REPORT THE RESULTS OF THE INSPECTION TO THE PRIMARY PERMITTEE WITHIN SEVEN (7) DAYS AND THE PERMITTEE MUST CORRECT ALL DEFICIENCIES WITHIN TWO (2) BUSINESS DAYS OF RECEIPT OF THE INSPECTION REPORT FROM THE DESIGN PROFESSIONAL PRIOR TO COMMENCING WITH CONSTRUCTION ACTIVITIES AS REQUIRED BY PART III.D.2 OF THE PERMIT UNLESS WEATHER RELATED SITE CONDITIONS ARE SUCH THAT ADDITIONAL TIME IS REQUIRED.

I CERTIFY THAT THE DESIGN PROFESSIONAL WHO PREPARED THE ES&PC PLAN, OR AN ALTERNATE DESIGN PROFESSIONAL APPROVED BY GA EPD IN WRITING, IS TO INSPECT THE INSTALLATION OF THE INITIAL SEDIMENT STORAGE REQUIREMENTS AND PERIMETER CONTROL BMPS WITHIN 7 DAY AFTER INSTALLATION.

SIGNATURE: ______________________________ SHAURYA SOOD.

B. EACH DAY WHEN ANY TYPE OF CONSTRUCTION ACTIVITY HAS TAKEN PLACE AT A PRIMARY PERMITTEE'S SITE, CERTIFIED PERSONNEL PROVIDED BY THE PRIMARY PERMITTEE SHALL INSPECT: (A) ALL AREAS AT THE PRIMARY PERMITTEE'S SITE WHERE PETROLEUM PRODUCTS ARE STORED, USED, OR HANDLED FOR SPILLS AND LEAKS FROM VEHICLES AND EQUIPMENT; (B) ALL LOCATIONS AT THE PRIMARY PERMITTEE'S SITE WHERE VEHICLES ENTER OR EXIT THE SITE FOR EVIDENCE OF OFF-SITE SEDIMENT TRACKING; AND (C) MEASURE RAINFALL ONCE EACH TWENTY-FOUR HOUR PERIOD AT THE SITE. THESE INSPECTIONS MUST BE CONDUCTED UNTIL A NOTICE OF TERMINATION IS SUBMITTED.

C. CERTIFIED PERSONNEL (PROVIDED BY THE PRIMARY PERMITTEE) SHALL INSPECT AT LEAST ONCE EVERY SEVEN (7) CALENDAR DAYS AND WITHIN 24 HOURS OF THE END OF A STORM THAT IS 0.5 INCHES OR GREATER (UNLESS SUCH STORM ENDS AFTER 5:00 PM ON ANY FRIDAY OR ANY NON-WORKING SATURDAY, NON-WORKING SUNDAY, OR ANY NON-WORKING FEDERAL HOLIDAY IN WHICH CASE THE INSPECTION SHALL BE COMPLETED BY THE END OF THE NEXT BUSINESS DAY AND/OR WORKING DAY, WHICHEVER OCCURS FIRST), THE FOLLOWING: (A) DISTURBED AREAS OF THE PRIMARY PERMITTEE'S CONSTRUCTION SITE THAT HAVE NOT UNDERGONE FINAL STABILIZATION; (B) AREAS USED BY THE PRIMARY PERMITTEE FOR STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION THAT HAVE NOT UNDERGONE FINAL STABILIZATION; AND (C) STRUCTURAL CONTROL MEASURES. EROSION AND SEDIMENT CONTROL MEASURES IDENTIFIED IN THE ES&PC PLANS APPLICABLE TO THE PRIMARY PERMITTEE'S SITE SHALL BE OBSERVED TO ENSURE THAT THEY ARE OPERATING CORRECTLY. WHERE DISCHARGE LOCATIONS OR POINTS ARE ACCESSIBLE, THEY SHALL BE INSPECTED TO ASCERTAIN WHETHER EROSION CONTROL MEASURES ARE EFFECTIVE IN PREVENTING SIGNIFICANT IMPACTS TO RECEIVING WATER(S). THESE INSPECTIONS MUST BE CONDUCTED UNTIL A NOTICE OF TERMINATION IS SUBMITTED.

D. CERTIFIED PERSONNEL (PROVIDED BY THE PRIMARY PERMITTEE) SHALL INSPECT AT LEAST ONCE PER MONTH DURING THE TERM OF THIS PERMIT (I.E., UNTIL A NOTICE OF TERMINATION IS RECEIVED BY EPD) THE AREAS OF THE SITE THAT HAVE UNDERGONE FINAL STABILIZATION. THESE AREAS SHALL BE INSPECTED FOR EVIDENCE OF, OR THE POTENTIAL FOR, POLLUTANTS ENTERING THE DRAINAGE SYSTEM AND THE RECEIVING WATER(S). EROSION AND SEDIMENT CONTROL MEASURES IDENTIFIED IN THE ES&PC PLANS SHALL BE OBSERVED TO ENSURE THAT THEY ARE OPERATING CORRECTLY. WHERE DISCHARGE LOCATIONS OR POINTS ARE ACCESSIBLE, THEY SHALL BE INSPECTED TO ASCERTAIN WHETHER EROSION CONTROL MEASURES ARE EFFECTIVE IN PREVENTING SIGNIFICANT IMPACTS TO RECEIVING WATER(S).

E. BASED ON THE RESULTS OF EACH INSPECTION, THE SITE DESCRIPTION AND THE POLLUTION PREVENTION AND CONTROL MEASURES IDENTIFIED IN THE ES&PC PLANS, THE PLAN SHALL BE REVISED AS APPROPRIATE NO LATER THAN SEVEN (7) CALENDAR DAYS FOLLOWING EACH INSPECTION. IMPLEMENTATION OF SUCH CHANGES SHALL BE MADE AS SOON AS PRACTICAL BUT IN NO CASE LATER THAN SEVEN (7) CALENDAR DAYS FOLLOWING EACH INSPECTION.

F. A REPORT SUMMARIZING THE SCOPE OF EACH INSPECTION AND THE NAME(S) OF PERSONNEL MAKING EACH INSPECTION, THE DATE(S) OF EACH INSPECTION, MAJOR OBSERVATIONS RELATING TO IMPLEMENTATION OF THE ES&PC PLAN AND ACTIONS TAKEN SHALL BE MADE AND RETAINED AT THE SITE OR BE READILY AVAILABLE AT THE DESIGNATED ALTERNATE LOCATION UNTIL THE SITE OR THAT PORTION OF A CONSTRUCTION PROJECT THAT HAS BEEN PHASED HAS UNDERGONE FINAL STABILIZATION AND A NOTICE OF TERMINATION IS SUBMITTED TO EPD. SUCH REPORTS SHALL IDENTIFY ANY INCIDENTS OR NON-COMPLIANCE. WHERE THE REPORT DOES NOT IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE, THE REPORT SHALL CONTAIN A CERTIFICATION THAT THE FACILITY IS IN COMPLIANCE WITH THE ES&PC PLANS AND THE STATE OF GEORGIA GENERAL PERMIT NO. GAR100001.

IV. MAINTENANCE

A. MAINTENANCE OF VEGETATION, EROSION AND SEDIMENT CONTROL MEASURES AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE ES&PC PLANS SHALL BE PERFORMED IN ACCORDANCE WITH SCHEDULES AND PROCEDURES SET FORTH IN THE "MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA".

B. EROSION CONTROL MEASURES WILL BE MAINTAINED AT ALL TIMES. IF FULL IMPLEMENTATION OF THE APPROVED PLAN DOES NOT PROVIDE FOR EFFECTIVE EROSION CONTROL, ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED TO CONTROL OR TREAT THE SEDIMENT SOURCE.

V. SAMPLING REQUIREMENTS

A. THIS PERMIT REQUIRES THE MONITORING OF NEPHELOMTRIC TURBIDITY IN RECEIVING WATER(S) OR OUTFALLS IN ACCORDANCE WITH THIS PERMIT. THE RECEIVING WATER SHALL BE SAMPLED FOR THIS PROJECT. UPSTREAM AND DOWNSTREAM SAMPLES SHALL BE COLLECTED FROM THE LOCATIONS SHOWN ON SHEETS 11 THROUGH 13.

B. SAMPLE TYPE: ALL SAMPLING SHALL BE COLLECTED BY "GRAB SAMPLES" AND THE ANALYSIS OF THESE SAMPLES MUST BE CONDUCTED IN ACCORDANCE WITH METHODOLOGY AND TEST PROCEDURES ESTABLISHED BY 40 CFR PART 136 (UNLESS OTHER TEST PROCEDURES HAVE BEEN APPROVED); THE GUIDANCE DOCUMENT TITLED "NPDES STORM WATER SAMPLING GUIDANCE DOCUMENT, EPA 833-B-92-001" AND GUIDANCE DOCUMENTS THAT MAY BE PREPARED BY THE EPD.

1. SAMPLE CONTAINERS SHOULD BE LABELED PRIOR TO COLLECTING THE SAMPLES.

2. SAMPLES SHOULD BE WELL MIXED BEFORE TRANSFERRING TO A SECONDARY CONTAINER.

3. LARGE MOUTH, WELL CLEANED AND RINSED GLASS AND PLASTIC JARS SHOULD BE USED FOR COLLECTING SAMPLES. THE JARS SHOULD BE CLEANED THOROUGHLY TO AVOID CONTAMINATION.

4. MANUAL, AUTOMATIC OR RISING STAGE SAMPLING MAY BE UTILIZED. SAMPLES REQUIRED BY THIS PERMIT SHOULD BE ANALYZED IMMEDIATELY, BUT IN NO CASE LATER THAN 48 HOURS AFTER COLLECTION. HOWEVER, SAMPLES FROM AUTOMATIC SAMPLERS MUST BE COLLECTED NO LATER THAN THE NEXT BUSINESS DAY AFTER THEIR ACCUMULATION, UNLESS FLOW THROUGH AUTOMATED ANALYSIS IS UTILIZED. IF AUTOMATIC SAMPLING IS UTILIZED AND AUTOMATIC SAMPLER IS NOT ACTIVATED DURING THE QUALIFYING EVENT, THE PERMITTEE MUST UTILIZE MANUAL SAMPLING OR RISING STAGE SAMPLING DURING THE NEXT QUALIFYING EVENT. DILUTION OF SAMPLES IS NOT REQUIRED. SAMPLES MAY BE ANALYZED DIRECTLY WITH A PROPERLY CALIBRATED TURBIDIMETER. SAMPLES ARE NOT REQUIRED TO BE COOLED.

5. SAMPLING AND ANALYSIS OF THE RECEIVING WATER(S) OR OUTFALLS BEYOND THE MINIMUM FREQUENCY STATED IN THIS PERMIT MUST BE REPORTED TO EPD AS SPECIFIED.

C. SAMPLING POINTS - FOR CONSTRUCTION ACTIVITIES, THE PERMITTEE MUST SAMPLE ALL RECEIVING WATER(S), OR ALL OUTFALL(S), OR A COMBINATION OF RECEIVING WATER(S) AND OUTFALL(S). SAMPLES TAKEN FOR THE PURPOSE OF COMPLIANCE WITH THIS PERMIT SHALL BE REPRESENTATIVE OF THE MONITORED ACTIVITY AND REPRESENTATIVE OF THE WATER QUALITY OF THE RECEIVING WATER(S) AND/OR THE OUTFALLS USING THE FOLLOWING MINIMUM GUIDELINES.

1. IDEALLY, THE SAMPLES SHOULD BE TAKEN FORM THE HORIZONTAL AND VERTICAL CENTER OF THE RECEIVING WATER(S) OR THE STORMWATER OUTFALL CHANNEL(S).

2. CARE SHOULD BE TAKEN TO AVOID STIRRING THE BOTTOM SEDIMENTS IN THE RECEIVING WATER(S) OR IN THE OUTFALL STORMWATER CHANNEL.

3. THE SAMPLING CONTAINER SHOULD BE HELD SO THAT THE OPENING FACES UPSTREAM.

4. THE SAMPLES SHOULD BE KEPT FREE FROM FLOATING DEBRIS.

5. PERMITTEES DO NOT HAVE TO SAMPLE SHEET FLOW THAT FLOWS ONTO UNDISTURBED NATURAL AREAS OR AREAS STABILIZED BY THE PROJECT. FOR PURPOSES OF THIS SECTION, STABILIZED SHALL MEAN, FOR UNPAVED AREAS AND AREAS NOT COVERED BY PERMANENT STRUCTURES, 100% OF THE SOIL SURFACE IS UNIFORMLY COVERED IN PERMANENT VEGETATION WITH A DENSITY OF 70% OR GREATER, OR LANDSCAPED ACCORDING TO THE PLAN (UNIFORMLY COVERED WITH LANDSCAPING MATERIALS IN PLANNED LANDSCAPED AREAS), OR EQUIVALENT PERMANENT STABILIZATION MEASURES AS DEFINED IN THE MANUAL (EXCLUDING A CROP OF ANNUAL VEGETATION AND A SEEDING OF TARGET CROPS PERENNIALS APPROPRIATE FOR THE REGION).

6. ALL SAMPLING PURSUANT TO THIS PERMIT MUST BE DONE IN SUCH A WAY (INCLUDING GENERALLY ACCEPTED SAMPLING METHODS, LOCATIONS, TIMING, AND FREQUENCY) AS TO ACCURATELY REFLECT WHETHER STORMWATER RUNOFF FROM THE CONSTRUCTION SITE IS IN COMPLIANCE WITH THE STANDARD SET FORTH IN PARTS III.D.3 OR III.D.4 OF THE GEORGIA GENERAL PERMIT NO. GAR100001, WHICHEVER IS APPLICABLE.

D. SAMPLE FREQUENCY

4. THE PRIMARY PERMITTEE MUST SAMPLE AT LEAST ONCE FOR EACH RAINFALL EVENT DESCRIBED BELOW. FOR A QUALIFYING EVENT, THE PERMITTEE SHALL SAMPLE AT THE BEGINNING OF ANY STORMWATER DISCHARGE TO A MONITORED RECEIVING WATER AND/OR FROM MONITORED OUTFALL LOCATION WITHIN FORTY-FIVE (45) MINUTES OF OR AS SOON AS POSSIBLE.

5. HOWEVER, WHERE MANUAL AND AUTOMATIC SAMPLING ARE IMPOSSIBLE (AS DEFINED IN THIS PERMIT), OR ARE BEYOND THE PERMITTEE'S CONTROL, THE PERMITTEE SHALL TAKE SAMPLES AS SOON AS POSSIBLE, BUT IN NO CASE MORE THAN TWELVE HOURS AFTER THE BEGINNING OF THE STORM WATER DISCHARGE.

SAMPLING BY THE PERMITTEE SHALL OCCUR FOR THE FOLLOWING QUALIFYING EVENTS:

(CONTINUED ON SHEET 18)

FOR REVIEW PURPOSES ONLY
DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| | | | | |
|---|---|---|---|---|
| 0 | XXX | XXX | XXX | XXX |
| REV | DATE | DESCRIPTION | DRN | APP |



| | |
|---|---|
| DESIGN BY: | JWB |
| DRAWN BY: | KL |
| CHECKED BY: | SS |
| REVIEWED BY: | JA |
| APPROVED BY: | JWB |

TITLE: EROSION & SEDIMENT CONTROL NOTES I

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: TJD10771 LAKE PETIT SPWY
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C17 |
| SHEET NO.: | 17 OF 41 |

# EROSION AND SEDIMENT CONTROL NOTES (CONT.)

A. FOR EACH AREA OF THE SITE THAT DISCHARGES TO A RECEIVING WATER OR FROM AN OUTFALL, THE FIRST RAIN EVENT THAT REACHES OR EXCEEDS 0.5 INCH WITH A STORMWATER DISCHARGE THAT OCCURS DURING NORMAL BUSINESS HOURS (AS DEFINED IN THE PERMIT) AFTER ALL CLEARING AND GRUBBING OPERATIONS HAVE BEEN COMPLETED, BUT PRIOR TO COMPLETION OF MASS GRADING OPERATIONS, IN THE DRAINAGE AREA OF THE LOCATION SELECTED AS THE SAMPLING LOCATION;

B. IN ADDITION TO (A) ABOVE, FOR EACH AREA OF THE SITE THAT DISCHARGES TO A RECEIVING WATER OR FROM AN OUTFALL, THE FIRST RAIN EVENT THAT REACHES OR EXCEEDS 0.5 INCH WITH A STORM WATER DISCHARGE THAT OCCURS DURING NORMAL BUSINESS HOURS AS DEFINED IN THIS PERMIT EITHER 90 DAYS AFTER THE FIRST SAMPLING EVENT OR AFTER ALL MASS GRADING OPERATIONS HAVE BEEN COMPLETED, BUT PRIOR TO SUBMITTAL OF A NOT, IN THE DRAINAGE AREA OF THE LOCATION SELECTED AS THE SAMPLING LOCATION, WHICHEVER COMES FIRST;

C. AT THE TIME OF SAMPLING PERFORMED PURSUANT TO (A) AND (B) ABOVE, IF BMPS IN ANY AREA OF THE SITE THAT DISCHARGES TO A RECEIVING WATER OR FROM AN OUTFALL ARE NOT PROPERLY DESIGNED, INSTALLED AND MAINTAINED, CORRECTIVE ACTION SHALL BE DEFINED AND IMPLEMENTED WITHIN TWO (2) BUSINESS DAYS, AND TURBIDITY SAMPLES SHALL BE TAKEN FROM DISCHARGES FROM THAT AREA OF THE SITE FOR EACH SUBSEQUENT RAIN EVENT THAT REACHES OR EXCEEDS 0.5 INCH DURING NORMAL BUSINESS HOURS UNTIL THE SELECTED TURBIDITY STANDARD IS ATTAINED, OR UNTIL POST-STORM EVENT INSPECTIONS DETERMINE THAT BMPS ARE PROPERLY DESIGNED, INSTALLED AND MAINTAINED.

D. WHERE SAMPLING PURSUANT TO (A), (B) OR (C) ABOVE IS REQUIRED BUT NOT POSSIBLE (OR NOT REQUIRED BECAUSE THERE WAS NO DISCHARGE), THE PERMITTEE, IN ACCORDANCE WITH PART IV.D.4.A.(6), OF THE GEORGIA GENERAL PERMIT NO. GAR100001 MUST INCLUDE WRITTEN JUSTIFICATION IN THE INSPECTION REPORT OF WHY SAMPLING WAS NOT PERFORMED. PROVIDING THIS JUSTIFICATION DOES NOT RELIEVE THE PERMITTEE OF ANY SUBSEQUENT SAMPLING OBLIGATIONS UNDER (A), (B) OR (C) ABOVE

* NOTE THE PERMITTEE MAY CHOOSE TO MEET THE REQUIREMENTS OF (A) AND (B) ABOVE BY COLLECTING TURBIDITY SAMPLES FROM ANY RAIN EVENT THAT REACHES OR EXCEEDS 0.5 INCH AND ALLOWS FOR SAMPLING AT ANY TIME OF THE DAY OR WEEK.

VI. REPORTING

A. A SUMMARY OF THE MONITORING RESULTS SHALL BE SENT TO THE EPD BY THE FIFTEENTH DAY OF THE MONTH FOLLOWING THE REPORTING PERIOD. REPORTING PERIODS ARE MONTHS DURING WHICH SAMPLES ARE TAKEN IN ACCORDANCE WITH THIS PERMIT. SAMPLING RESULTS SHALL BE IN A CLEARLY LEGIBLE FORMAT.

B. ALL WRITTEN CORRESPONDENCE REQUIRED BY THIS PERMIT SHALL BE SUBMITTED BY RETURN RECEIPT CERTIFIED MAIL (OR SIMILAR SERVICE) TO THE EPD - MOUNTAIN DISTRICT - CARTERSVILLE OFFICE [16 CENETR ROAD, CARTERSVILLE, GA 30120; (770-387-4900)]. THE PERMITTEE SHALL RETAIN A COPY OF THE PROOF OF SUBMITTAL AT THE CONSTRUCTION SITE OR THE PROOF OF SUBMITTAL SHALL BE READILY AVAILABLE AT A DESIGNATED LOCATION FROM COMMENCEMENT OF CONSTRUCTION UNTIL SUCH TIME AS A NOT IS SUBMITTED. ALL REPORTS MUST BE SIGNED IN ACCORDANCE WITH PART V.G OF GEORGIA GENERAL PERMIT NO. GAR100001.

C. RETENTION OF RECORDS

1. THE PRIMARY PERMITTEE SHALL RETAIN THE FOLLOWING RECORDS AT THE CONSTRUCTION SITE OR THE RECORDS SHALL BE READILY AVAILABLE AT A DESIGNATED ALTERNATE LOCATION FROM COMMENCEMENT OF CONSTRUCTION UNTIL SUCH TIME AS A NOT IS SUBMITTED:

A. A COPY OF THE NOI SUBMITTED TO EPD;

B. A COPY OF THE ES&PC PLANS REQUIRED BY THE PERMIT, TO BE KEPT UP TO DATE, "RED-LINED" AS APPROPRIATE AND SIGNED BY THE DESIGNER;

C. THE DESIGN PROFESSIONAL'S REPORT OF THE RESULTS OF THE INITIAL INSPECTION;

D. A COPY OF ALL MONITORING INFORMATION, RESULTS AND REPORTS REQUIRED BY THE PERMIT;

E. A COPY OF ALL INSPECTION REPORTS GENERATED IN ACCORDANCE WITH THIS PERMIT. OBSERVATIONS RELATED TO THE CONSTRUCTION ENTRANCES SHALL BE RECORDED IN AN ON-SITE CONSTRUCTION ENTRANCE AREA LOG-BOOK. REPORTS FROM BMP INSPECTIONS MADE WITHIN 24-HOURS OF EVERY 0.5-INCH RAINFALL AND AT A MINIMUM OF EVERY 7 DAYS SHALL BE RECORDED IN AN ON-SITE BMP INSPECTION LOG-BOOK;

F. A COPY OF ALL VIOLATIONS AND ASSOCIATED SUMMARY REPORTS GENERATED IN ACCORDANCE WITH THE PERMIT; AND

G. DAILY RAINFALL INFORMATION COLLECTED IN ACCORDANCE WITH THE PERMIT. MEASURED RAINFALL SHALL BE RECORDED IN AN ON-SITE DAILY RAINFALL LOG-BOOK.

2. COPIES OF ALL NOTICES OF INTENT, NOTICES OF TERMINATION, REPORTS, PLANS, MONITORING REPORTS, MONITORING INFORMATION, INCLUDING ALL CALIBRATION AND MAINTENANCE RECORDS AND ALL ORIGINAL STRIP CHART RECORDINGS FOR CONTINUOUS MONITORING INSTRUMENTATION, EROSION, SEDIMENTATION AND POLLUTION CONTROL PLANS, RECORDS OF ALL DATA USED TO COMPLETE THE NOTICE OF INTENT TO BE COVERED BY THIS PERMIT AND ALL OTHER RECORDS REQUIRED BY THIS PERMIT SHALL BE RETAINED BY THE PERMITTEE WHO EITHER PRODUCED OR USED IT FOR A PERIOD OF AT LEAST THREE YEARS FROM THE DATE THAT THE SITE IS FINALLY STABILIZED. THESE RECORDS MUST BE MAINTAINED AT THE PERMITTEE'S PRIMARY PLACE OF BUSINESS ONCE THE CONSTRUCTION ACTIVITY HAS CEASED AT THE PERMITTED SITE.

D. KEEPING PLANS CURRENT - THE PRIMARY PERMITTEE SHALL AMEND THE PLAN WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, WHICH HAS A SIGNIFICANT EFFECT ON BMPS WITH A HYDRAULIC COMPONENT (I.E., THOSE BMPS WHERE THE DESIGN IS BASED UPON RAINFALL INTENSITY, DURATION AND RETURN FREQUENCY OF STORMS) OR IF THE PLAN PROVES TO BE INEFFECTIVE IN ELIMINATING OR SIGNIFICANTLY MINIMIZING POLLUTANTS FROM SOURCES IDENTIFIED IN THE PLAN. AMENDMENTS/REVISIONS TO THE ES&PC PLAN WHICH HAVE A SIGNIFICANT EFFECT ON BMPS WITH A HYDRAULIC COMPONENT MUST BE CERTIFIED BY THE DESIGN PROFESSIONAL.

## EROSION, SEDIMENTATION & POLLUTION CONTROL PLAN CHECKLIST
## STAND ALONE GUIDANCE CONSTRUCTION PROJECTS GAR100001

**SWCD:** REGION 1 - LIMESTONE VALLEY
**Project Name:** LAKE PETIT DAM - OVERFLOW SPILLWAY REDESIGN **Address:** 10586 BIG CANOE, JASPER, GA 30143
**Local Issuing Authority:** PICKENS COUNTY **Date on Plans:**______
**Name & Email of person filling out checklist:** SHAURYA SOOD, SSOOD@GEOSYNTEC.COM

**TO BE SHOWN ON ES&PC PLAN**

| Plan Page # | Included Y/N | Item |
|---|---|---|
| 18 | Y | 1 The applicable Erosion, Sedimentation and Pollution Control Plan Checklist established by the Commission as of January 1 of the year in which the land-disturbing activity was permitted. The completed Checklist must be submitted with the ES&PC Plan or the Plan will not be reviewed. **Permit IV.D.1. pg 27** |
| 11 - 18 | Y | 2 Level II certification number issued by the Commission, signature and seal of the certified design professional. Signature, seal and Level II number must be on each sheet pertaining to ES&PC Plan or the Plan will not be reviewed. The Level II certification must be issued to the Design Professional, **after completion of a GSWCC approved course**, and whose signature and seal are on the Plan. |
| - | N/A | 3 Limits of disturbance shall be **less than** 50 acres at any one time without prior written authorization from the GAEPD District Office. If GAEPD approves the request to disturb 50 acres or more at any one time, the Plan must include the GAEPD approval letter and completed Appendix 1 of this checklist with at least 4 of the chosen BMPs. * A copy of the written approval by GAEPD must be attached to the Plan for the Plan to be reviewed. **Permit IV.D.3. pg 28** |
| 1 | Y | 4 The name and phone number of the 24-hour contact responsible for erosion, sedimentation and pollution controls. |
| 17 | Y | 5 Provide the name, address, email address, and phone number of Primary Permittee. |
| 17 | Y | 6 Note total and disturbed acreages of the project or phase under construction. |
| 17 | Y | 7 Provide the GPS location of the construction exit for the site. Give the Latitude and Longitude in decimal degrees. |
| All | Y | 8 Initial date of the Plan and the dates of any revisions made to the Plan including the entity who requested the revisions. |
| 17 | Y | 9 Descriptions of the nature of construction activity and existing site conditions. |
| 1 | Y | 10 Provide vicinity map showing site's relation to surrounding areas. Include designation of specific phase, if necessary. |
| 17 | Y | 11 Identify the project receiving waters and describe all sensitive adjacent areas including streams, lakes, residential areas, wetlands, marshlands, etc. which may be affected. |
| 17 | Y | 12 Design professional's certification statement and signature that the site was visited prior to development of the ES&PC Plan as stated on **Part IV page 20** of the permit. |
| 17 | Y | 13 Design professional's certification statement and signature that the Permittee's ES&PC Plan provides for an appropriate and comprehensive system of BMPs and sampling to meet permit requirements as stated on **Part IV page 20** of the permit. * |
| 17 | Y | 14 Clearly note the statement that "The design professional who prepared the ES&PC Plan is to inspect **and certify** the installation of the initial sediment storage requirements and perimeter control BMPs within 7 days after installation." * |
| 17 | Y | 15 Clearly note the statement that "Non-exempt activities shall not be conducted within the 25 or 50-foot undisturbed stream buffers as measured from the point of wrested vegetation or within 25-feet of the coastal marshland buffer as measured from the Jurisdictional Determination Line without first acquiring the necessary variances and permits." |
| | | 16 Provide a description of any buffer encroachments and indicate whether a buffer variance is required. |
| 18 | Y | 17 Clearly note the statement that "Amendments/revisions to the ES&PC Plan which have a significant effect on BMPs with a hydraulic component must be certified by the design professional." * |
| 17 | Y | 18 Clearly note the statement that "Waste materials shall not be discharged to waters of the State, except as authorized by a Section 404 permit." * |
| 17 | Y | 19 Clearly note statement that "The escape of sediment from the site shall be prevented by the installation of erosion and sediment control measures and practices prior to land disturbing activities." |
| 17 | Y | 20 Clearly note statement that "Erosion control measures will be maintained at all times. If full implementation of the approved Plan does not provide for effective erosion control, additional erosion and sediment control measures shall be implemented to control or treat the sediment source." |
| 17 | Y | 21 Clearly note the statement "Any disturbed area left exposed for a period greater than 14 days shall be stabilized with mulch or temporary seeding." |
| - | N/A | 22 Any construction activity which discharges storm water into a Biota Impaired Stream Segment, or within 1 linear mile upstream of and within the same watershed as any portion of a Biota Impaired Stream Segment, must comply with **Part III.C.** of the permit. Include the completed Appendix 1 of this checklist with at least 4 of the chosen BMPs that will be used for those areas of the site which discharge to the Impaired Stream Segment. * |
| - | N/A | 23 If a TMDL Implementation Plan for sediment has been finalized for the Biota Impaired Stream Segment (identified in Item 22 above) at least six months prior to submittal of NOI, the ES&PC Plan must address any site-specific conditions or requirements included in the TMDL Implementation Plan. * |
| 17 | Y | 24 BMPs for concrete washdown of tools, concrete mixer chutes, hoppers and the rear of the vehicles. Include statement that washout of the drum at the construction site is prohibited. * |
| 17 | Y | 25 Provide BMPs for the remediation of all petroleum spills and leaks. |
| 17 | Y | 26 Description of the measures that will be installed during the construction process to control pollutants in storm water that will occur after construction operations have been completed. * |
| 17 | Y | 27 Description of practices to provide cover for building materials and building products on site. * |
| 17 | Y | 28 Description of the practices that will be used to reduce the pollutants in storm water discharges. * |
| | | 29 Description and chart or timeline of the intended sequence of major activities which disturb soils for the major portions of the site (i.e., initial perimeter and sediment storage BMPs, clearing and grubbing activities, excavation activities, utility activities, grading, infrastructure, temporary and final stabilization). |
| 17 - 18 | Y | 30 Provide complete requirements of Inspections and record keeping by the Primary Permittee. * |
| 18 | Y | 31 Provide complete requirements of Sampling Frequency and Reporting of sampling results. * |
| 18 | Y | 32 Provide complete details for Retention of Records as per **Part IV.F.** of the permit. * |
| 17 - 18 | Y | 33 Description of analytical methods to be used to collect and analyze the samples from each location. * |
| - | N/A | 34 Appendix B rationale for NTU values at all outfall sampling points where applicable. * |
| 11 - 13 | Y | 35 Delineate all sampling locations on **all phases of** the Plan, and perennial and intermittent streams and other water bodies into which storm water is discharged. * |
| 11 - 13 | Y | 36 A description of appropriate controls and measures that will be implemented at the construction site including: (1) initial sediment storage requirements and perimeter control BMPs, (2) intermediate grading and drainage BMPs, and (3) final BMPs. For construction sites where there will be no mass grading and the initial sediment storage requirements and initial perimeter control BMPs, intermediate grading and drainage BMPs, and final BMPs are the same, the Plan may combine all BMPs into a single |
| 1, 11 - 13 | Y | 37 Graphic scale and North arrow. |
| 1, 11 - 13 | Y | 38 Existing and proposed contour lines with contour lines drawn at an interval in accordance with the following: |

| Map Scale | Ground Slope | Contour Intervals, ft. |
|---|---|---|
| 1 inch = 100ft or larger scale | Flat 0 - 2% | 0.5 or 1 |
| | Rolling 2 - 8% | 1 or 2 |
| | Steep 8% + | 2, 5 or 10 |

| Plan Page # | Included Y/N | Item |
|---|---|---|
| 17 | Y | 39 Use of Alternative BMPs whose performance has been documented to be equivalent to or superior to conventional BMPs as certified by a Design Professional (unless disapproved by GAEPD or the Georgia Soil and Water Conservation Commission). Refer to the Alternative BMP Guidance Document found at www.gaswcc.georgia.gov. |
| 17 | Y | 40 Use of Alternative BMP for application to the Equivalent BMP List. Refer to Appendix A-2 of the Manual for Erosion & Sediment Control in Georgia 2016 Edition. * |
| | | 41 Delineation of the applicable 25-foot or 50-foot undisturbed buffers adjacent to State Waters and any additional buffers as required by the Local Issuing Authority. Clearly note and delineate all areas of impact. |
| 11 - 13 | Y | 42 Delineation of all State Waters and wetlands located on or within 200 feet of the project site. |
| | | 43 Delineation and acreage of contributing drainage basins on the project site. |
| | | 44 Provide hydrology study and maps of drainage basins for both the pre- and post-developed conditions. * |
| 17 | Y | 45 Estimate of the runoff coefficient or peak discharge flow of the site prior to and after construction activities are completed. **For solar farm projects, post-construction impervious area shall be calculated as 70% of total solar panel square footage.** |
| | | 46 Storm-drain pipe and weir velocities with appropriate outlet protection to accommodate discharges without erosion. Identify/Delineate at all storm water discharge points. |
| 18 | Y | 47 Soil series for the project site and their delineation. |
| 11 - 13 | Y | 48 The limits of disturbance for each phase of construction. |
| 17 | Y | 49 Provide a minimum of 67 cubic yards of sediment storage per acre drained using a temporary sediment basin, retrofitted detention pond, and/or excavated inlet sediment traps for each common drainage location. Sediment storage volume must be in place prior to and during all land disturbance activities until final stabilization of the site has been achieved. A written justification explaining the decision to use equivalent controls when a sediment basin is not attainable must be included in the Plan for each common drainage location in which a sediment basin is not provided. A written justification as to why 67 cubic yards of storage is not attainable must also be given. Worksheets from the Manual must be included for structural BMPs and all calculations used by the design professional to obtain the required sediment storage when using equivalent controls. When discharging from sediment basins and impoundments, Permittees are required to utilize outlet structures that withdraw water from the surface, unless infeasible. If outlet structures that withdraw water from the surface are not feasible, a written justification explaining this |
| 11 - 13 | Y | 50 Location of Best Management Practices that are consistent with, and no less stringent than, the Manual for Erosion and Sediment Control in Georgia. Use uniform coding symbols from the Manual Chapter 6, with legend. |
| 14 - 16 | Y | 51 Provide detailed drawings for all structural practices. Specifications must, at a minimum, meet the guidelines set forth in the Manual for Erosion and Sediment Control in Georgia. |
| 16 | Y | 52 Provide vegetative plan, noting all temporary and permanent vegetative practices. Include species, planting dates and seeding, fertilizer, lime and mulching rates. Vegetative plan shall be site specific for appropriate time of year that seeding will take place and for the appropriate geographic region of Georgia. |

*** If using this checklist for a project that is less than 1 acre and not part of a common development but within 200 ft of a perennial stream, the * checklist items would be N/A.**

**Effective January 1, 2025**

Soil Map—Cherokee, Gilmer, and Pickens Counties, Georgia
(LOD 01-13-25)


Map Scale: 1:1,730 if printed on A landscape (11" x 8.5") sheet.
0 25 50 100 150 Meters
0 50 100 200 300 Feet
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

**Natural Resources Conservation Service** — Web Soil Survey, National Cooperative Soil Survey — 1/14/2025, Page 1 of 3

### Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| TbF | Tallapoosa cobbly sandy loam, 25 to 60 percent slopes | 3.9 | 81.4% |
| TmE | Tusquitee stony loam, 10 to 25 percent slopes | 0.9 | 18.6% |
| **Totals for Area of Interest** | | **4.8** | **100.0%** |

11 / 11 TABLE
EROSION & SEDIMENT CONTROL CHECKLIST
SOURCE: GSWCC

FOR REVIEW PURPOSES ONLY
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| REV | DATE | DESCRIPTION | DRN | APP |
|---|---|---|---|---|
| 0 | XXX | XXX | XXX | XXX |



DESIGN BY: JWB
DRAWN BY: KL
CHECKED BY: SS
REVIEWED BY: JA
APPROVED BY: JWB

TITLE: EROSION & SEDIMENT CONTROL NOTES II
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT
SITE: TJD10771 LAKE PETIT SPWY JASPER, GEORGIA

Big Canoe POA

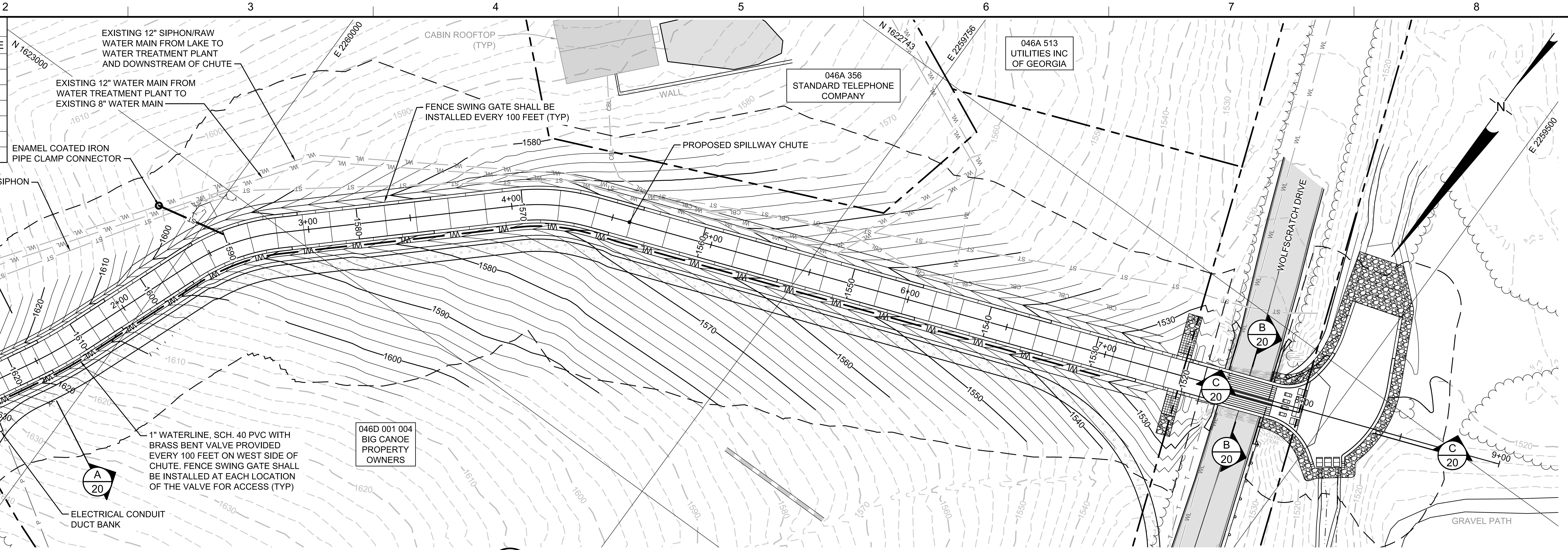
Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

DATE: FEBRUARY 2025
PROJECT NO.: TJD10771
FILE: TJD10771.01 C18
SHEET NO.: 18 OF 41

C:_GEO-ACCACODOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CAD\01_SPILLWAY DESIGN\DWG\SHEETS\TJD10771.01 C18

## RIPRAP DRAINAGE DITCH TABLE

| SEGMENT | H | WIDTH | START STATION | END STATION | CHUTE SIDE |
|---|---|---|---|---|---|
| A | 12" | 4' | 0+88.42 | 2+42.63 | WEST |
| B | 15" | 5' | 2+42.63 | 4+52.50 | WEST |
| C AND D | 18" | 7' | 4+52.50 | 7+29.13 | WEST |
| D | 21" | 7' | 7+29.13 | 7+34.13 | WEST |
| E | 15" | 3' | 0+88.42 | 2+12.32 | EAST |
| F | 18" | 6' | 2+12.32 | 3+77.28 | EAST |
| G AND H | 21" | 7' | 3+77.28 | 7+34.13 | EAST |




1 / 19 PLAN
OVERALL SPILLWAY CHUTE
SCALE: 1" = 30'


1 / 19 PROFILE
OVERALL SPILLWAY CHUTE
SCALE: 1" = 30'

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025

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| DESIGN BY: | JWB |
| DRAWN BY: | TW/TR |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: FINAL CHUTE PLAN AND PROFILE

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
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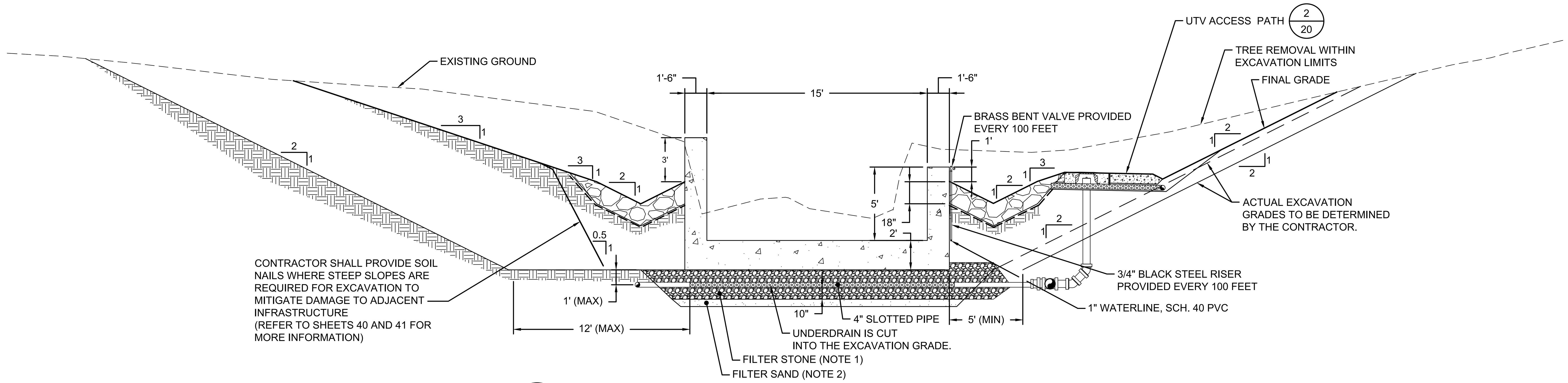
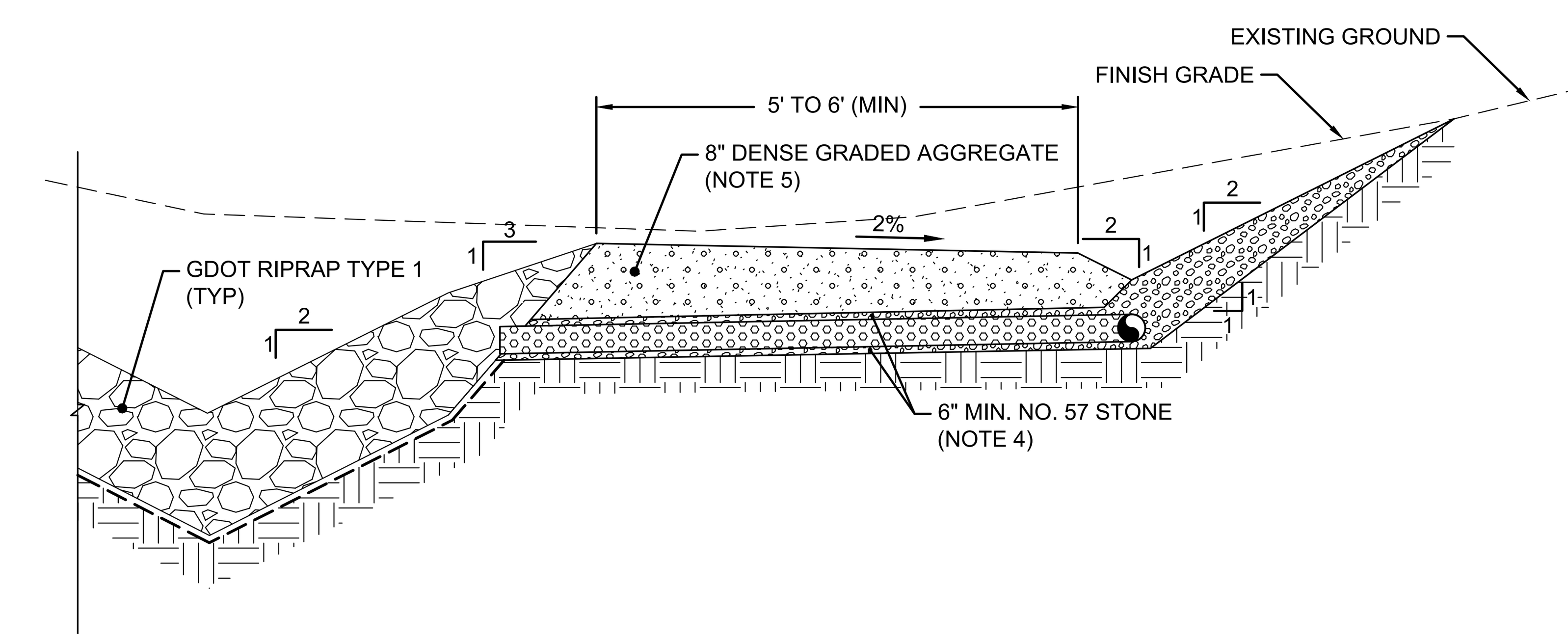
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C19 |
| SHEET NO.: | 19 OF 41 |



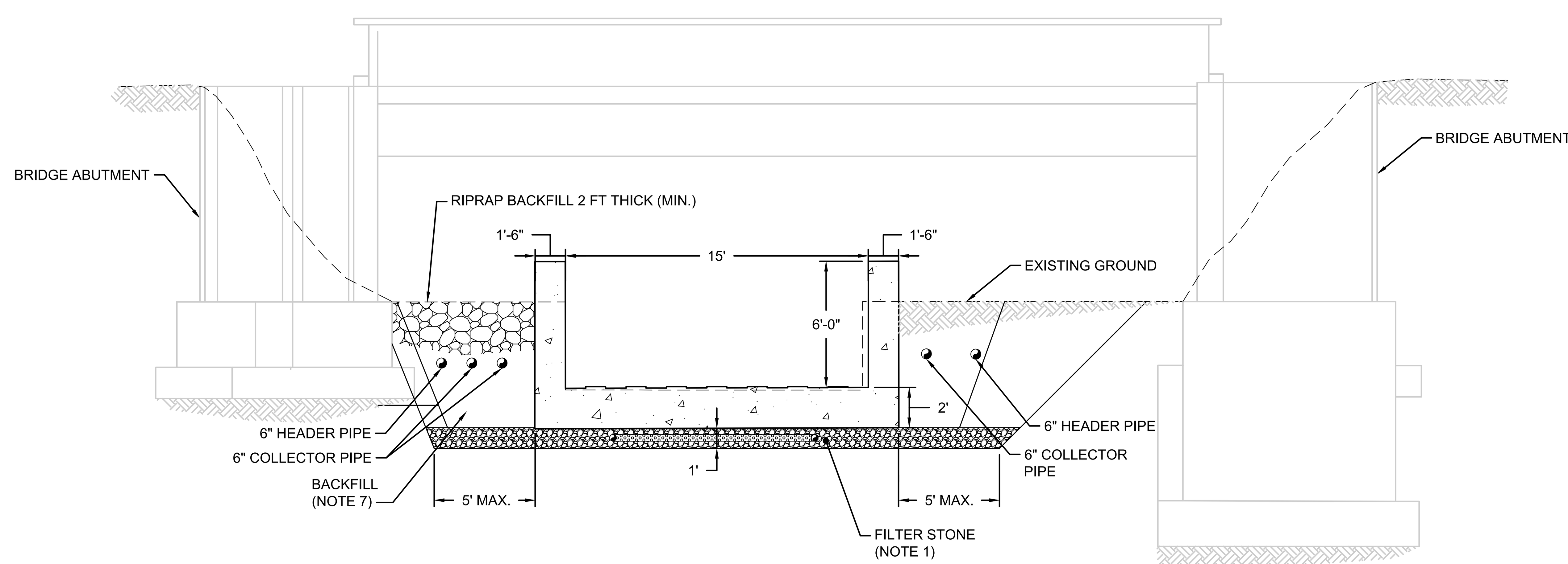

A/19 SECTION
TYPICAL EXCAVATION - UPPER SPILLWAY CHUTE

SCALE: 1" = 5'



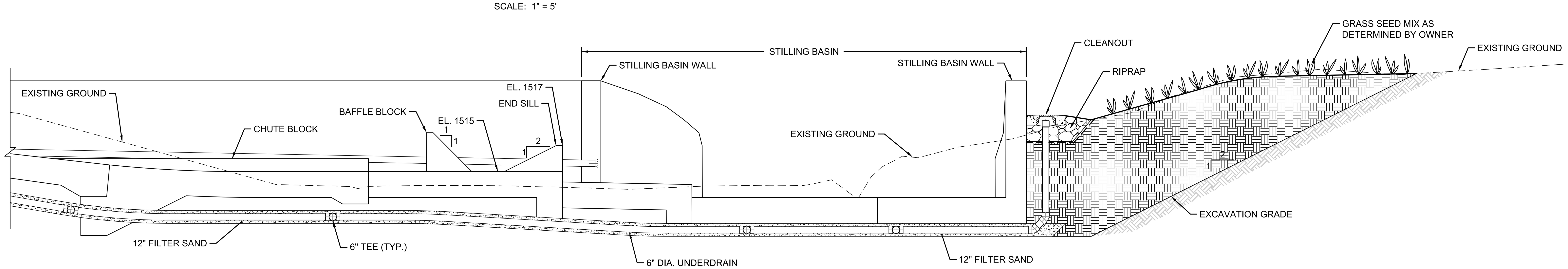

2/20 DETAIL
UTV ACCESS PATH

SCALE: 1" = 2'




B/19 SECTION
TYPICAL EXCAVATION - LOWER SPILLWAY CHUTE

SCALE: 1" = 5'




C/19 SECTION
TYPICAL EXCAVATION - STILLING BASIN

SCALE: 1" = 5'

NOTES:

1. FILTER STONE SHALL MEET THE REQUIREMENTS OF GDOT 800 FOR COARSE AGGREGATE SIZE NO. 89.
2. FILTER SAND SHALL MEET THE REQUIREMENTS OF GDOT 801 AND GRADATION OF ASTM C-33.
3. GRANULAR MATERIALS SHALL BE FREE OF SOLUBLE MATERIALS, ORGANICS, TOPSOIL, AND CONTAMINANTS.
4. NO. 57 STONE SHALL MEET THE REQUIREMENTS OF GDOT 800 FOR COARSE AGGREGATE SIZE NO. 57.
5. DENSE GRADED AGGREGATE SHALL MEET THE REQUIREMENTS OF GDOT SECTION 815 AND BE INSTALLED ACCORDING TO GDOT SECTION 310.
6. CONTRACTOR SHALL SUBMIT SAMPLE OF EACH GRANULAR MATERIAL OR AGGREGATE AND SUPPLIER'S CERTIFICATION OF MATERIAL FOR ENGINEER APPROVAL PRIOR TO INSTALLATION.
7. BACKFILL BETWEEN MINIMUM THICKNESS OF COARSE FILTER AND RIPRAP MAY BE RIPRAP OR NO. 57 STONE. CONTRACTOR SHALL PREVENT DAMAGE TO SPILLWAY AND BRIDGE DURING BACKFILL PLACEMENT.

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| DRAWN BY: | KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: EXCAVATION DETAILS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C20 |
| SHEET NO.: | 20 OF 41 |

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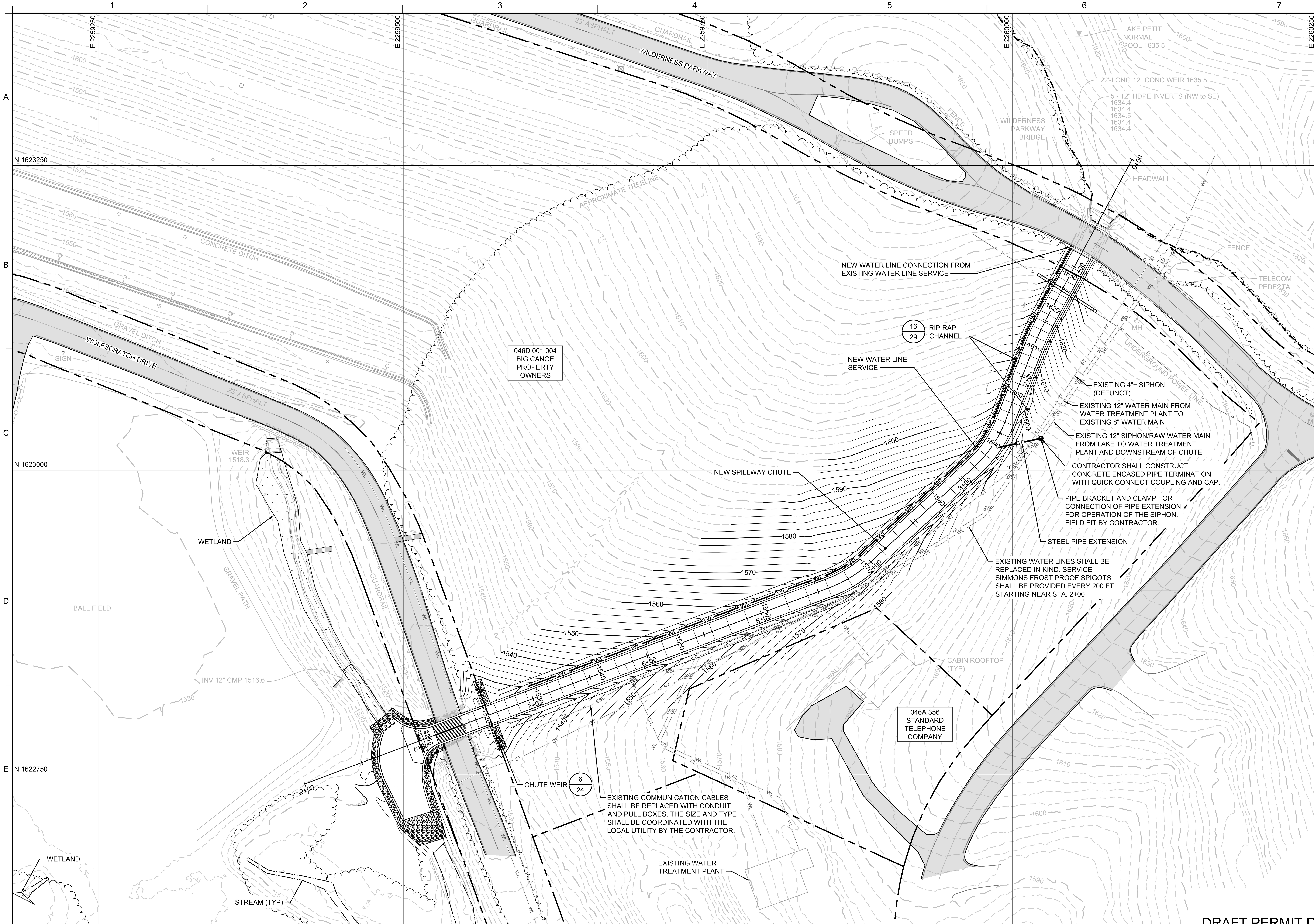


## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- 1570 — FINISHED GRADE SURFACE ELEVATION (FEET)
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- WL — PROPOSED WATER LINE SERVICE
- STREAM
- PROPOSED UTV ACCESS TRAIL
- WETLAND

NOTES:

1. FOR GENERAL NOTES SEE SHEET 2.

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| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: FINAL SITE PLAN

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500 CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C21 |
| SHEET NO.: | 21 OF 41 |

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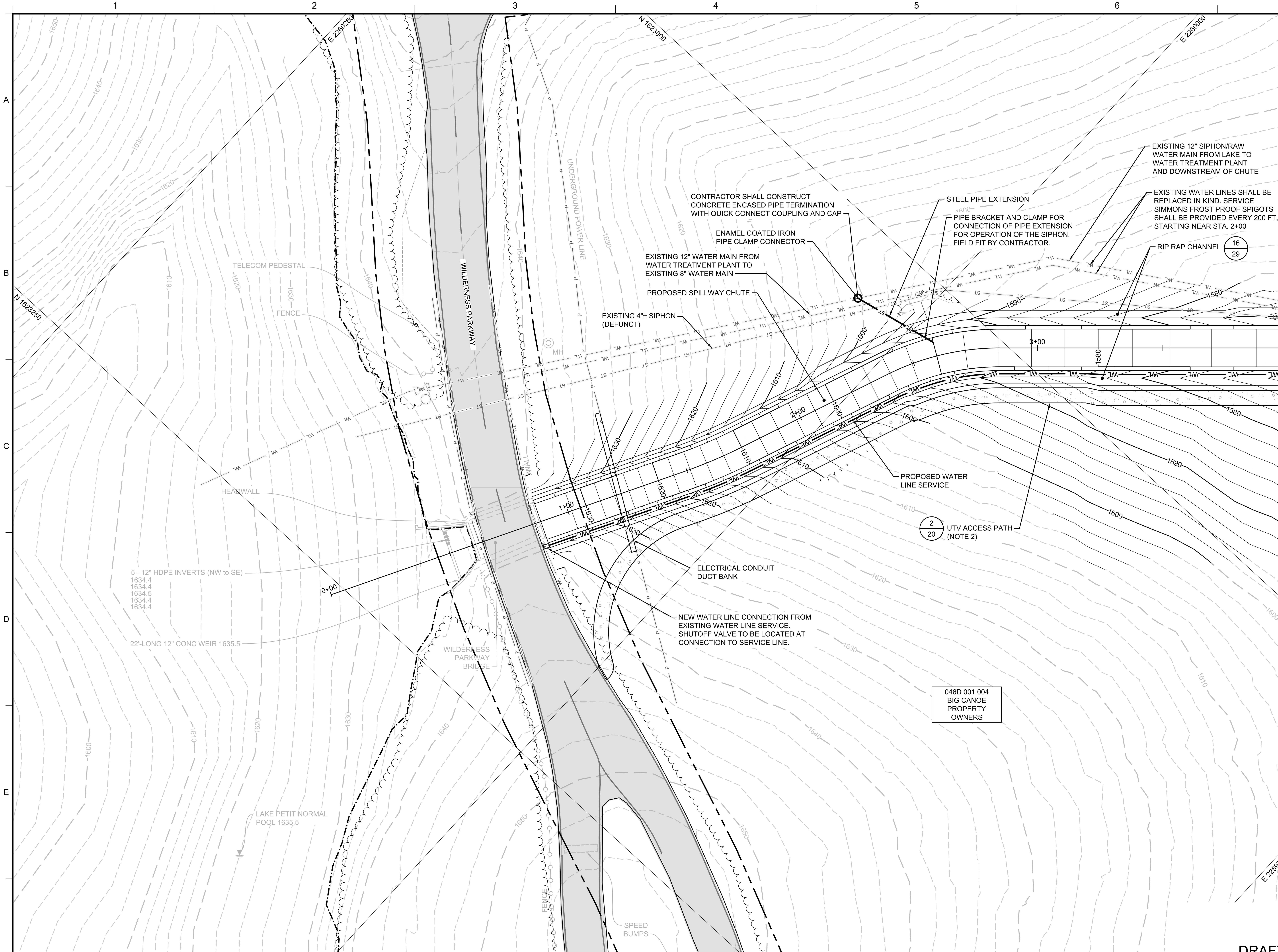


0 20 40
SCALE IN FEET

## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
- EXISTING PAVED ROAD
- EXISTING CURRENT BORINGS
- P — EXISTING UNDERGROUND POWER LINE
- T — EXISTING UNDERGROUND TELEPHONE LINE
- CBL — EXISTING UNDERGROUND CABLE TRANSMISSION LINE
- WL — EXISTING WATER LINE
- ST — EXISTING 4"± SIPHON (DEFUNCT)
- EXISTING STORM DRAIN CULVERT
- PROPERTY BOUNDARY
- 1570 — FINISHED GRADE SURFACE ELEVATION (FEET)
- ST — PROPOSED PUMP/SIPHON DISCHARGE
- WL — PROPOSED WATER LINE SERVICE
- STREAM
- ACCESS TRAIL
- WETLAND

NOTES:

1. FOR GENERAL NOTES SEE SHEET 2.
2. GRADES SHOWN FOR THE GRAVEL UTV PATH ARE APPROXIMATE. THE ACTUAL LAYOUT AND GRADES SHALL FOLLOW THE RIPRAP CHANNEL. UNDERDRAINS SHALL BE PROVIDED EVERY 50 FEET. A CONTINUOUS UPHILL DRAIN SHALL BE PROVIDED WITHIN #57 STONE, AND SHALL RUN CONTINUOUSLY. RELATIVELY FLAT OR SMALL DEPRESSIONS IDENTIFIED SHALL HAVE ADDITIONAL TRANSVERSE DRAIN CROSSING THE PATH.

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| DRAWN BY: | TW |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: FINAL SITE AND GRADING PLAN 1 OF 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C22 |
| SHEET NO.: | 22 OF 41 |

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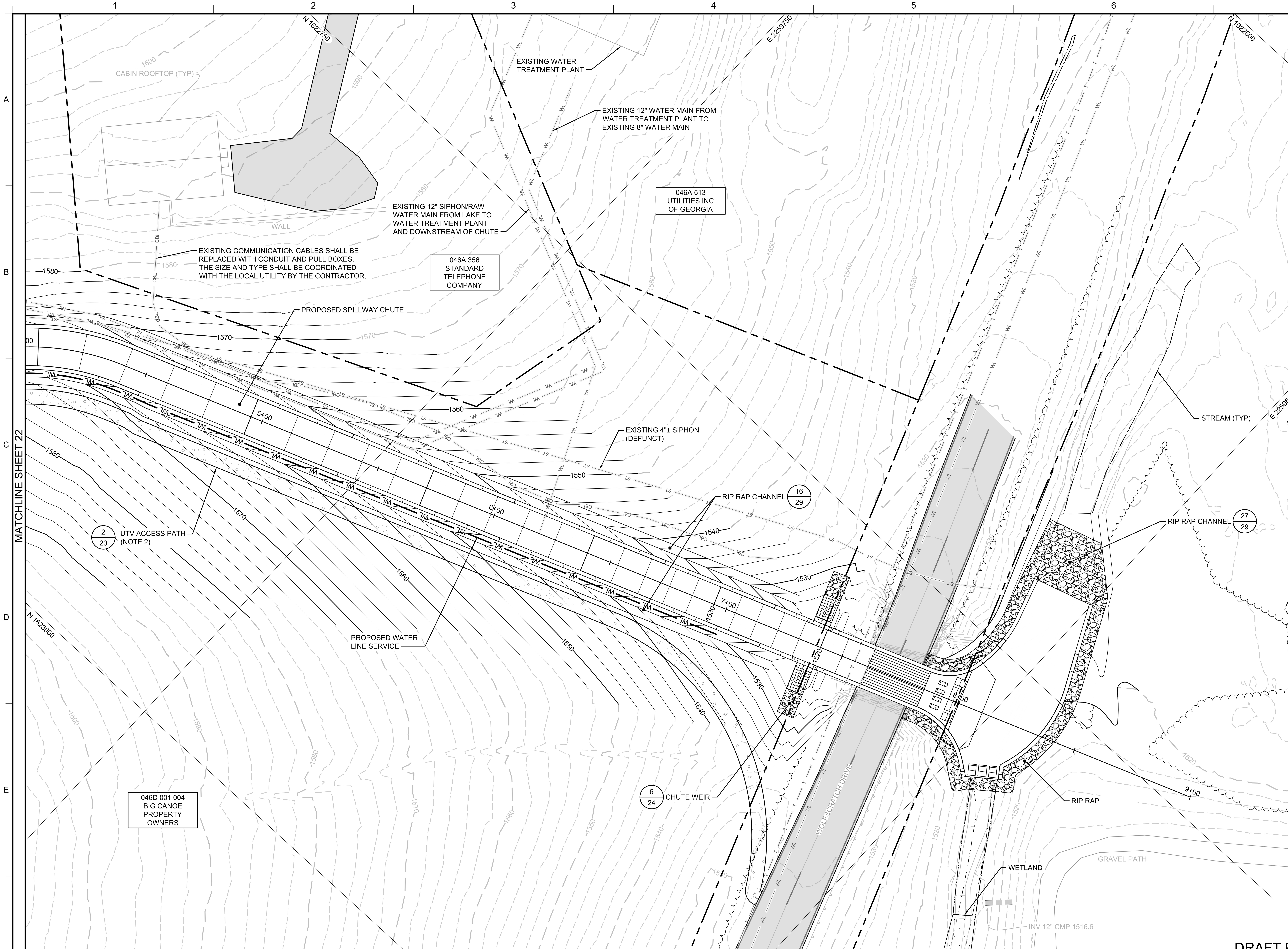


0 20 40
SCALE IN FEET

## LEGEND

- 1650 — EXISTING GROUND ELEVATION (FEET)
- EXISTING LAKE SHORELINE
- EXISTING CREEK SHORELINE
- EXISTING VEGETATION
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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025



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| DRAWN BY: | TW |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: FINAL SITE AND GRADING PLAN 2 OF 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C23 |
| SHEET NO.: | 23 OF 41 |

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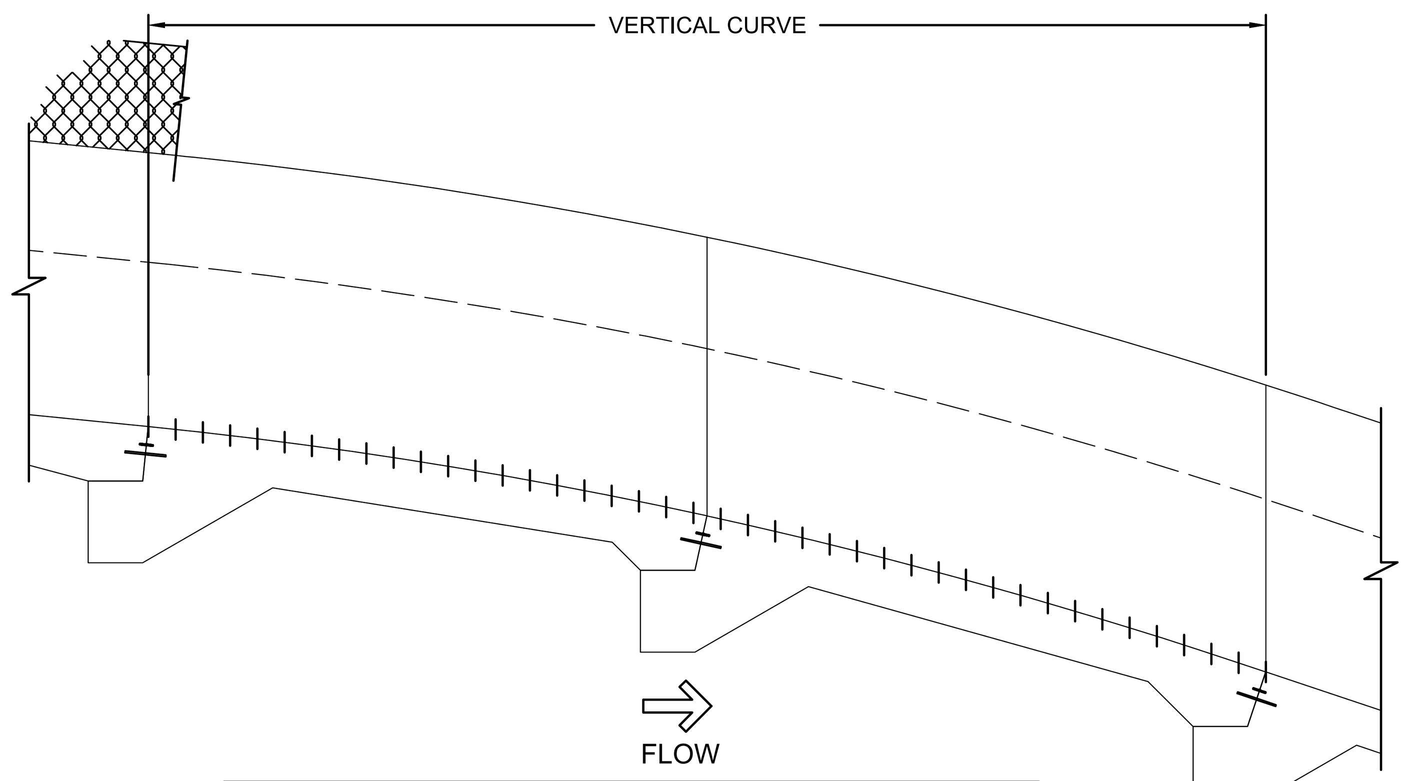
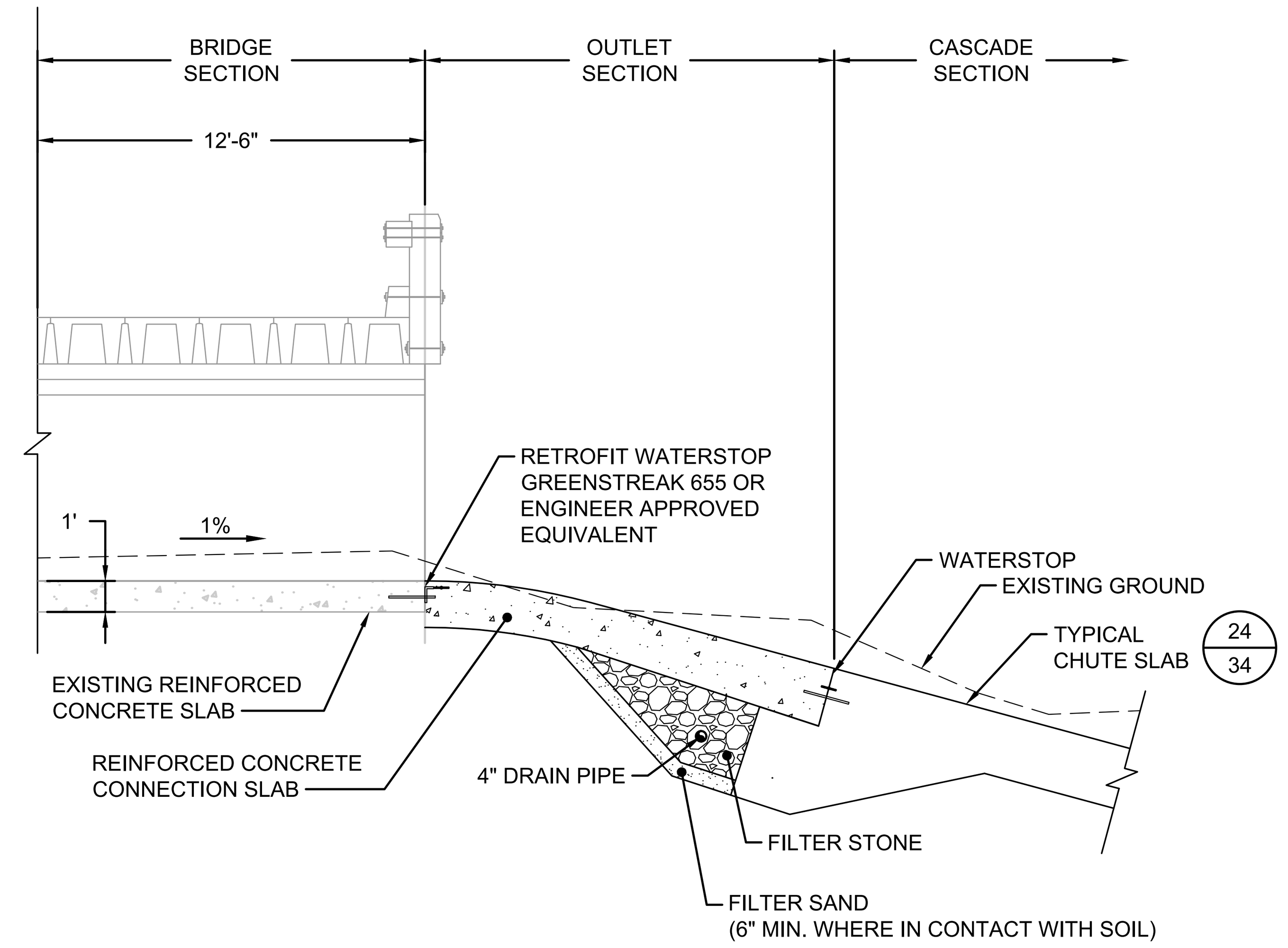
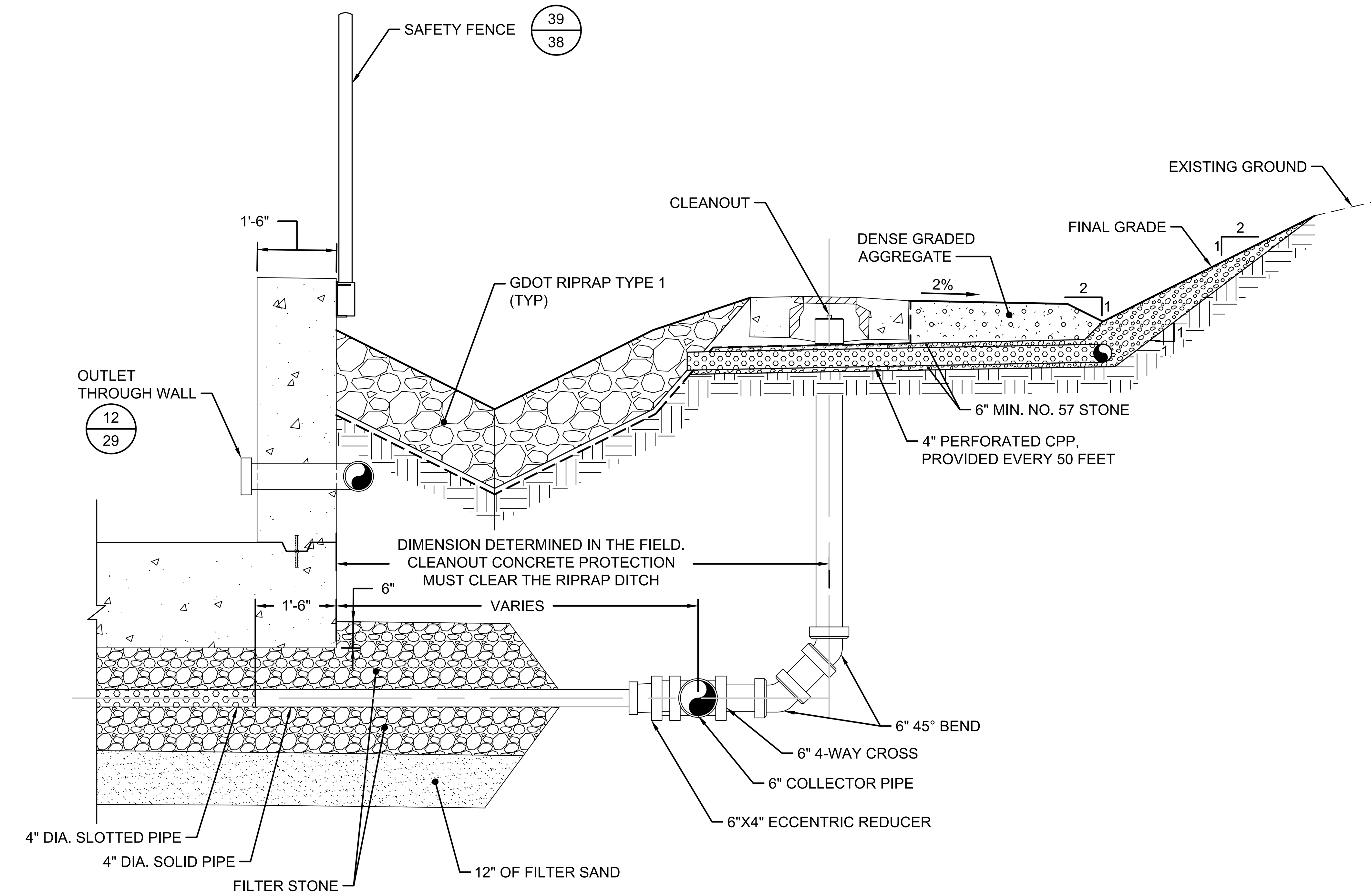



| VERTICAL CURVE LAYOUT DETAILS | | | |
|---|---|---|---|
| Station Range: Start: 0+88.42, End: 8+00.30 | | | |
| Vertical Curve Information:(crest curve) | | | |
| PVC Station: | 0+91.81 | Elevation: | 1,633.587' |
| PVI Station: | 0+96.81 | Elevation: | 1,633.537' |
| PVT Station: | 1+01.81 | Elevation: | 1,631.880' |
| High Point: | 0+91.81 | Elevation: | 1,633.587' |
| Grade in: | -1.00% | Grade out: | -33.14% |
| Change: | 32.14% | K: | 0.311' |
| Curve Length: | 10.000' | Curve Radius | 31.114' |
| Vertical Curve Information:(sag curve) | | | |
| PVC Station: | 1+26.62 | Elevation: | 1,623.660' |
| PVI Station: | 1+51.62 | Elevation: | 1,615.375' |
| PVT Station: | 1+76.62 | Elevation: | 1,609.275' |
| Low Point: | 1+76.62 | Elevation: | 1,609.275' |
| Grade in: | -33.14% | Grade out: | -24.40% |
| Change: | 8.74% | K: | 5.720' |
| Curve Length: | 50.000' | Curve Radius | 572.001' |
| Vertical Curve Information:(sag curve) | | | |
| PVC Station: | 2+27.15 | Elevation: | 1,596.947' |
| PVI Station: | 2+52.15 | Elevation: | 1,590.847' |
| PVT Station: | 2+77.15 | Elevation: | 1,587.083' |
| Low Point: | 2+77.15 | Elevation: | 1,587.083' |
| Grade in: | -24.40% | Grade out: | -15.06% |
| Change: | 9.34% | K: | 5.351' |
| Curve Length: | 50.000' | Curve Radius | 535.138' |
| Vertical Curve Information:(sag curve) | | | |
| PVC Station: | 3+24.56 | Elevation: | 1,579.945' |
| PVI Station: | 3+49.56 | Elevation: | 1,576.181' |
| PVT Station: | 3+74.56 | Elevation: | 1,573.403' |
| Low Point: | 3+74.56 | Elevation: | 1,573.403' |
| Grade in: | -15.06% | Grade out: | -11.11% |
| Change: | 3.94% | K: | 12.678' |
| Curve Length: | 50.000' | Curve Radius | 1,267.828' |
| Vertical Curve Information:(crest curve) | | | |
| PVC Station: | 4+97.72 | Elevation: | 1,559.717' |
| PVI Station: | 5+22.72 | Elevation: | 1,556.939' |
| PVT Station: | 5+47.72 | Elevation: | 1,553.334' |
| High Point: | 4+97.72 | Elevation: | 1,559.717' |
| Grade in: | -11.11% | Grade out: | -14.42% |
| Change: | 3.31% | K: | 15.112' |
| Curve Length: | 50.000' | Curve Radius | 1,511.194' |
| Vertical Curve Information:(crest curve) | | | |
| PVC Station: | 6+40.69 | Elevation: | 1,539.928' |
| PVI Station: | 6+65.69 | Elevation: | 1,536.323' |
| PVT Station: | 6+90.69 | Elevation: | 1,530.879' |
| High Point: | 6+40.69 | Elevation: | 1,539.928' |
| Grade in: | -14.42% | Grade out: | -21.77% |
| Change: | 7.35% | K: | 6.799' |
| Curve Length: | 50.000' | Curve Radius | 679.900' |
| Vertical Curve Information:(sag curve) | | | |
| PVC Station: | 7+51.12 | Elevation: | 1,517.722' |
| PVI Station: | 7+63.62 | Elevation: | 1,515.000' |
| PVT Station: | 7+76.12 | Elevation: | 1,515.000' |
| Low Point: | 7+76.12 | Elevation: | 1,515.000' |
| Grade in: | -21.77% | Grade out: | 0.00% |
| Change: | 21.77% | K: | 1.148' |
| Curve Length: | 25.000' | Curve Radius | 114.814' |

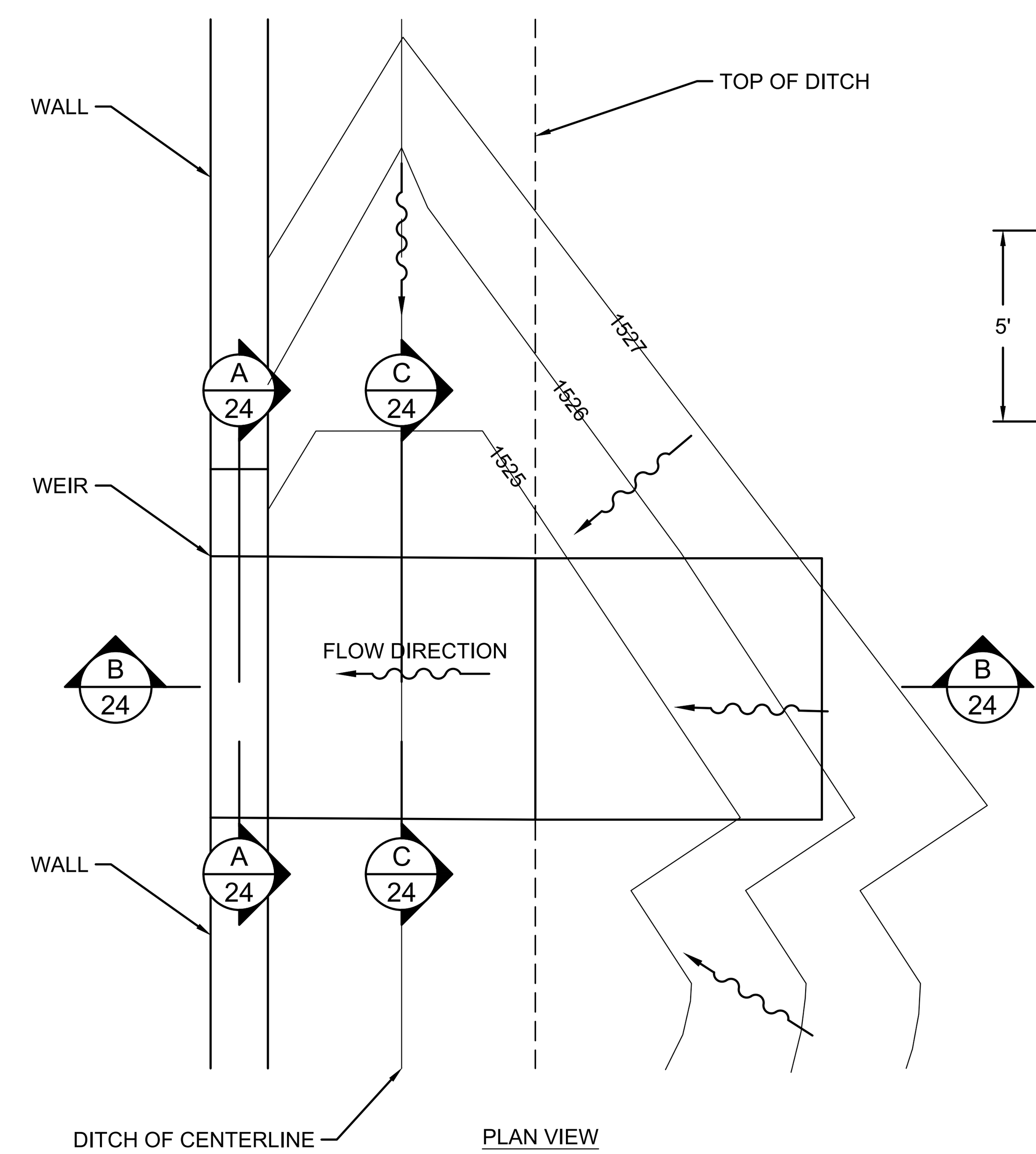
3 / 24 DETAIL
## SPILLWAY VERTICAL CURVE LAYOUT
SCALE: 1" = 1'

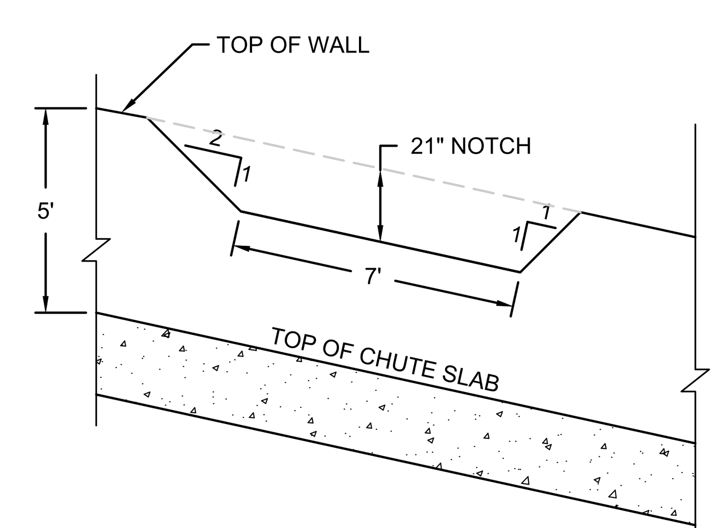



4 / 24 DETAIL
## PROFILE ALONG SPILLWAY CHANNEL AT CREST
SCALE: 1" = 1'

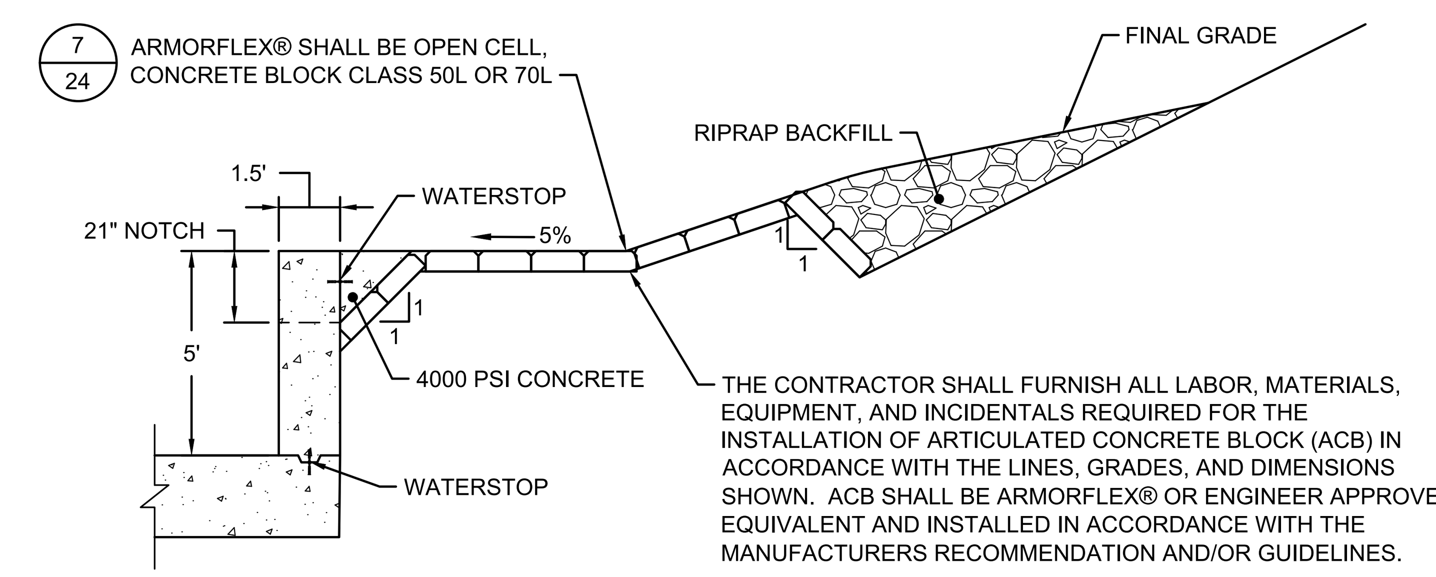



5 / 24 DETAIL
## SPILLWAY WALL DRAIN
SCALE: 1" = 1'

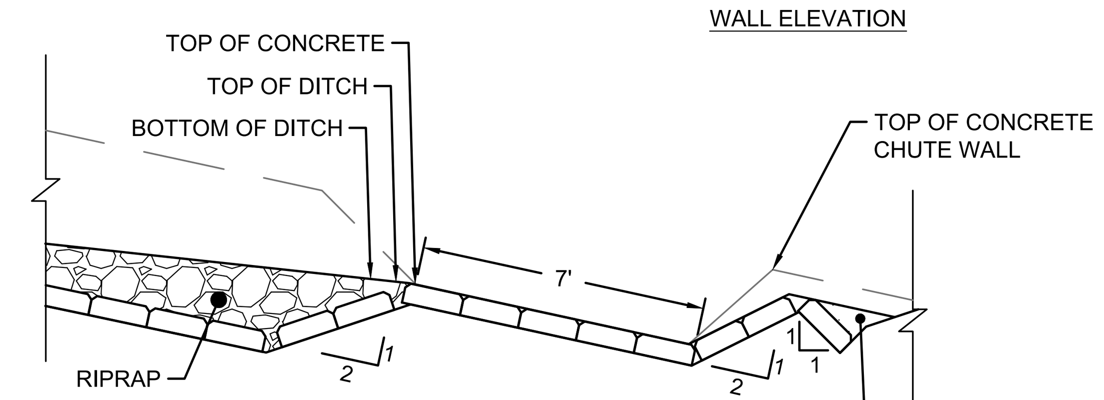



SECTION A-A
WALL ELEVATION

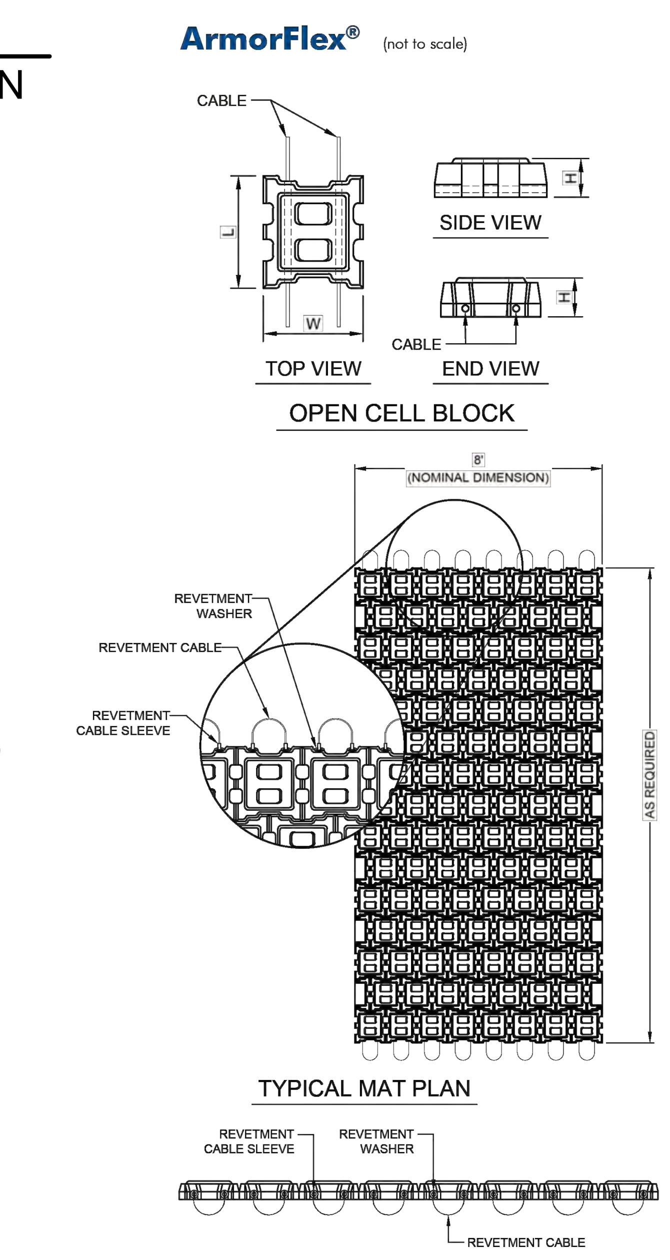



SECTION B-B
WALL ELEVATION




SECTION C-C
SECTION THROUGH ARMOR

6 / 23 DETAIL
## CHUTE WEIR
SCALE: 1" = 4'




7 / 23 DETAIL
## ARMORFLEX
SCALE: N.T.S.

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025



| | |
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| DESIGN BY: | JWB |
| DRAWN BY: | TW/KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CHUTE DETAILS
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT
SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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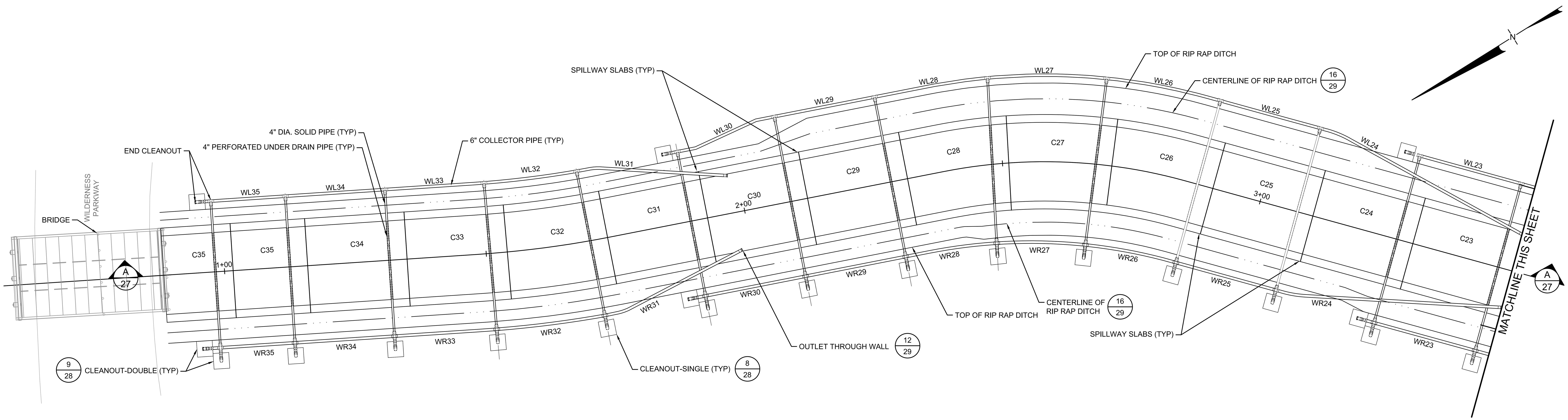
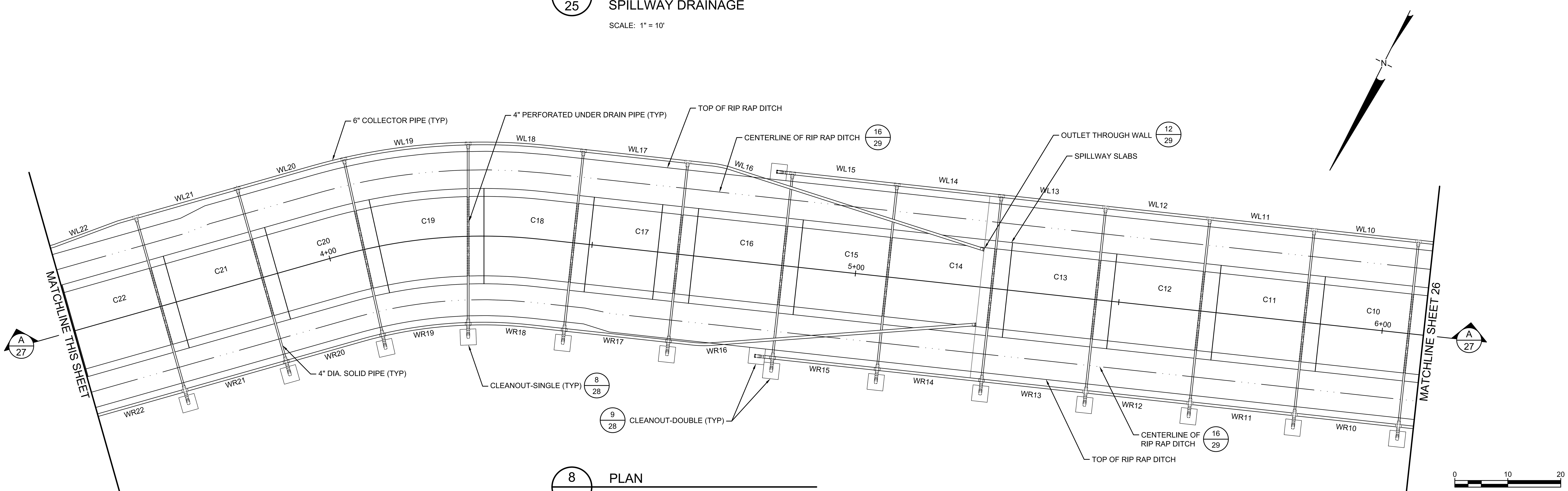
| FILE: | TJD10771.01 C24 |
| SHEET NO.: | 24 OF 41 |




8/25 PLAN
SPILLWAY DRAINAGE

SCALE: 1" = 10'




8/25 PLAN
SPILLWAY DRAINAGE

SCALE: 1" = 10'

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| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CHUTE SLAB AND DRAINAGE DETAIL PLAN 1 OF 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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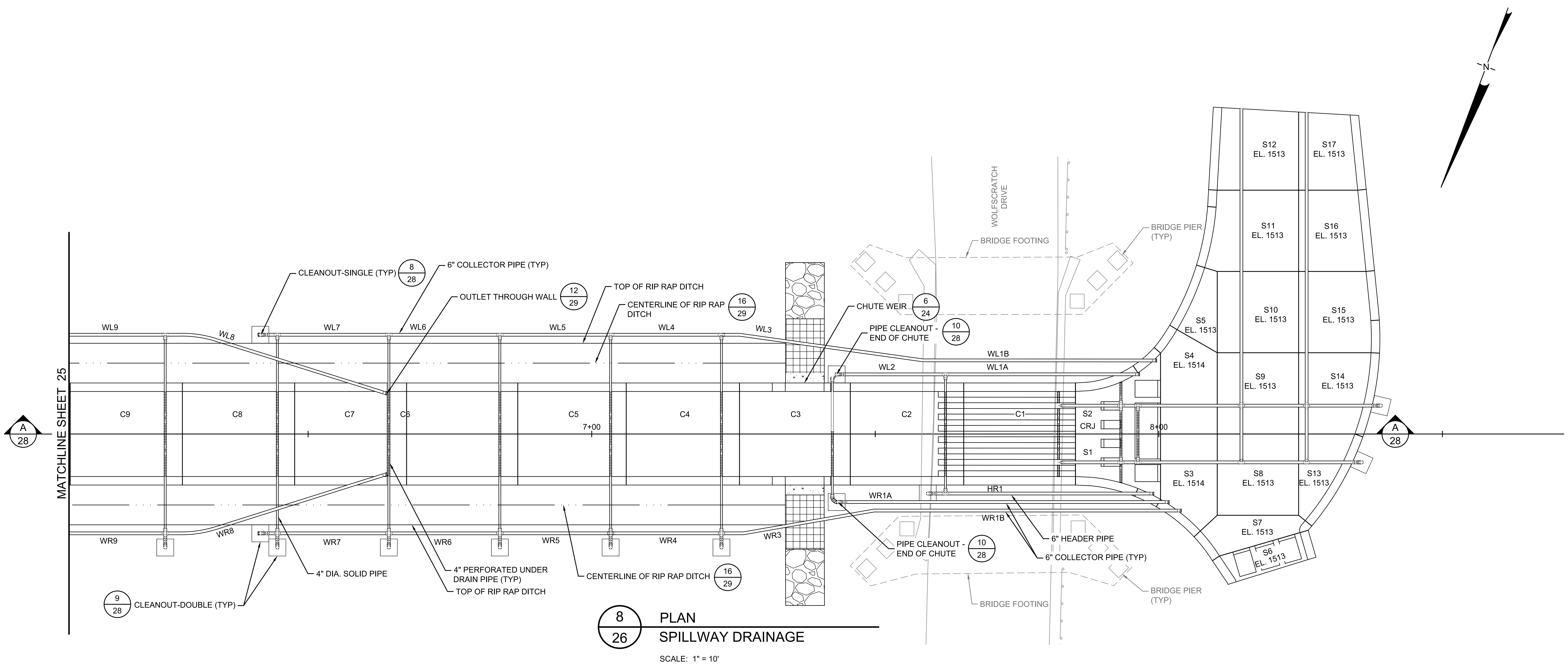
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C25 |
| SHEET NO.: | 25 OF 41 |

C:_GEO-ACC\ACCDOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CAD\01_SPILLWAY DESIGN\DWGS\SHEETS\TJD10771.01 C25




8/26 PLAN
SPILLWAY DRAINAGE

SCALE: 1" = 10'



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| DRAWN BY: | TW |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CHUTE SLAB AND DRAINAGE DETAIL PLAN 2 OF 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C26 |
| SHEET NO.: | 26 OF 41 |

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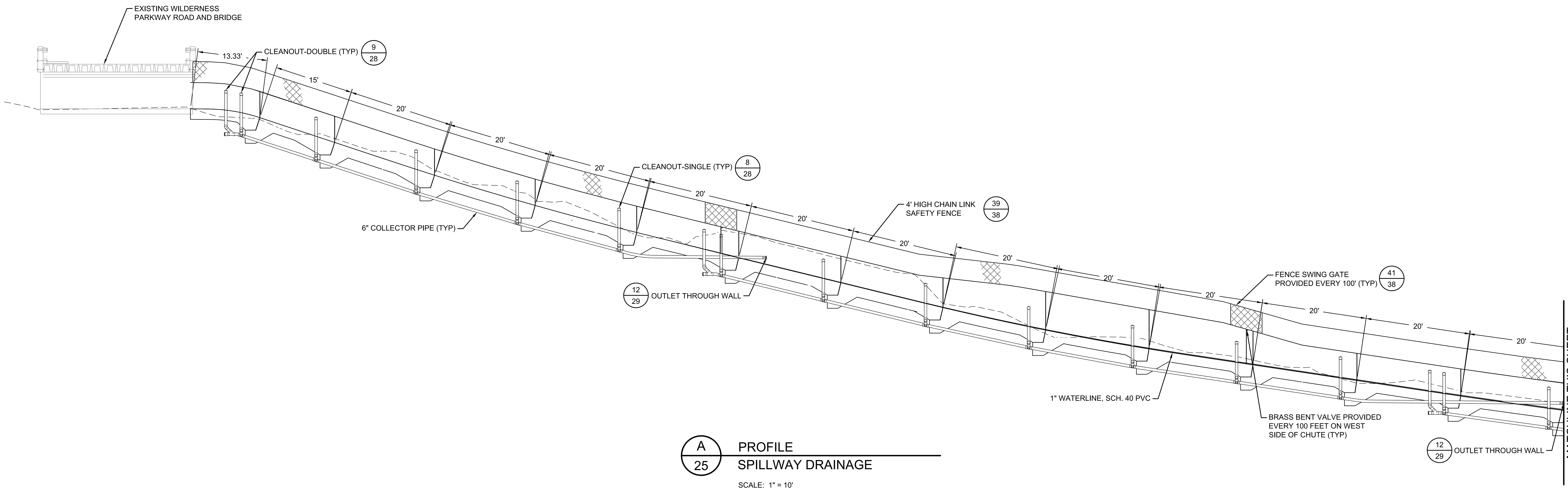
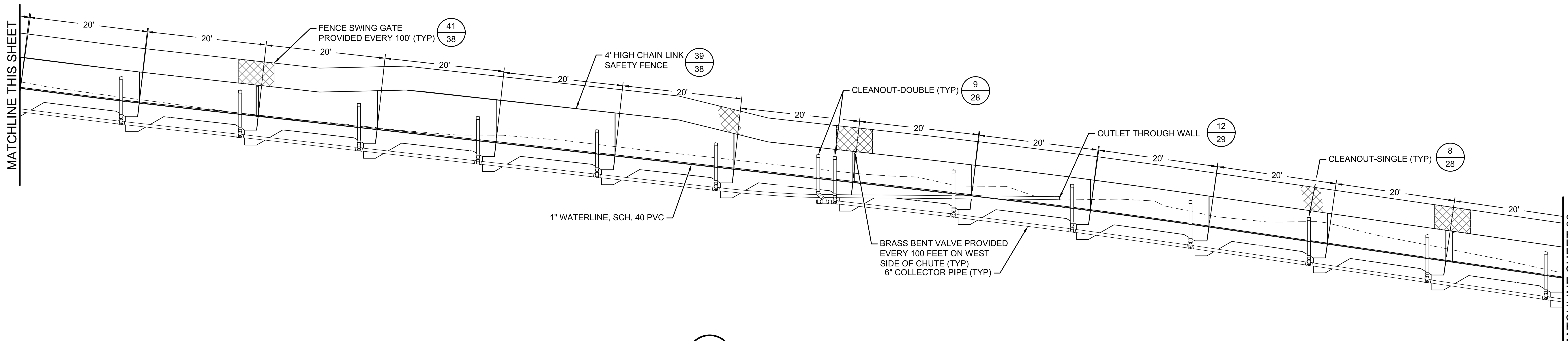



A/25 PROFILE
SPILLWAY DRAINAGE
SCALE: 1" = 10'




0 10 20
SCALE IN FEET

A/25 PROFILE
SPILLWAY DRAINAGE
SCALE: 1" = 10'

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| DRAWN BY: | TW |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CHUTE SLAB AND DRAINAGE SECTION DETAIL 1 OF 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C27 |
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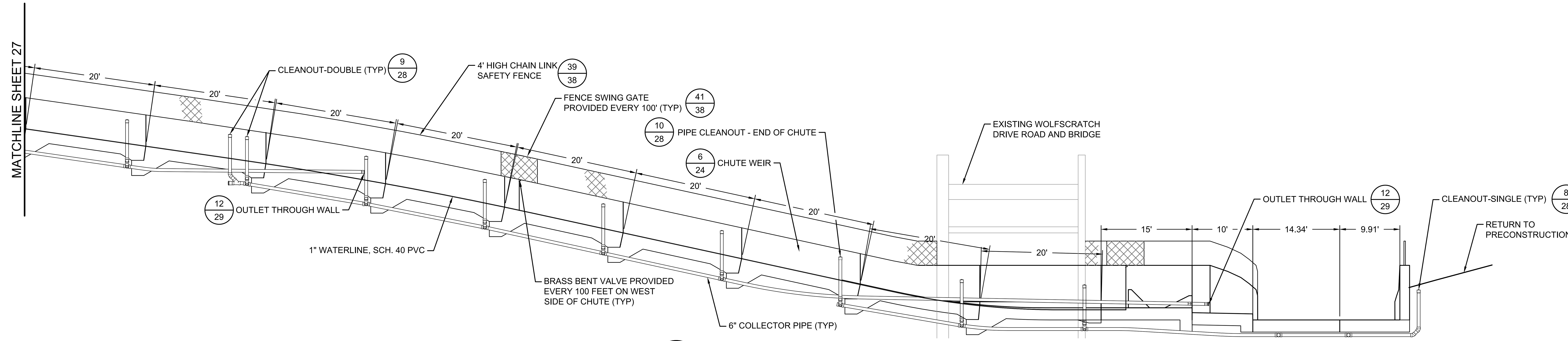
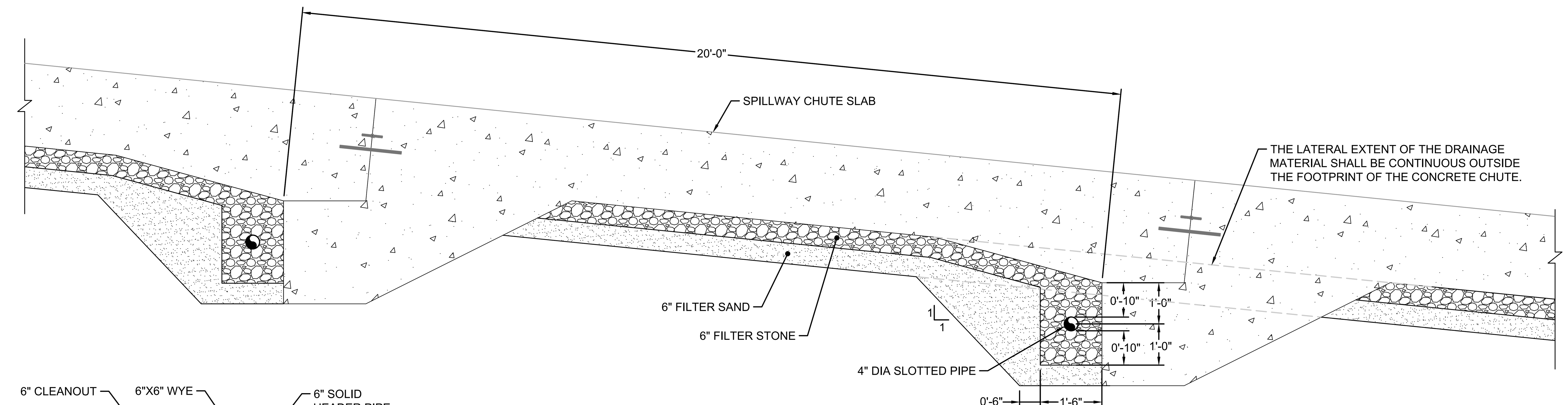


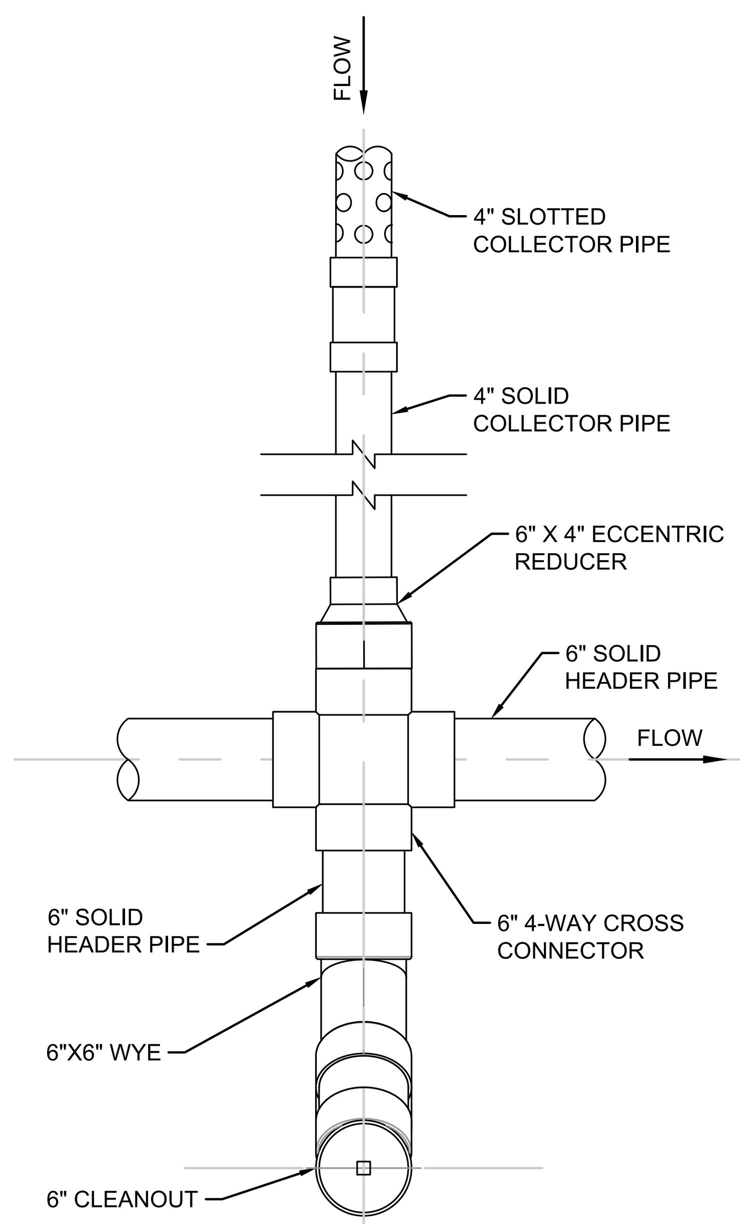

A/26 PROFILE
SPILLWAY DRAINAGE

SCALE: 1" = 10'



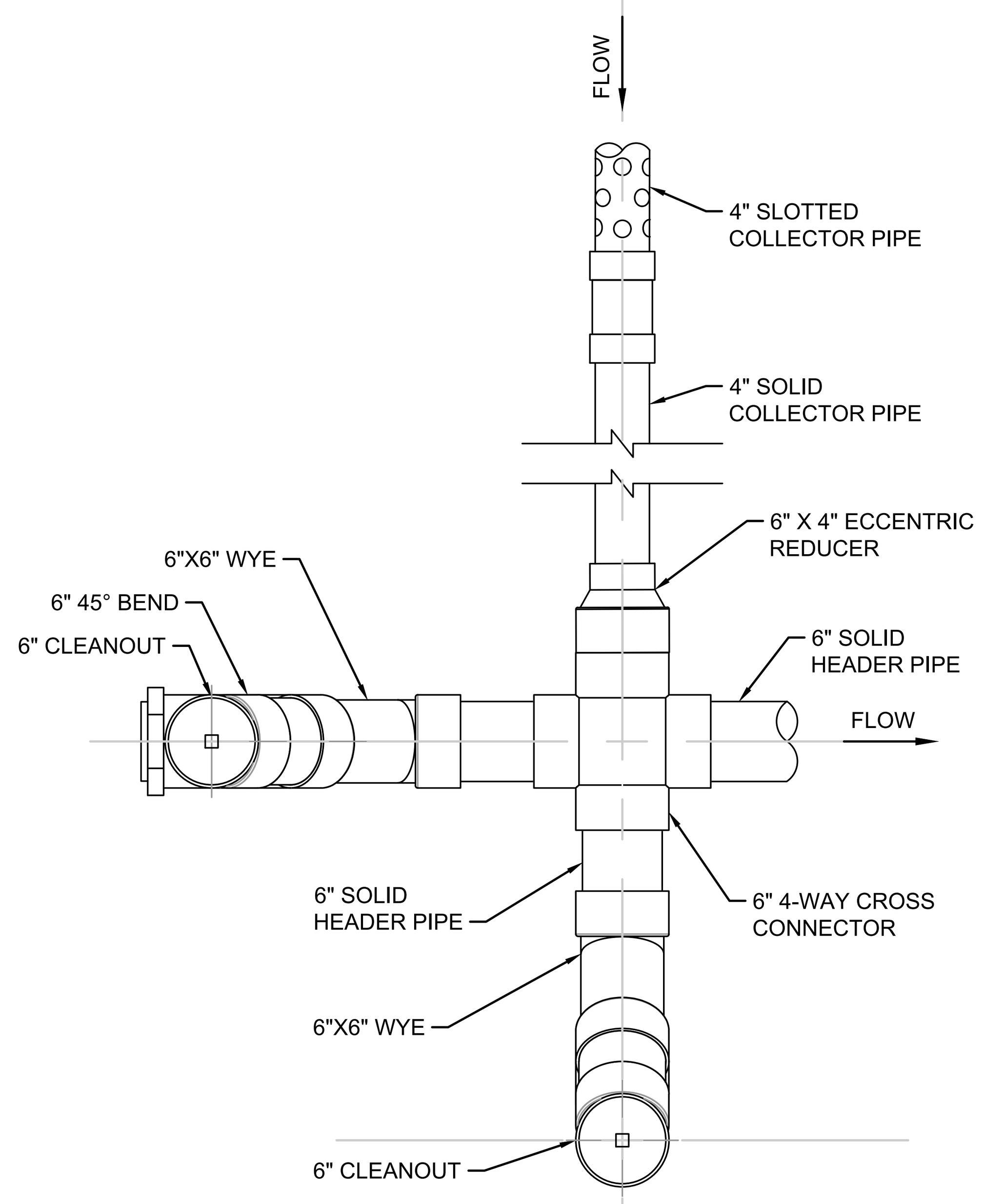

11/28 DETAIL
SPILLWAY CHUTE SLAB (TYP.)

SCALE: 1" = 2'



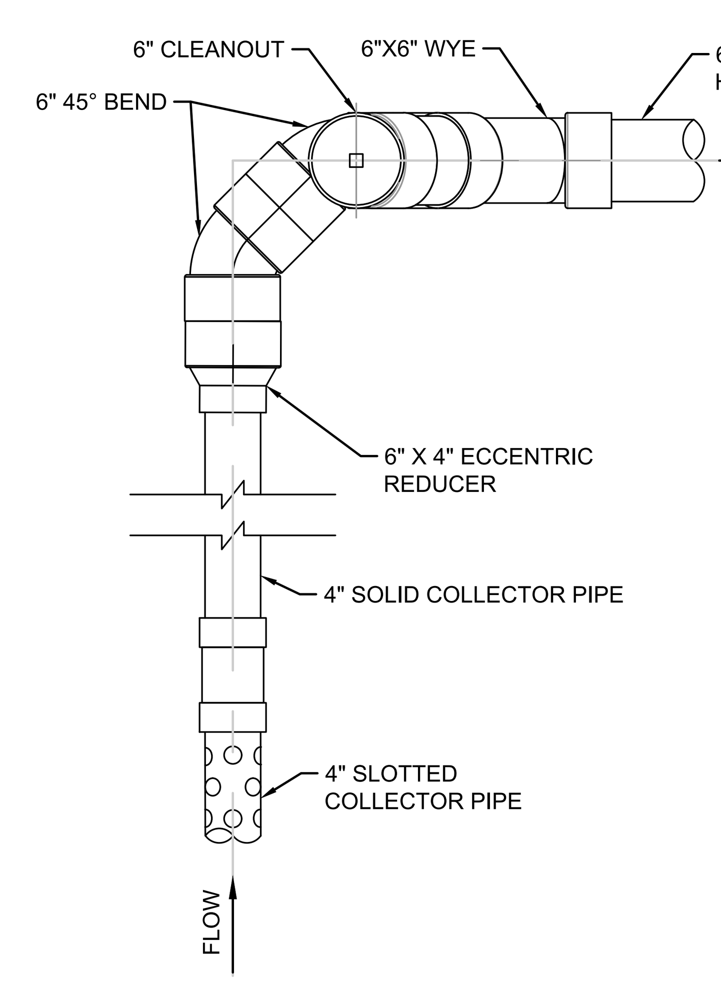

8/25 DETAIL
PIPE CLEANOUT-SINGLE

SCALE: 1" = 1'




9/25 DETAIL
PIPE CLEANOUT-DOUBLE

SCALE: 1" = 1'




10/25 DETAIL
PIPE CLEANOUT END OF CHUTE

(NOTE)
SCALE: 1" = 1'
XREF:

0 10 20
SCALE IN FEET

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| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: CHUTE SLAB AND DRAINAGE SECTION DETAIL 2 OF 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C28 |
| SHEET NO.: | 28 OF 41 |

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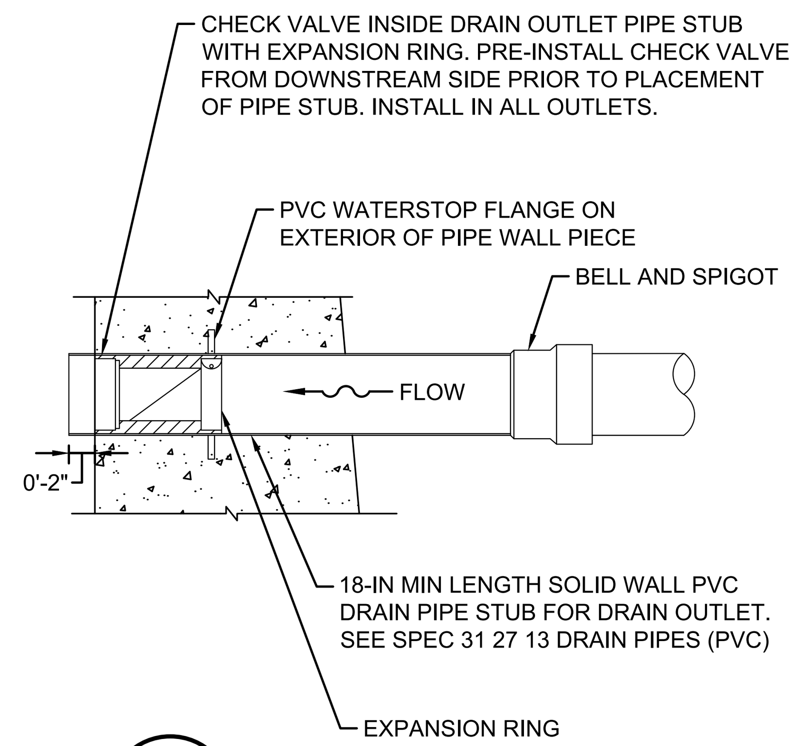
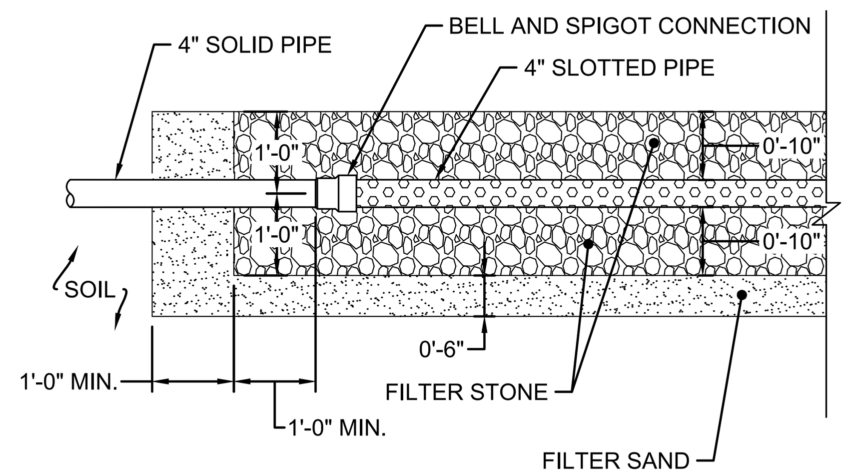



12/29 DETAIL

OUTLET THROUGH WALL

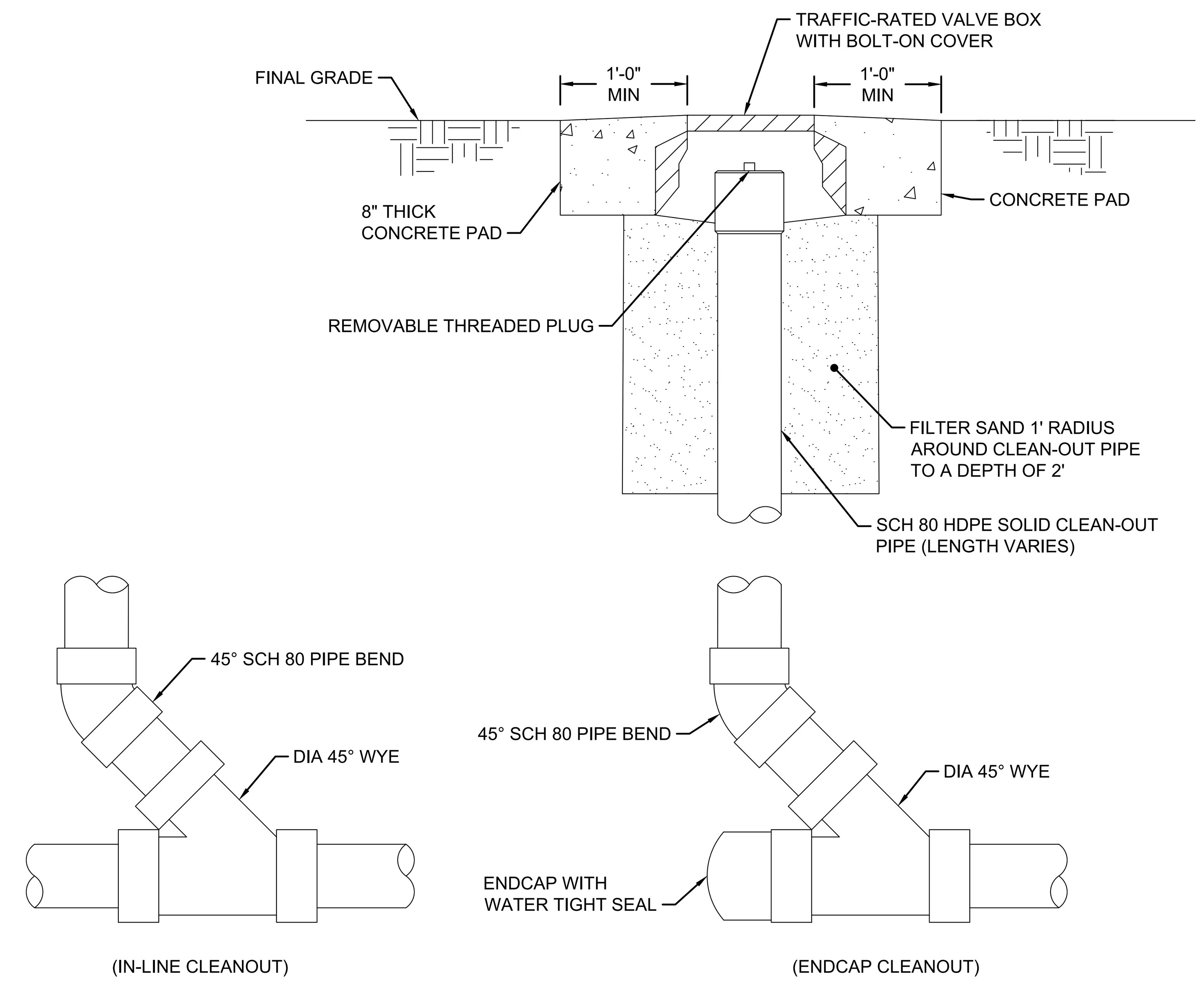
SCALE: NTS




13/29 DETAIL

PIPE TRANSITION

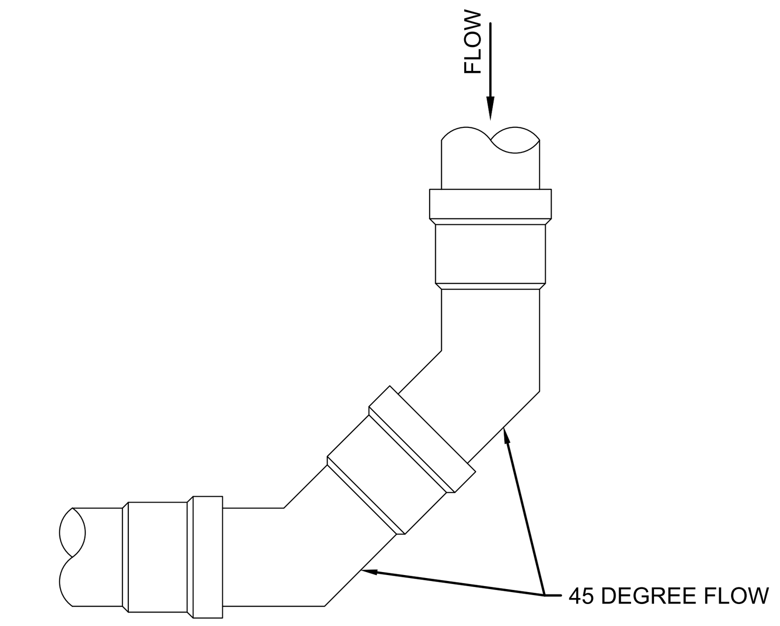
SCALE: 1" = 2'




14/29 DETAIL

CLEANOUT SECTIONS

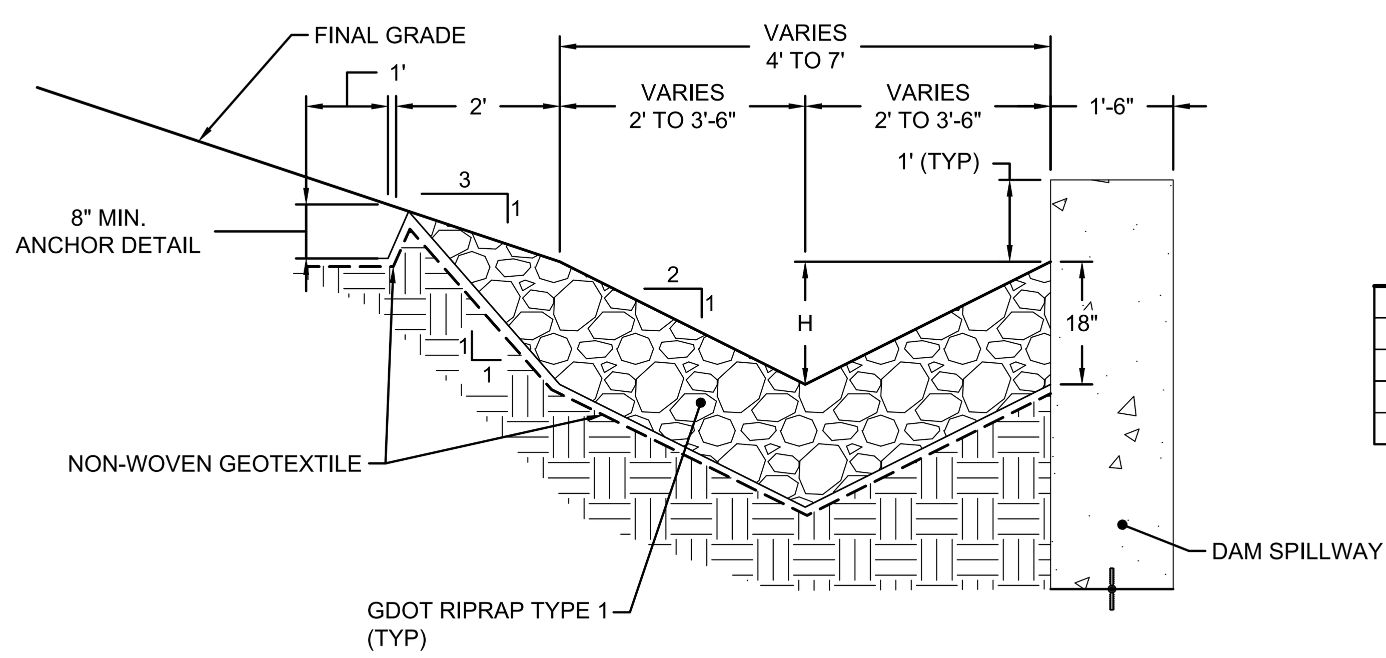
SCALE: NTS




15/29 DETAIL

90 DEGREE BEND DETAIL

SCALE: NTS




| SEGMENT | H |
|---|---|
| A | 12" |
| B, E | 15" |
| C, D, F | 18" |
| D, G, H | 21" |

16/29 DETAIL

RIP RAP CHANNEL

SCALE: 1" = 2'

NOTES

1. ALL SPILLWAY DRAIN PIPES TO BE SCHEDULE 80 PVC PIPE WITH SOLVENT WELD JOINTS. ALL BENDS AND FITTINGS TO BE FACTORY FABRICATED.
2. SLOTS SHOWN ON THE DRAIN PIPES ARE FOR ILLUSTRATION PURPOSES ONLY. REFER TO SPECIFICATIONS FOR SLOT REQUIREMENTS.
3. FILTER SAND AND DRAINFILL SHALL HAVE A MINIMUM OF 3 FEET OF EARTHFILL COVER AT ALL LOCATIONS.
4. PIPE AND FITTING DIAMETERS VARY BY LOCATION.

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044283 JOHN W. BARRETT 02/20/2025



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| DESIGN BY: | JWB |
| DRAWN BY: | KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: SPILLWAY DETAILS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C29 |
| SHEET NO.: | 29 OF 41 |

**PROJECT SPECIFICATIONS - STILLING BASIN AND REINFORCED CONCRETE CHUTE**

ALL CAST-IN-PLACE CONCRETE, INCLUDING CONCRETE MATERIALS, LIMITING REQUIREMENTS, MIXTURE DESIGN, AND PERFORMANCE REQUIREMENTS, AND DELIVERY TO THE SITE THROUGH DISCHARGE AT THE END OF THE DELIVERY TRUCK CHUTE, CONCRETE FORMING, CONCRETE JOINTS, CONCRETE ACCESSORIES, AND CONCRETE REINFORCEMENT/PLACEMENT/FINISHING/CURING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS LISTED IN SPECIFICATION SECTION 03300 CAST-IN-PLACE CONCRETE AND WITHIN THESE DRAWINGS.

**MANUFACTURERS' ITEMS**

1. ITEMS REFERENCED TO SPECIFIC MANUFACTURERS OR BRAND NAMES SHALL BE SUBJECT TO ANY MANUFACTURERS RECOMMENDATIONS OR LIMITATIONS PERTAINING TO THEIR INSTALLATION OR USE.
2. REQUESTS FOR SUBSTITUTIONS MUST BE APPROVED BY THE ENGINEER. SUFFICIENT INFORMATION REGARDING REQUESTS MUST BE RECEIVED BY THE ENGINEER 10 DAYS IN ADVANCE OF APPROVAL.

**REINFORCED CONCRETE**

1. CONCRETE SHALL BE AIR ENTRAINED READY MIXED CONCRETE, MINIMUM 28 DAY COMPRESSIVE STRENGTH 4,000 PSI. CONCRETE SHALL MEET REQUIREMENTS OF GDOT CONCRETE, CLASS A.2.
2. CHAMFER ALL CONCRETE CORNERS ¾ INCH, OR AS NOTED ON THE DRAWINGS.
3. ALL STEEL REINFORCING SHALL CONFORM TO ASTM A615, GRADE 60. WELDING OF BARS IS PROHIBITED.
4. STEEL REINFORCING SHALL BE AS DETAILED ON THE DRAWINGS.
5. A MINIMUM CLEAR COVER OF 3.5 INCHES IS REQUIRED FOR ALL REBAR WHEN CONCRETE IS CAST AGAINST EARTH (BASE SLAB), FOR ALL SIDEWALLS, AND THE INTERIOR WALL OF THE IMPACT BASIN, EXCEPT WHERE NOTED.
6. ALL REINFORCING STEEL LAP SPLICES, DEVELOPMENT LENGTHS, AND HOOKED BARS SHALL BE IN CONFORMANCE WITH ACI 318-19. HOOKED BARS SHALL BE DETAILED AS STANDARD HOOKS IN ACCORDANCE WITH ACI 318-19.
7. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR REINFORCING BAR LAYOUT AND BENDING, FORMWORK, AND WATERSTOPS IN CONFORMANCE WITH THE REQUIREMENTS HEREIN AND ON THE DRAWINGS FOR ENGINEER APPROVAL.
8. REBAR SPACING SHALL BE VERIFIED IN THE FIELD FOR CONFORMANCE WITH THE APPROVED SHOP DRAWINGS PRIOR TO PLACEMENT OF CONCRETE.
9. SAMPLING AND ACCEPTANCE FOR CONCRETE:
    a. ONE SET OF SAMPLES FOR TESTS SHALL BE TAKEN FOR EACH DAY'S PLACEMENT. TESTS SHALL INCLUDE TEMPERATURE READING AND FOUR COMPRESSIVE STRENGTH CYLINDERS.
    b. COMPRESSIVE STRENGTH SAMPLING AND TESTING SHALL CONFORM TO ASTM C31 AND ASTM C39 WITH ONE SPECIMEN TESTED AT 7 DAYS, TWO AT 28 DAYS, AND ONE HELD FOR EACH BATCH OF FOUR SPECIMENS.
    c. SAMPLING AND TESTING SHALL BE PERFORMED BY A QUALIFIED, INDEPENDENT COMMERCIAL TESTING LABORATORY. TEST RESULTS SHALL BE SUBMITTED TO ENGINEER WITHIN 48 HOURS OF COMPLETION OF TESTING.
10. THE CONTRACTOR SHALL PLACE STEEL REINFORCING AND CONCRETE FOR CONSTRUCTION OF THE STILLING BASIN IN CONFORMANCE WITH ACI 117, SPECIFICATIONS FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS COMMENTARY. UNLESS REQUIRED OTHERWISE BY ACI 117, THE CONTRACTOR SHALL ADHERE TO THE FOLLOWING TOLERANCES FOR PLACEMENT OF NON-PRESTRESSED STEEL REINFORCEMENT AND FOR FINISHED CONSTRUCTION OF THE CONCRETE STILLING BASIN.
    a. PLACEMENT OF NON-PRESTRESSED STEEL REINFORCEMENT (ACI-117, SECTION 2.2):
    i. +/- 3/8 INCH IN SLABS AND WALLS
    ii. +/- 3/8 INCH FROM FORMED SURFACE, REDUCTION IN COVER SHALL NOT EXCEED 1/3 OF THE SPECIFIED COVER
    iii. +/- 3/4 INCH VERTICAL DEVIATION FOR SLAB-ON-GROUND
    b. DISTANCE BETWEEN REINFORCEMENT SHALL NOT BE LESS THAN THE GREATER OF THE BAR DIAMETER OR 1 INCH
    c. FINISHED CONSTRUCTION (ACI-117, SECTION 10):
    d. DEVIATION OF THE CENTERLINE ALIGNMENT, +/- 1/2 INCH
    e. DEVIATION OF SURFACE INVERT, +/- 1/4 INCH
    f. DEVIATION OF THE INTERIOR DIMENSIONS, +/- 0.5 % OF THE INSIDE DIMENSION
    g. DEVIATION FROM VERTICAL, +/- 1/2 INCH ON VISIBLE FORMED SURFACES
    h. INCREASE IN CROSS SECTIONAL THICKNESS, GREATER OF 5% OF THE THICKNESS OR + 1/2 INCH
    i. DECREASE IN CROSS-SECTIONAL THICKNESS, GREATER OF 2.5% OF THE THICKNESS OR -1/4 INCH
11. REINFORCING STEEL SHALL BE STORED ABOVE GROUND ON PLATFORMS OR OTHER SUPPORTS AND SHALL BE PROTECTED FROM THE WEATHER AT ALL TIMES BY SUITABLE COVERING. IT SHALL BE STORED IN AN ORDERLY MANNER AND PLAINLY MARKED TO FACILITATE IDENTIFICATIONS.
12. REINFORCING STEEL SHALL AT ALL TIMES BE PROTECTED FROM CONDITIONS CONDUCIVE TO CORROSION UNTIL CONCRETE IS PLACED AROUND IT.
13. THE SURFACES OF ALL REINFORCING STEEL AND OTHER METAL WORK TO BE IN CONTACT WITH CONCRETE SHALL BE THOROUGHLY CLEANED OF ALL DIRT, GREASE, LOOSE SCALE AND RUST, GROUT, MORTAR, AND OTHER FOREIGN SUBSTANCES IMMEDIATELY BEFORE THE CONCRETE IS PLACED. WHERE THERE IS DELAY IN DEPOSITING CONCRETE, REINFORCING SHALL BE REINSPECTED AND, IF NECESSARY, RECLEANED.
14. INTERIOR FORMS SHALL REMAIN IN PLACE FOR A MINIMUM OF 7 DAYS.
15. BACKFILLING BEHIND REINFORCED CONCRETE SHALL NOT BEGIN UNTIL 2/3 OF THE CONCRETE DESIGN STRENGTH IS ACHIEVED.

**WATERSTOPS**

**SLAB-TO-WALL WATERSTOPS**

1. WATERSTOPS SHALL BE USED TO SEAL BETWEEN FLOOR SLAB AND WALLS OF THE STILLING BASIN AND CHUTE.
2. CONTRACTOR SHALL SUBMIT PRODUCT DATA SHEETS AND MANUFACTURER INSTALLATION INSTRUCTIONS FOR ENGINEER APPROVAL PRIOR TO PERFORMING THE WORK. WATERSTOPS SHALL BE MANUFACTURED BY SUCH A PROCESS THAT THEY WILL BE DENSE, HOMOGENOUS, AND FREE FROM HOLES AND OTHER IMPERFECTIONS. THE CROSS-SECTION OF THE WATERSTOP SHALL BE UNIFORM AND SYMMETRICAL ALONG ITS ENTIRE LENGTH.
3. MATERIALS DELIVERED AND PLACED IN STORAGE SHALL BE STORED OFF THE GROUND AND PROTECTED FROM MOISTURE, DIRT, AND OTHER CONTAMINANTS. THE WATERSTOPS SHALL BE STORED OUT OF DIRECT SUNLIGHT.
4. SLAB TO WALL WATERSTOP INSTALLATION SHALL INCLUDE USE OF:
    a. WATERSTOP, SIKA TYPE 705 (6-INCH LONG WITH 11/16 INCH CENTER BULB) OR ENGINEER APPROVED EQUAL
    b. CONCRETE KEYWAY CONSTRUCTION AS ILLUSTRATED ON THE DRAWINGS.
    c. WATERSTOPS SHALL BE POSITIONED ALONG THE CENTERLINE OF THE KEYWAY AND FIRMLY HELD IN PLACE TO PREVENT MOVEMENT DURING CONCRETE INSTALLATION.
5. ALL WATERSTOPS SHALL BE JOINED WHERE THEY INTERSECT. SPLICE/JOIN WATERSTOPS TO CREATE A COMPLETE AND CONTINUOUS WATERSTOP MEMBER PRIOR TO INSTALLATION. SPLICES SHALL BE NEAT, FULLY ALIGNED, WITHOUT CHARRED OR BURNT MATERIAL, AND WITHOUT VISIBLE SEPARATION WHEN COOLED AND BENT BY HAND AT A SHARP ANGLE.
6. PROTECT THE FREE SIDE OF THE WATERSTOP FROM CONCRETE SPLATTER DURING INSTALLATION.
7. THOROUGHLY CONSOLIDATE CONCRETE AROUND THE WATERSTOP TO PREVENT VOIDS OR HONEYCOMBING.

**RETROFIT WATERSTOP**

1. WATERSTOPS SHALL BE USED TO SEAL BETWEEN THE EXISTING CONCRETE AT WILDERNESS PARKWAY BRIDGE AND THE CONNECTION CHUTE SLAB.
2. CONTRACTOR SHALL SUBMIT PRODUCT DATA SHEETS AND MANUFACTURER INSTALLATION INSTRUCTIONS FOR ENGINEER APPROVAL PRIOR TO PERFORMING THE WORK.
3. DO NOT STORE OR LEAVE PVC WATERSTOPS EXPOSED TO DIRECT SUNLIGHT FOR MORE THAN 21 DAYS.
4. RETROFIT WATERSTOP INSTALLATION SHALL INCLUDE USE OF:
    a. WATERSTOP, SIKA GREENSTREAK TYPE 655, OR ENGINEER APPROVED EQUAL
    b. CHEMICAL RESISTANT EPOXY GEL
    c. STAINLESS STEEL BATTEN BARS
    d. STAINLESS STEEL CONCRETE FASTENERS
5. PREPARE EXISTING CONCRETE BY SANDBLASTING OR GRINDING TO CREATE A CLEAN TEXTURED SURFACE FOR EPOXY TO BOND TO. REMOVE EXCESS DUST AND CONTAMINANTS, SURFACE SHALL BE FREE OF WATER OILS AND OTHER CHEMICALS AT THE TIME OF CONSTRUCTION.
6. ALL WATERSTOPS SHALL BE JOINED WHERE THEY INTERSECT. SPLICE/JOIN WATERSTOPS TO CREATE A COMPLETE AND CONTINUOUS WATERSTOP MEMBER PRIOR TO INSTALLATION. SPLICES SHALL BE NEAT, FULLY ALIGNED, WITHOUT CHARRED OR BURNT MATERIAL, AND WITHOUT VISIBLE SEPARATION WHEN COOLED AND BENT BY HAND AT A SHARP ANGLE.
7. DRILL PILOT HOLES FOR INSTALLATION OF STAINLESS STEEL CONCRETE FASTENER THROUGH THE WATERSTOP AND INTO THE EXISTING CONCRETE; PRE-DRILLED HOLES IN THE BATTEN BAR SHOULD BE USED AS A GUIDE.
8. REMOVE CONCRETE DUST AND DRILLING DEBRIS FROM THE SURFACE AND THE PILOT HOLES.
9. APPLY EPOXY TO THE PREPARED SURFACE, MATCHING THE WIDTH OF THE WATERSTOP,
10. PRESS THE WATERSTOP INTO THE UNCURED EPOXY.
11. PLACE THE BATTEN BAR OVER THE WATERSTOP AND SECURE THE SYSTEM TO THE EXISTING CONCRETE STRUCTURE USING STAINLESS STEEL CONCRETE FASTENERS.
12. ALLOW EPOXY TO CURE FOR A MINIMUM OF 24 HOURS PRIOR TO PLACING NEW CONCRETE AGAINST THE RETROFIT SYSTEM.
13. THOROUGHLY CONSOLIDATE FRESH CONCRETE AROUND THE WATERSTOP TO PREVENT VOIDS OR HONEYCOMBING.

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| DRAWN BY: | KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: STRUCTURAL NOTES

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C30 |
| SHEET NO.: | 30 OF 41 |

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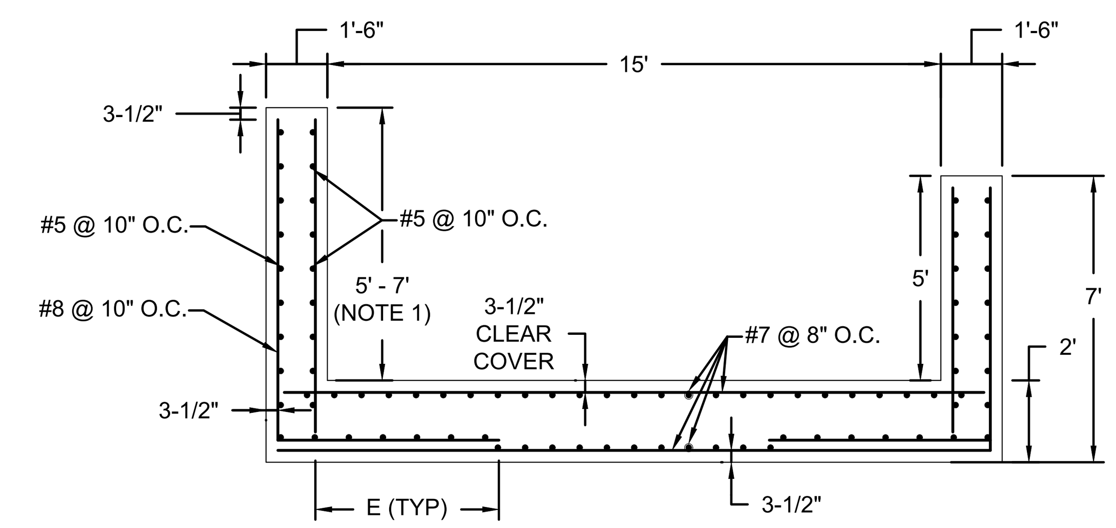
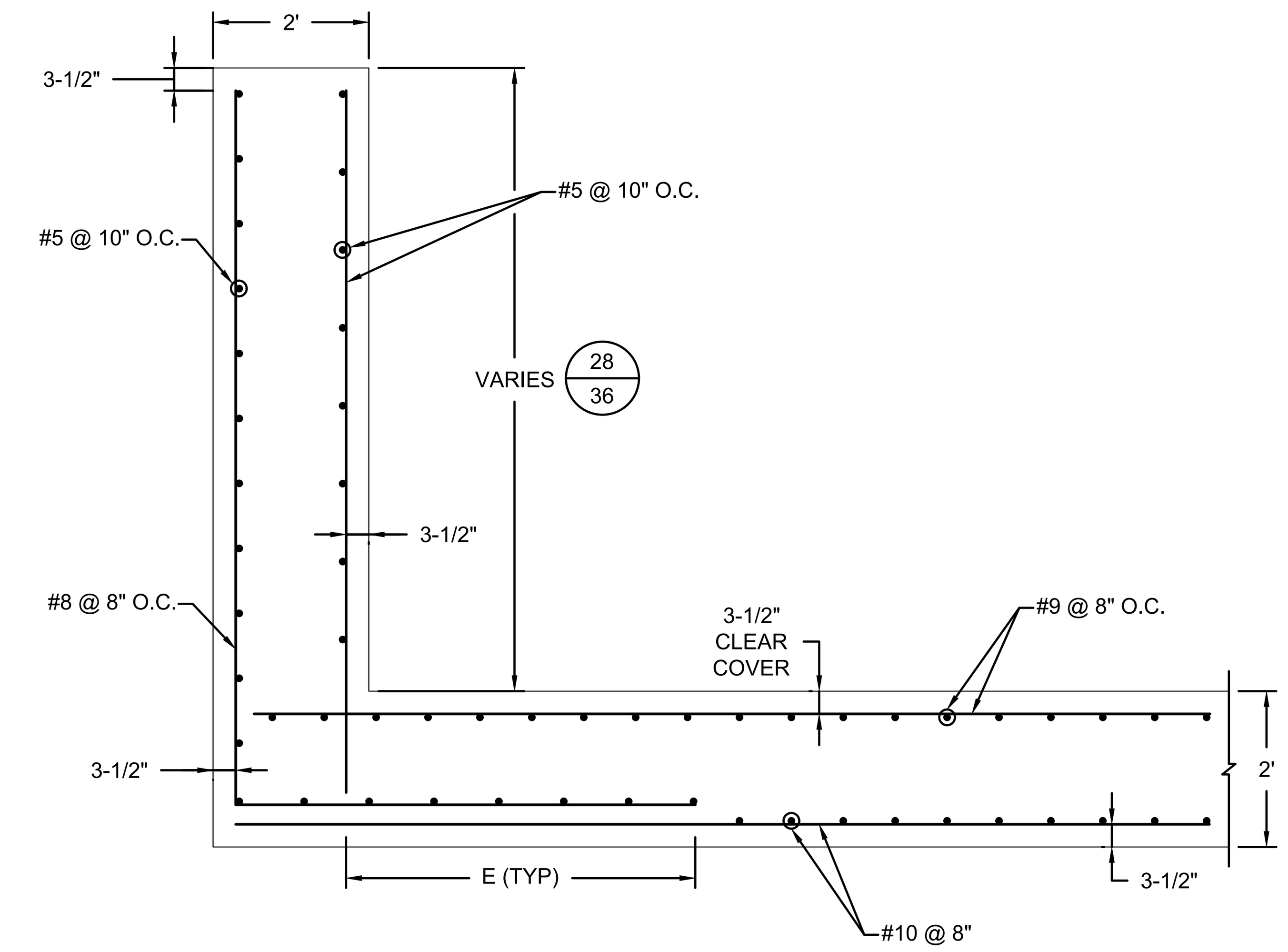



NOTES:

1. REFER TO SHEET 27 FOR STATIONING OF 7' HIGH CHUTE WALLS.

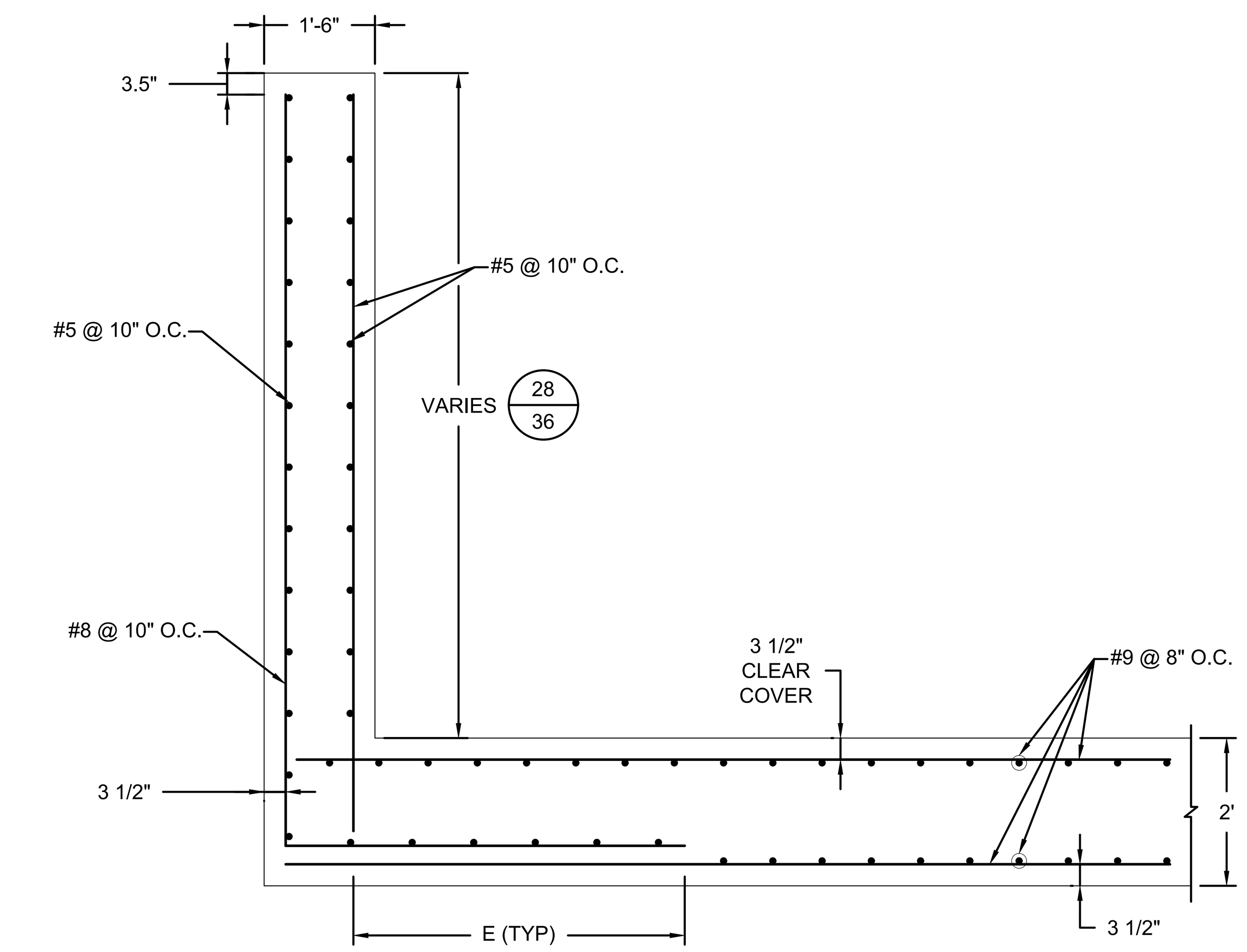
17/31 DETAIL
TRAINING WALL - CHUTE DETAIL

SCALE: 1" = 4'



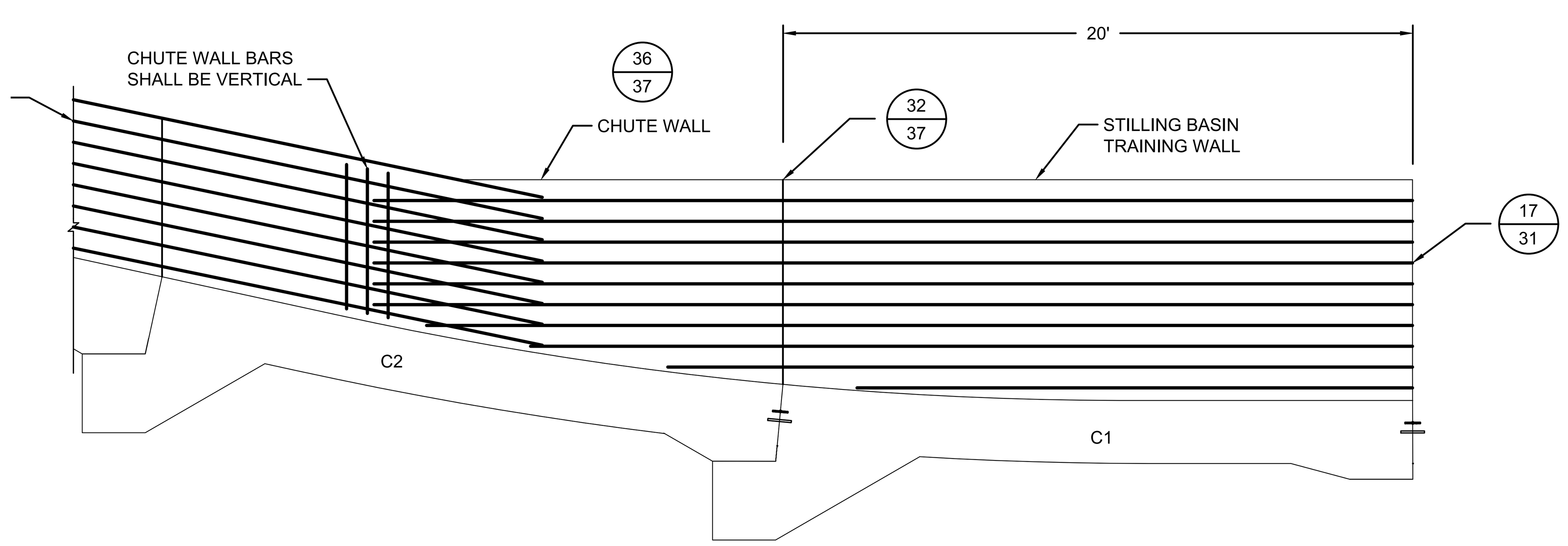

18/31 DETAIL
TRAINING WALL - STILLING BASIN

SCALE: 1" = 2'




19/31 DETAIL
TRAINING WALL

SCALE: 1" = 2'




20/31 DETAIL
CHUTE WALL SECTION AT C2

SCALE: 1" = 1'

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CHECKED BY:
REVIEWED BY:
APPROVED BY:

TITLE: WALL DETAILS

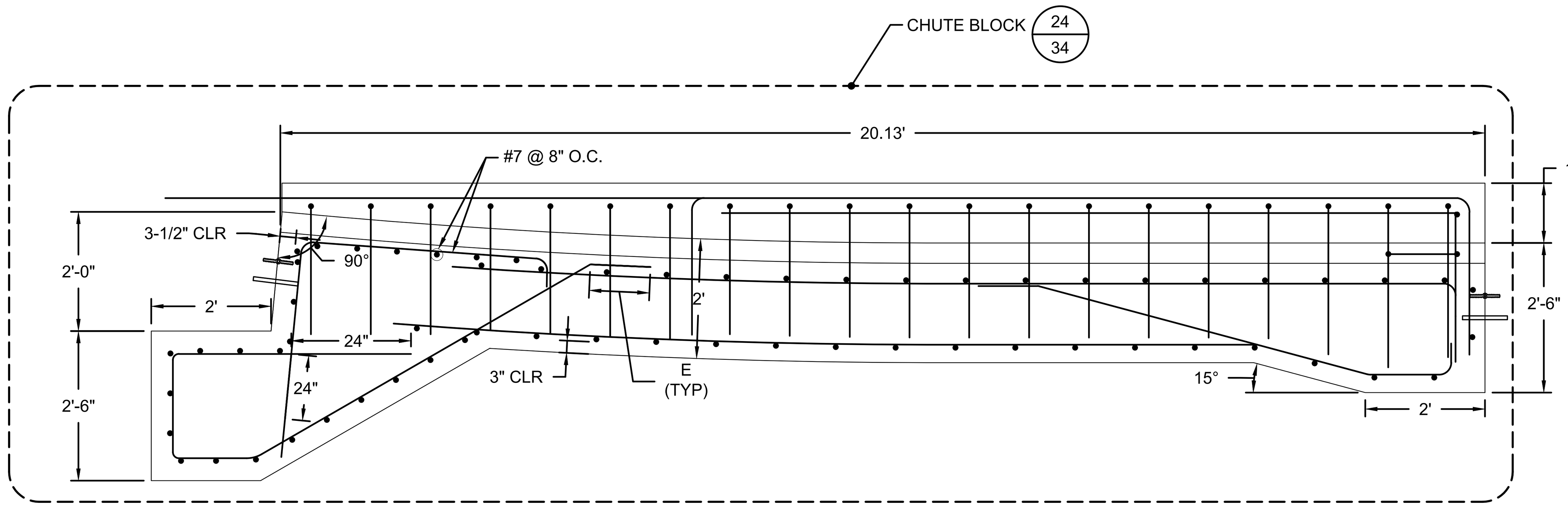
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

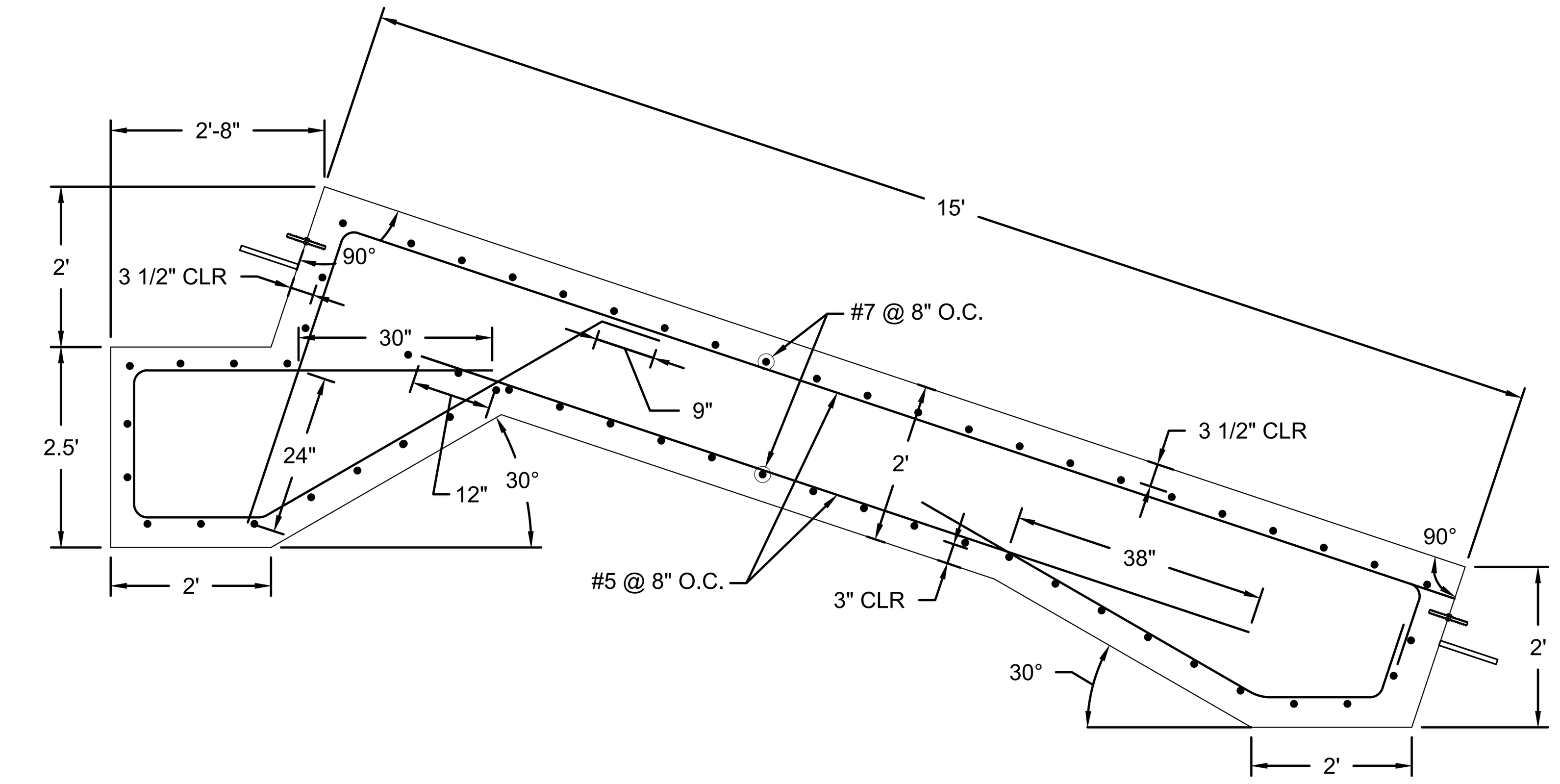
Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

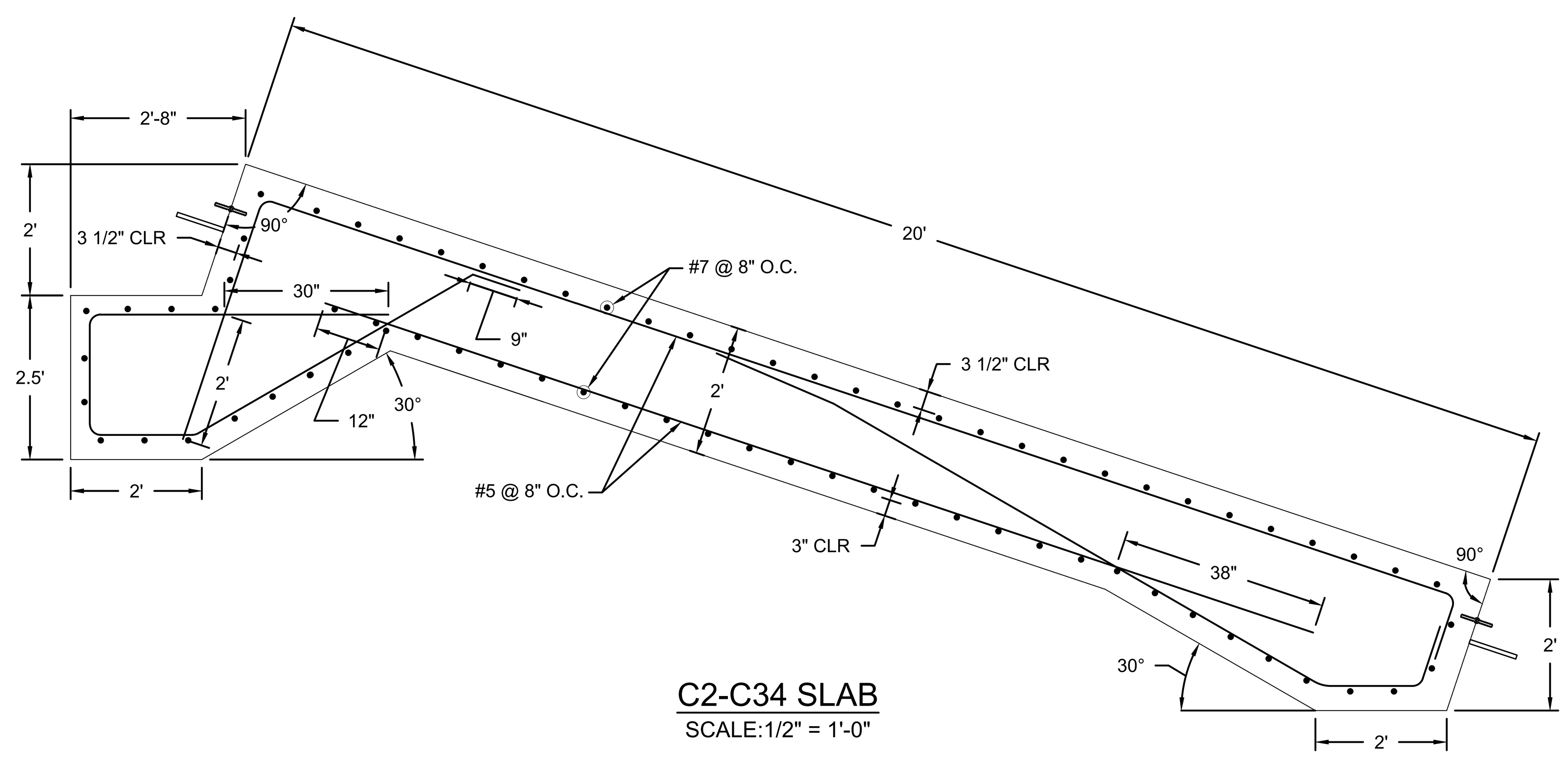
DATE: FEBRUARY 2025
PROJECT NO.: TJD10771
FILE: TJD10771.01 C31



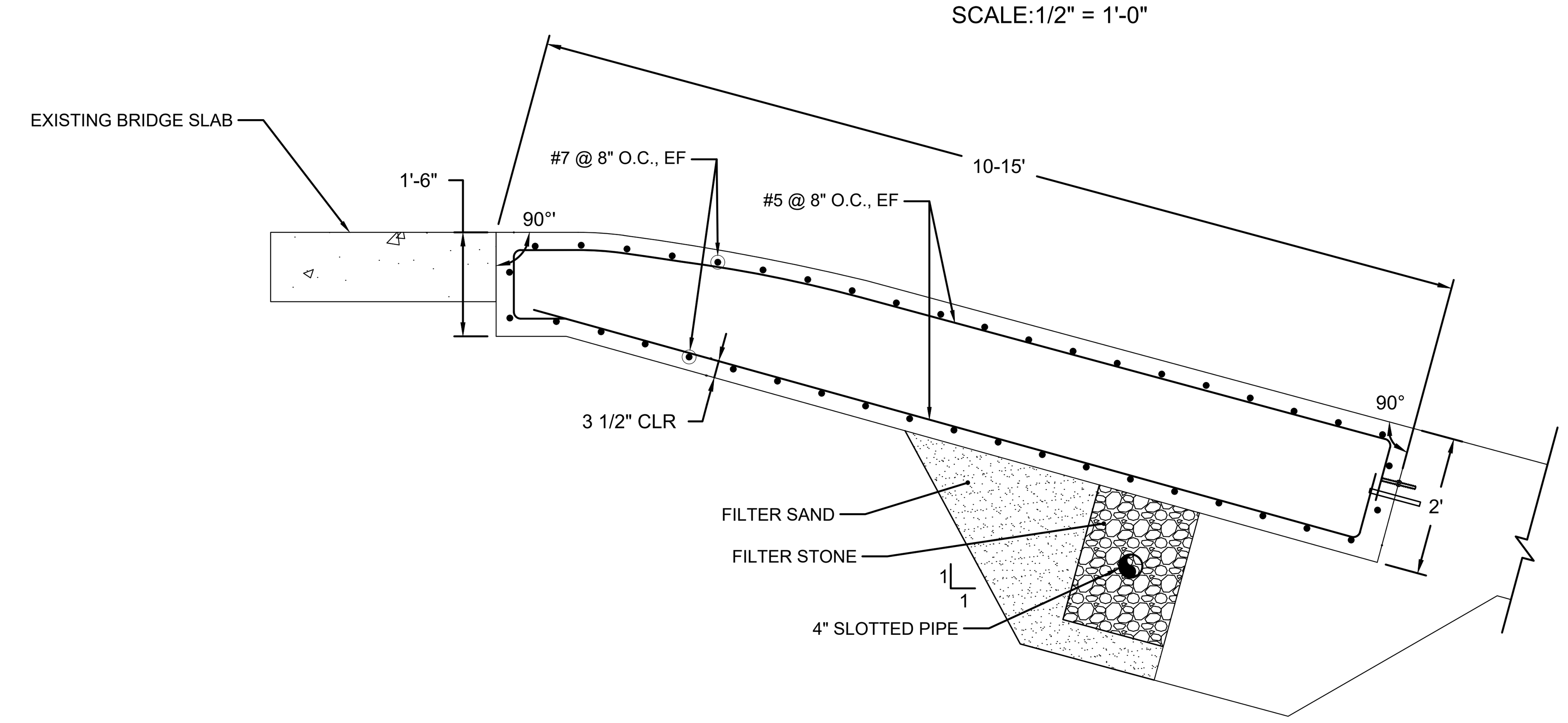

C1 SLAB
SCALE:1/2" = 1'-0"




C35 SLAB
SCALE:1/2" = 1'-0"




C2-C34 SLAB
SCALE:1/2" = 1'-0"




C36 SLAB
SCALE:1/2" = 1'-0"

NOTE:

1. THE LENGTH OF THE SLAB SHALL BE FIELD FIT BASED ON THE FINAL CONDITION OF SLAB C35.

DETAIL 21/32
SLAB
SCALE: 1" = 2'

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| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: SLAB DETAILS

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C32 |
| SHEET NO.: | 32 OF 41 |

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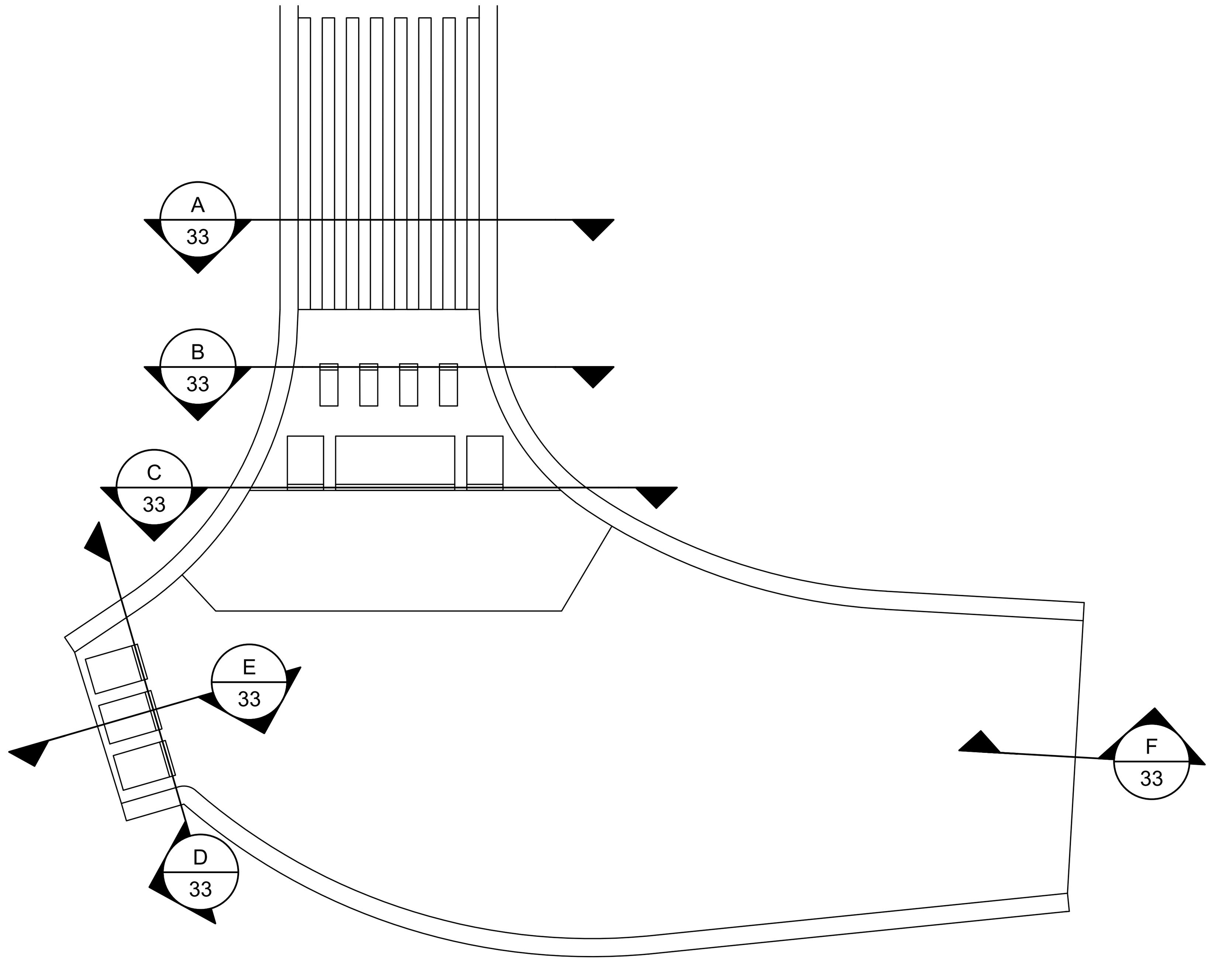
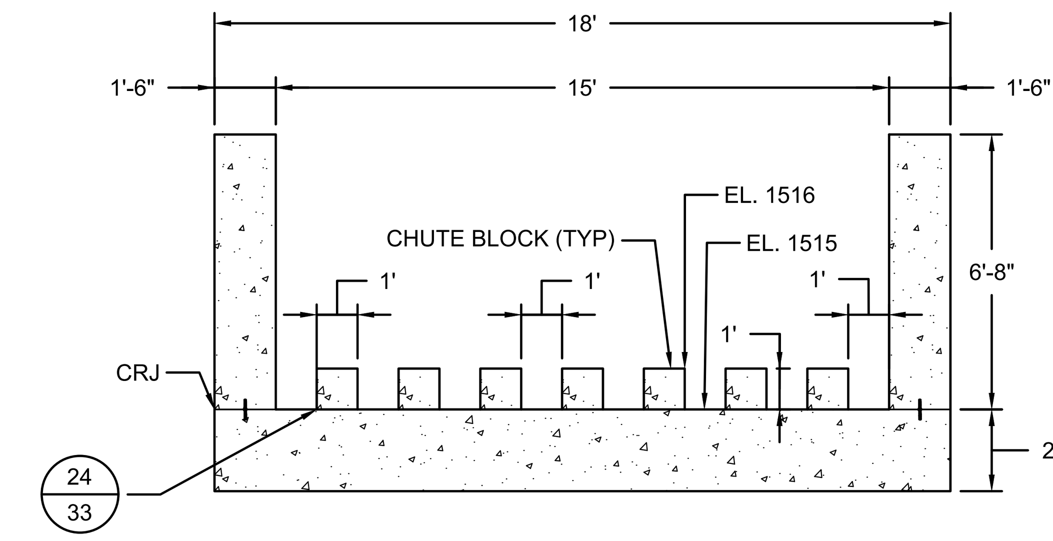


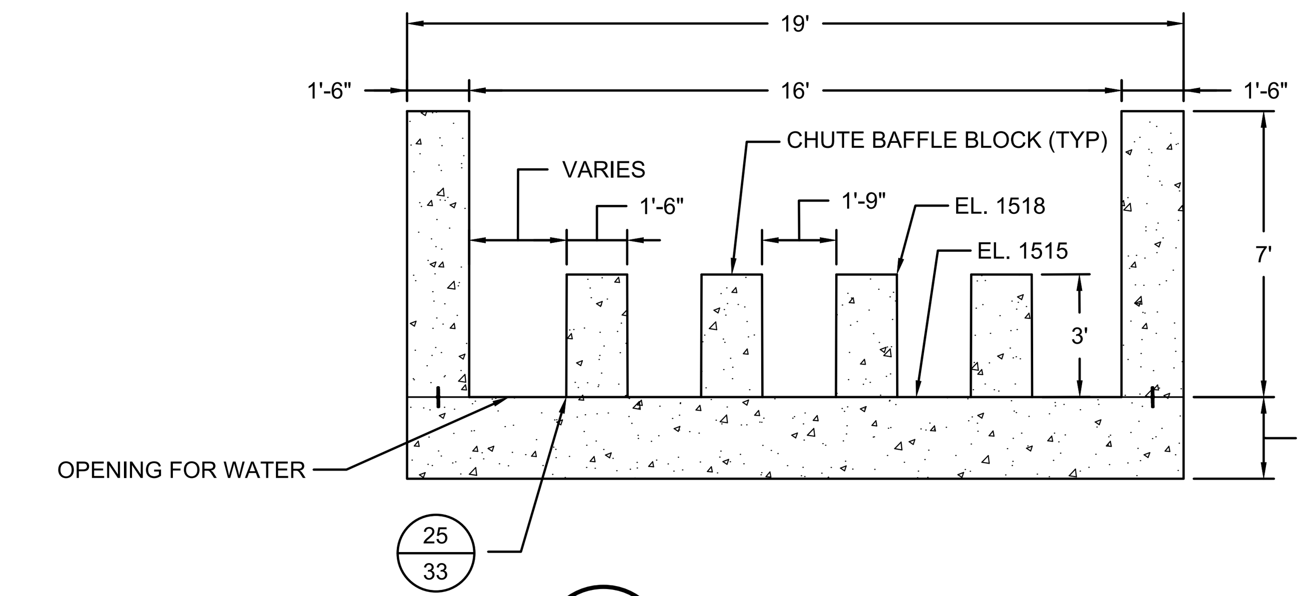

22 / 33 PLAN — STILLING BASIN

SCALE: 1" = 1'



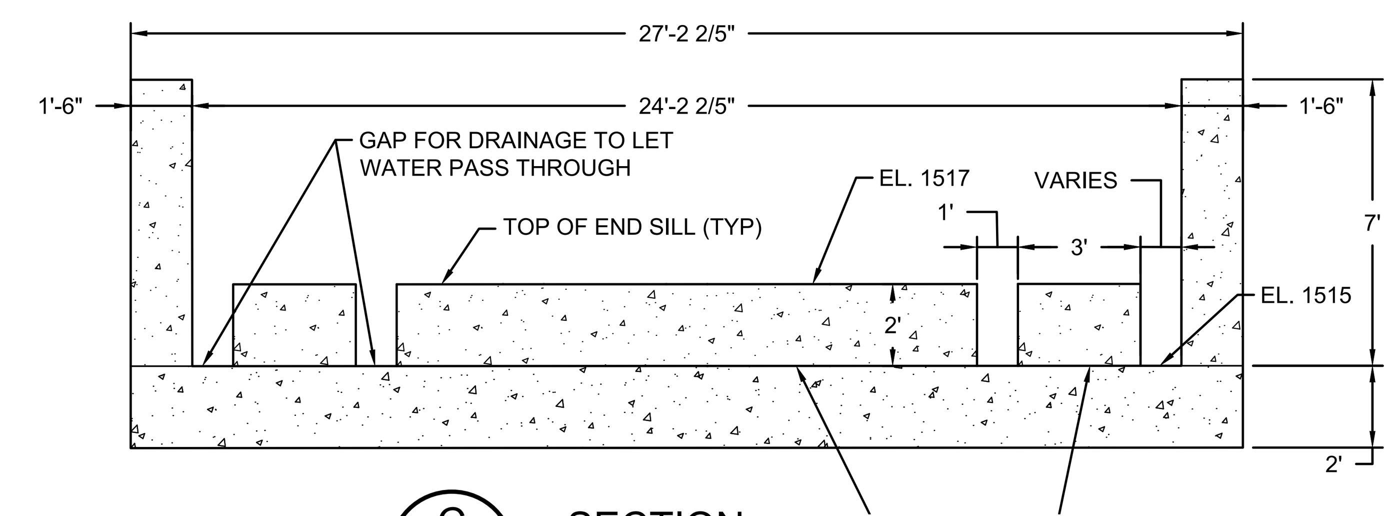

A / 33 SECTION — CHUTE BLOCK

SCALE: 1" = 4'



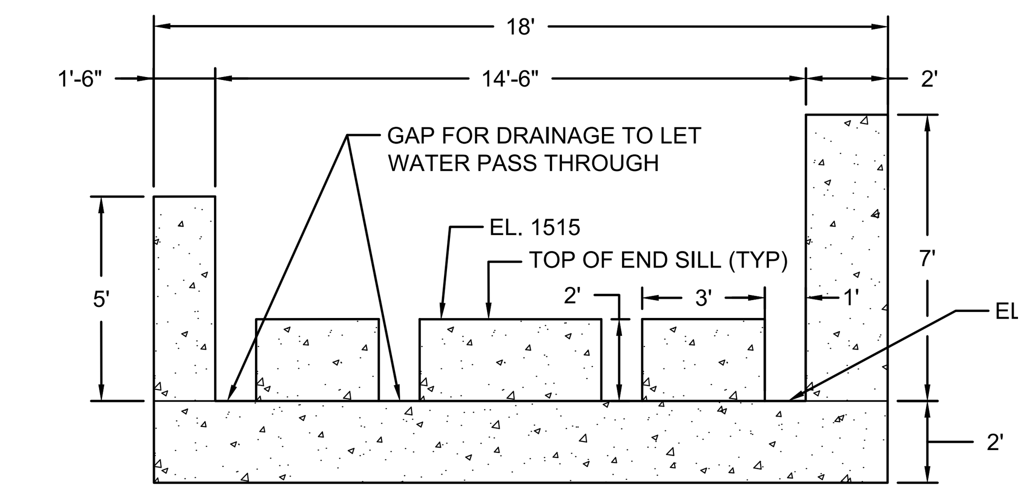

B / 34 SECTION — BAFFLE BLOCK

SCALE: 1" = 4'



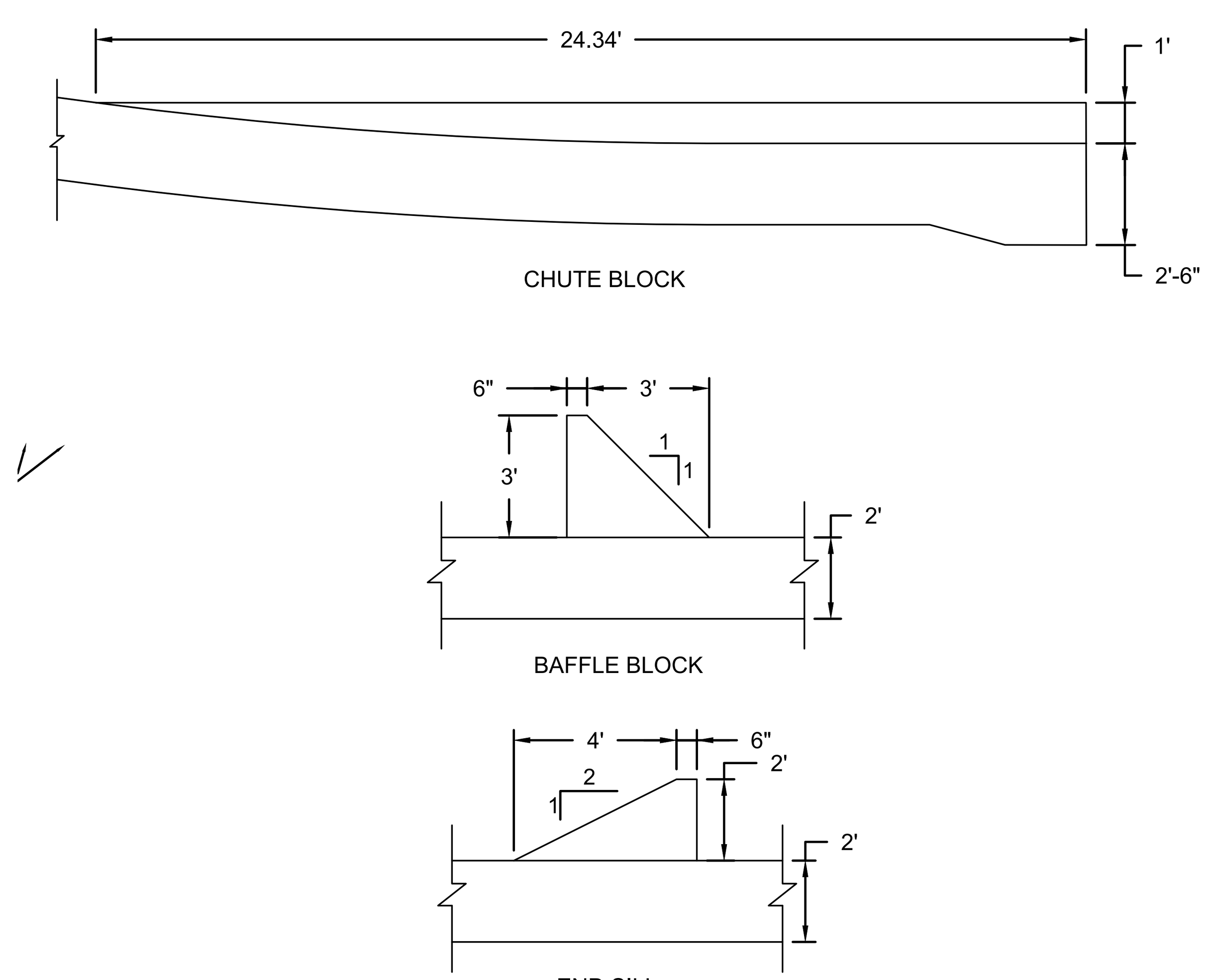

C / 34 SECTION — CHUTE END SILL

SCALE: 1" = 4'



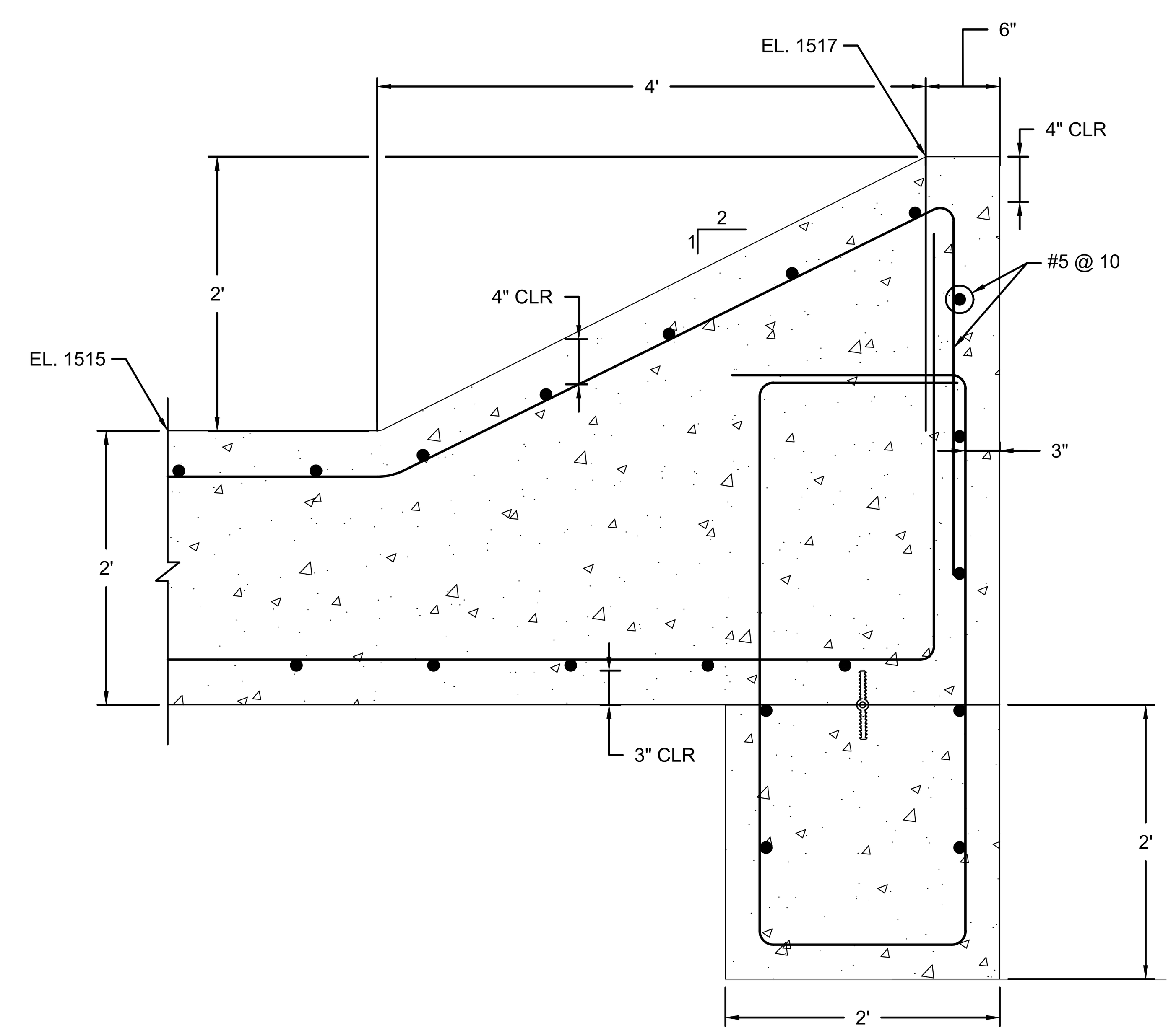

D / 34 SECTION — STILLING BASIN UPSTREAM END SILL

SCALE: 1" = 4'



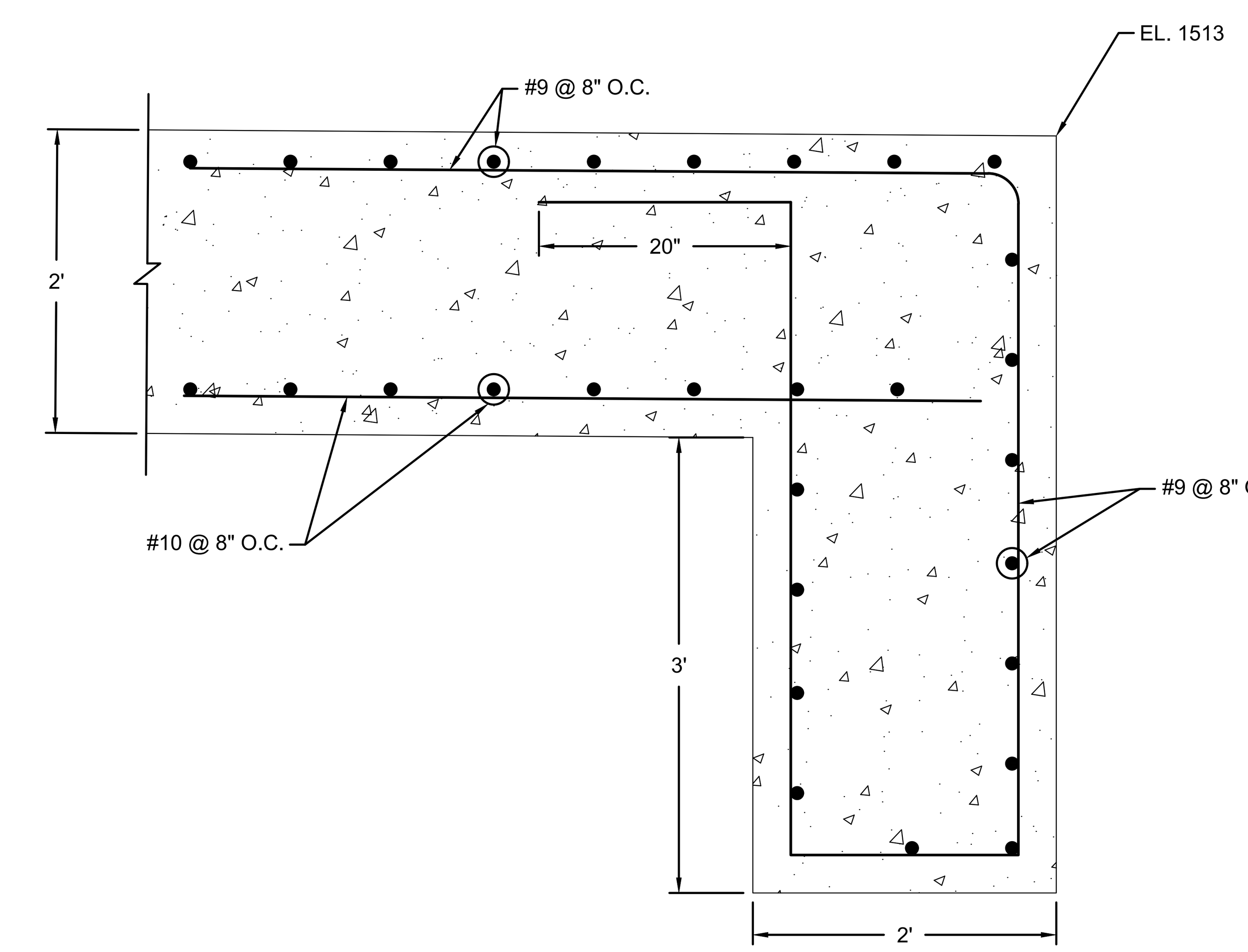

23 / 33 DETAIL — CHUTE

SCALE: 1" = 4'




E / 34 SECTION — STILLING BASIN END SILL

SCALE: 1" = 1'




F / 34 SECTION — STILLING BASIN SLAB END

SCALE: 1" = 1'

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| DRAWN BY: | KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: STILLING BASIN DETAILS 1

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| DATE: | FEBRUARY 2025 |
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| SHEET NO.: | 33 OF 41 |

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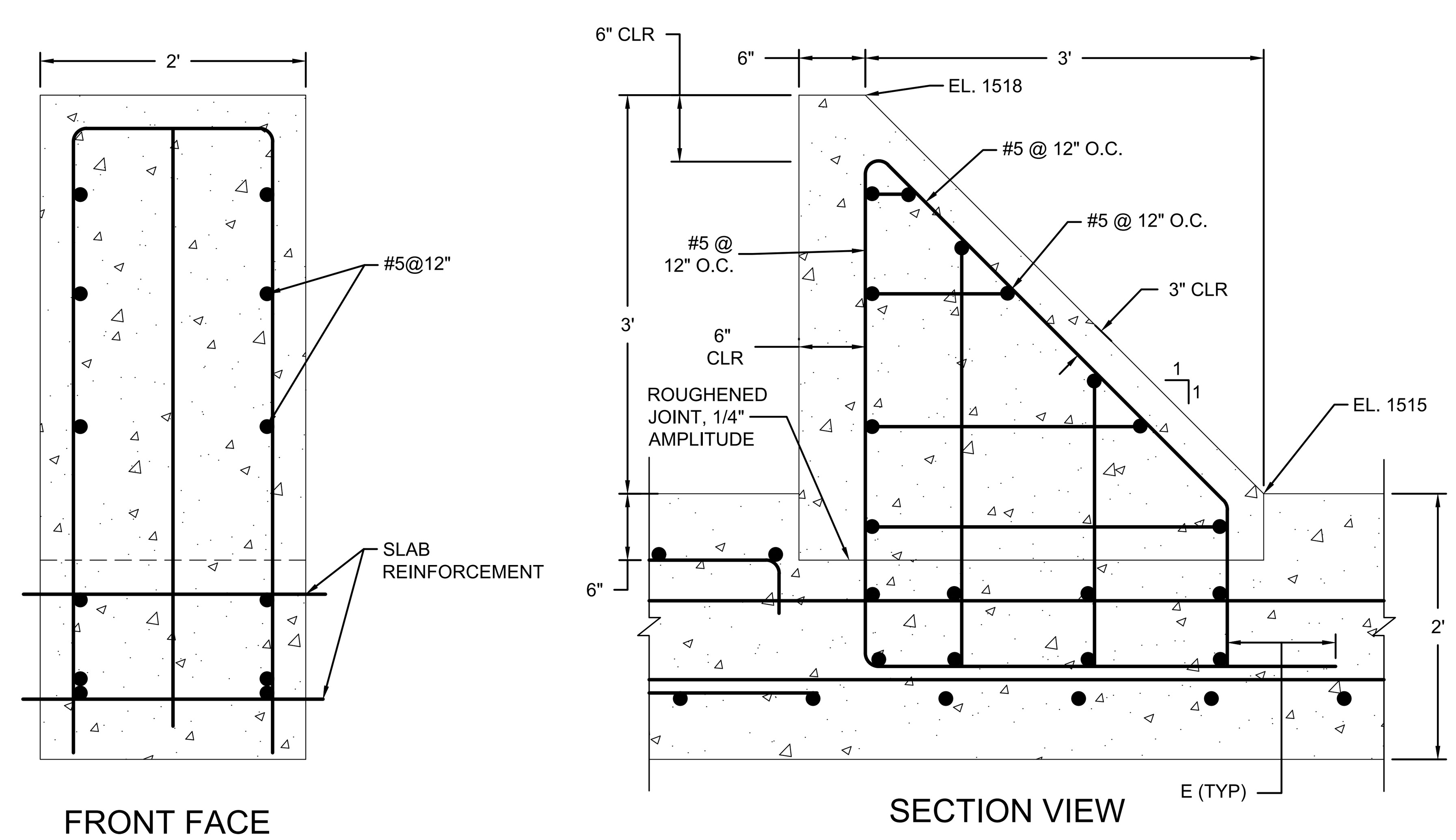
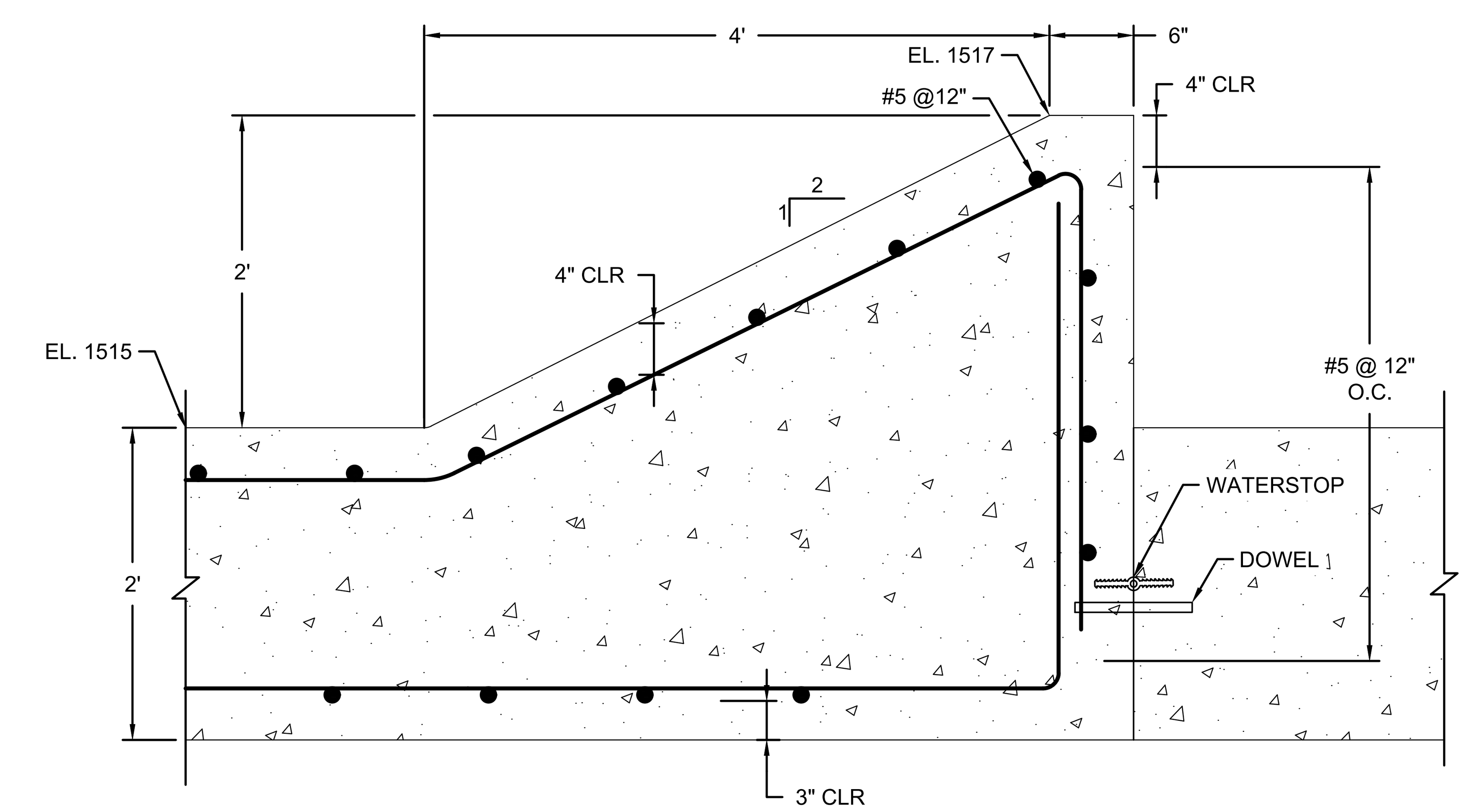
24
33
DETAIL
CHUTE BLOCK
SCALE: 1" = 1'




25
33
DETAIL
BAFFLE BLOCK
SCALE: 1" = 1'




26
33
DETAIL
ENDSILL
SCALE: 1" = 1'

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| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: STILLING BASIN DETAILS 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C34 |
| SHEET NO.: | 34 OF 41 |

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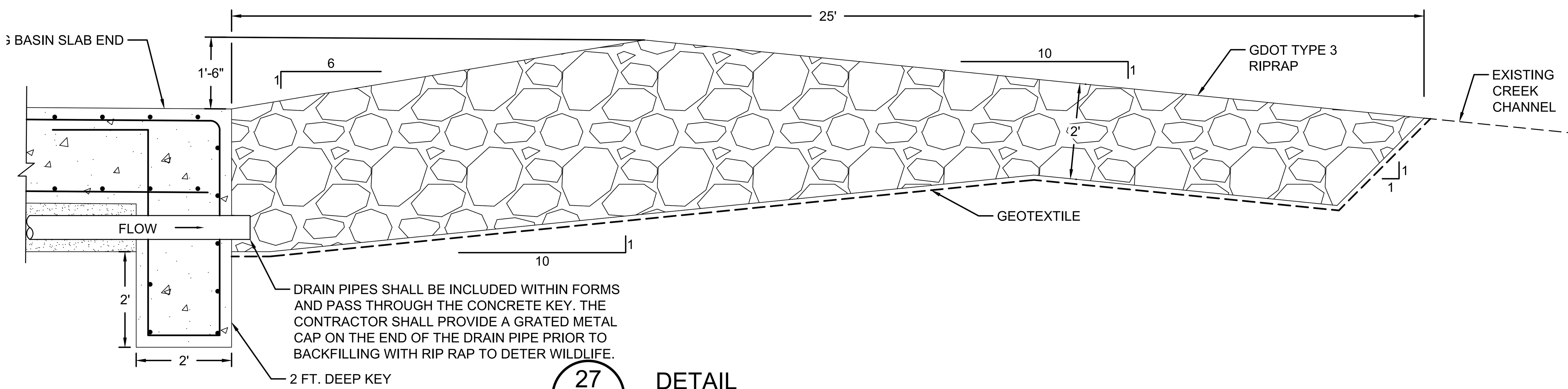


27/26 DETAIL

END OF SLAB-EAST

SCALE: 1" = 2'

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| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: STILLING BASIN DETAILS 3

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C35 |
| SHEET NO.: | 35 OF 41 |

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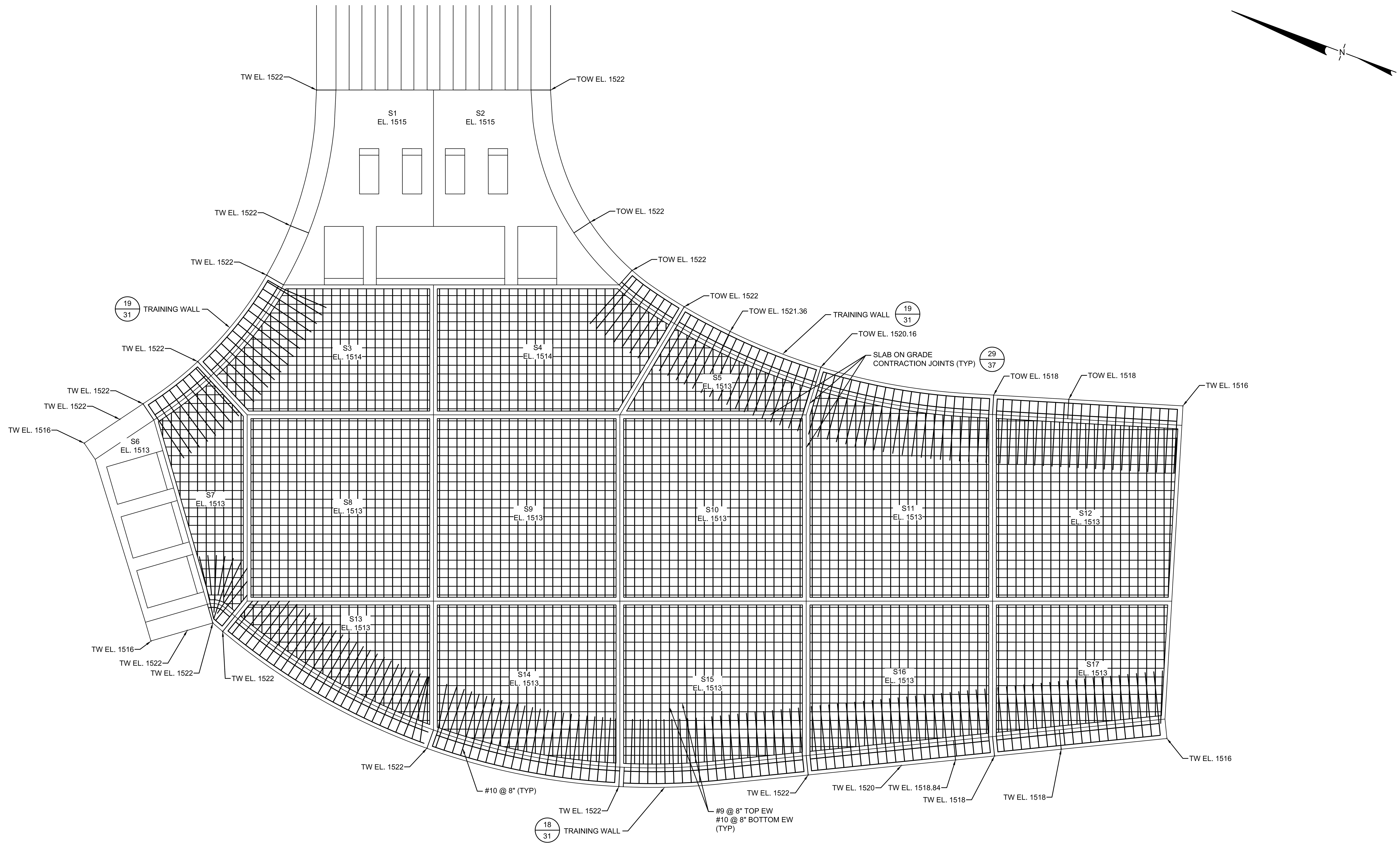


28/36 PLAN

STILLING BASIN SLAB REINFORCEMENT

SCALE: 1" = 4'

0 4 8
SCALE IN FEET

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GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044263 JOHN W. BARRETT 02/20/2025

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| DESIGN BY: | JWB |
| DRAWN BY: | TW/BW |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: STILLING BASIN SLAB REINFORCEMENT PLAN

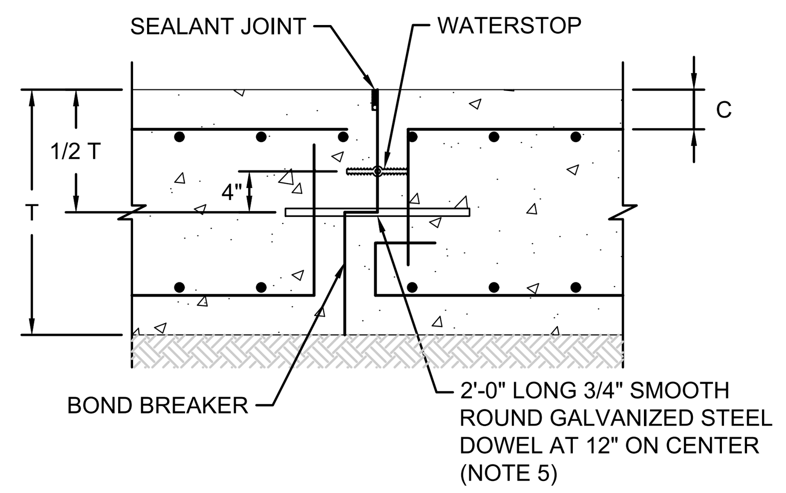
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

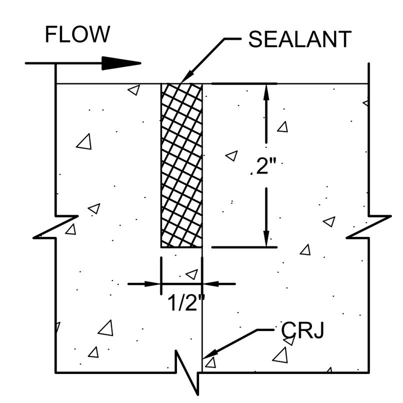
Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C36 |
| SHEET NO.: | 36 OF 41 |




(A) T = 24" OR LARGER




(B) SEALANT JOINT

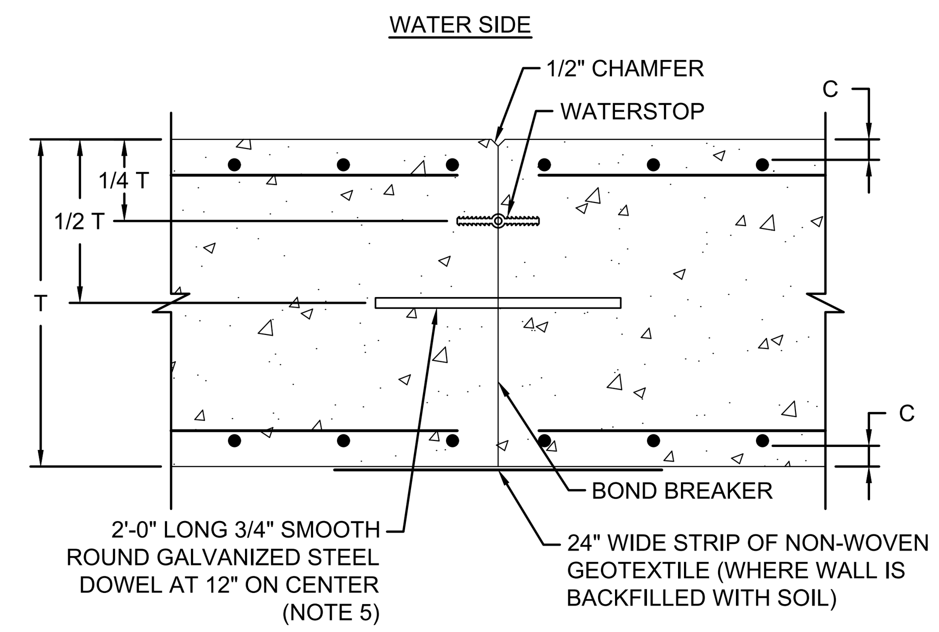
NOTES:

1. DO NOT CARRY HORIZONTAL REINF. THROUGH JOINT.
2. WATERSTOPS SHALL BE PROVIDED IN ALL WATER RETAINING STRUCTURES. REFER TO DETAIL #.
3. APPLY BOND BREAKER TO FACE OF JOINT.
4. C = CONCRETE CLEAR COVER. T = SLAB THICKNESS.
5. DOWELS SHALL BE GRADE 40 MINIMUM. PROVIDE DOWEL CLIP OR GREASE ONE SIDE OF DOWEL. PLACE DOWELS PARALLEL TO TOP OF SLAB. PROVIDE CONTINUOUS SUPPORT FOR DOWELS TO MAINTAIN PARALLEL ALIGNMENT.
6. PROVIDE A SEALANT JOINT UNLESS NOTED OTHERWISE.
7. SEALANT JOINT DETAIL STOPS AT VERTICAL FACE OF SIDEWALL AND DOES NOT EXTEND BELOW WALL OR THROUGH BURIED FOOTING.

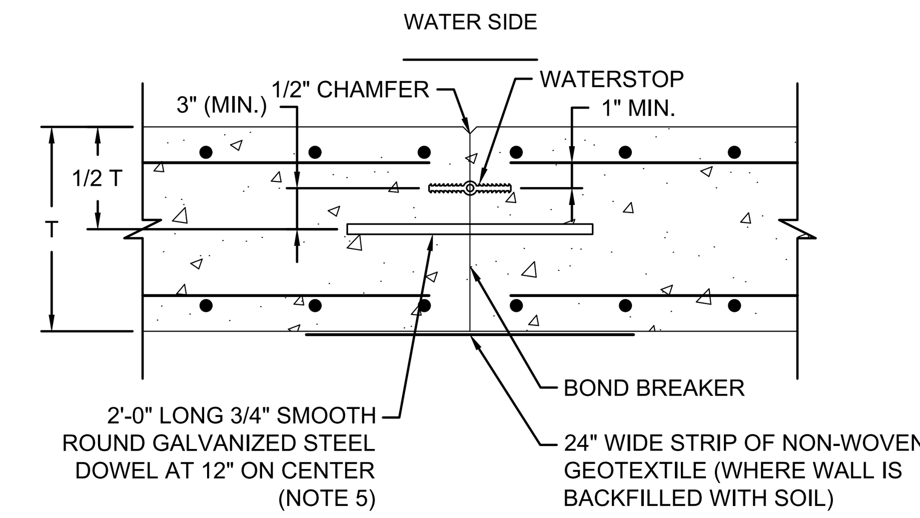
NOTE: DETAIL A APPLIES TO SLOPING SPILLWAY CHUTE SLABS WITH REINFORCED CONCRETE TURN-DOWN AND SLAB SEATS.

## 29/37 DETAIL
## SLAB ON GRADE - CONTRACTION JOINT

SCALE: NTS




(A) T = 24" OR LARGER



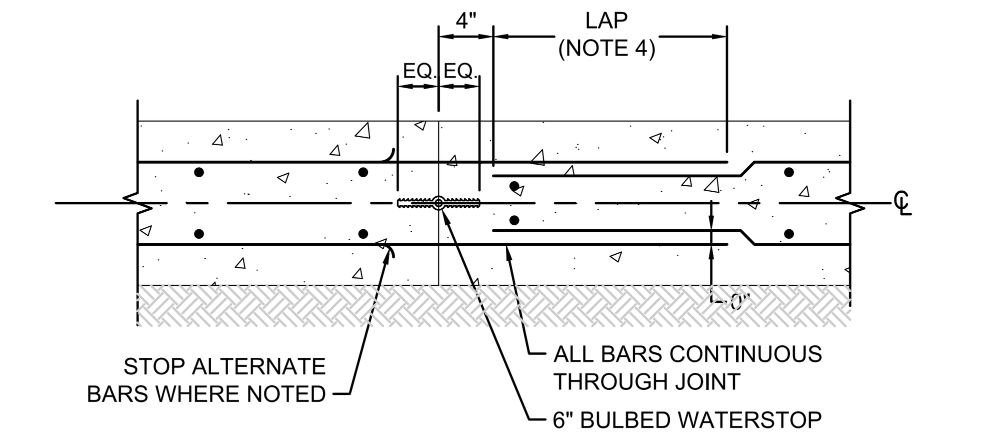

(B) T = 12" THROUGH 18"

NOTES:

1. DO NOT CARRY HORIZONTAL REINF. THROUGH JOINT.
2. WATERSTOPS SHALL BE PROVIDED IN ALL WATER RETAINING STRUCTURES ON THE WATER SIDE OF THE WALL. REFER TO DETAIL #.
3. APPLY BOND BREAKER TO FACE OF JOINT.
4. C = CONCRETE CLEAR COVER. T = WALL THICKNESS.
5. DOWELS SHALL BE GRADE 40 MINIMUM. PROVIDE DOWEL CLIP OR GREASE ONE SIDE OF DOWEL. PLACE DOWELS PARALLEL TO TOP OF SLAB. PROVIDE CONTINUOUS SUPPORT FOR DOWELS TO MAINTAIN PARALLEL ALIGNMENT.

## 30/37 DETAIL
## VERTICAL WALL - CONTRACTION JOINT

SCALE: NTS



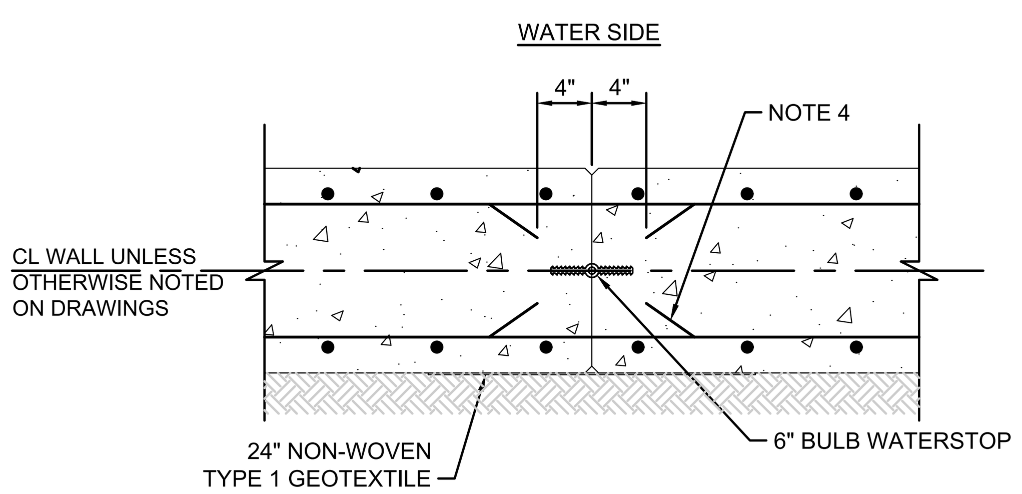

DOUBLE MAT REINF.

NOTES:

1. WATERSTOPS TO BE PROVIDED IN ALL WATER RETAINING SLABS, SEE DRAWINGS, FOR OTHER LOCATIONS WHERE THEY MAY BE REQUIRED.
2. DIMENSIONS INDICATED ON DETAIL CONTROL MINIMUM COVER.
3. STAGGER SPLICES UNO.
4. SEE DWGS. FOR LAP LOCATIONS. IF NOT SPECIFIED PLACED LAP AS SHOWN FOR TOP AND BOTTOM MATS.

## 31/37 DETAIL
## SLAB ON GRADE-CONSTRUCTION JOINTS

SCALE: NTS



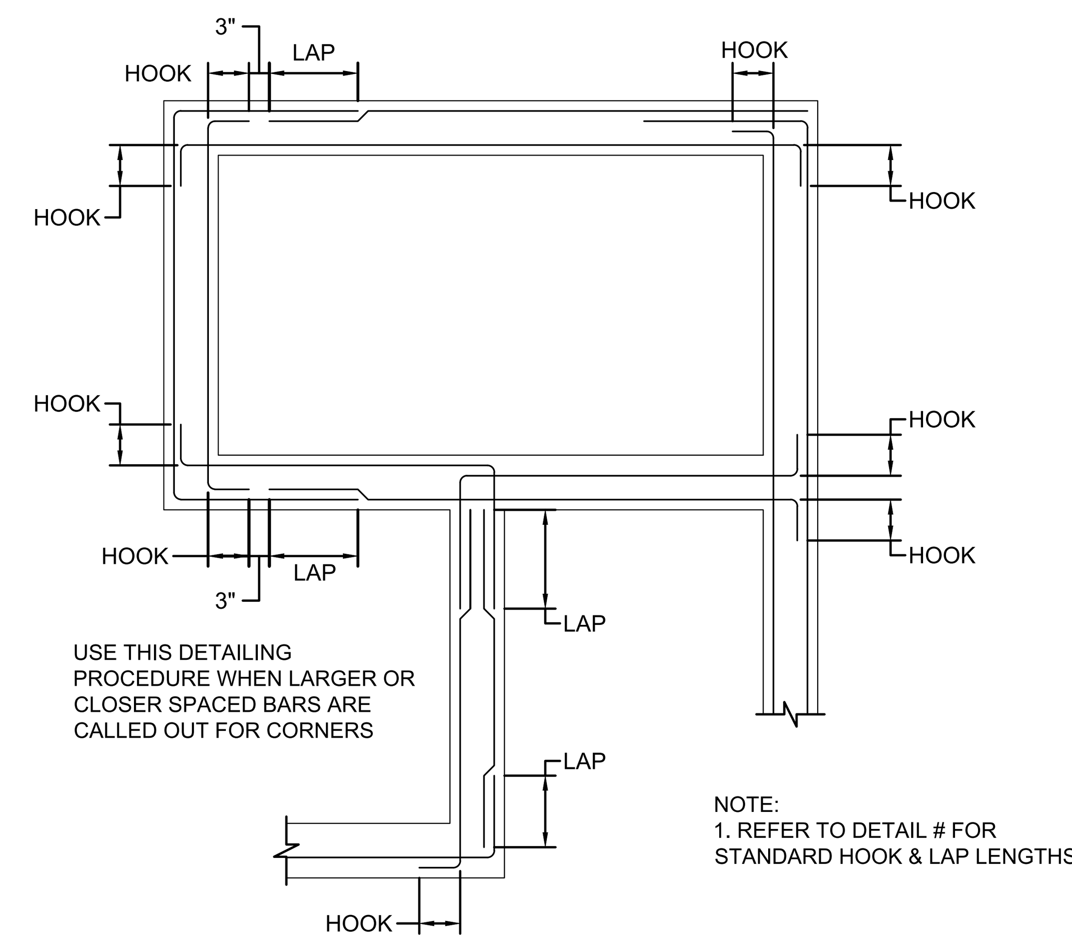

DOUBLE CURTAIN REINFORCED WITH WATERSTOP

NOTES:

1. IN ALL WALL CONSTRUCTION JOINTS WITH WATERSTOPS APPLY 2 COATS OF BOND BREAKER TO FACE OF JOINT, AVOID COATING WATERSTOP.
2. WHERE WATERSTOP IS REQUIRED IN SINGLE CURTAIN WALL REINFORCEMENT, PLACE WATERSTOP ON WATER SIDE OF WALL.
3. UNLESS SPECIFICALLY NOTED OTHERWISE #5 AND LARGER BARS SHALL BE CONTINUOUS THROUGH JOINT. #4 AND SMALLER BARS SHALL STOP ALTERNATE BARS AT JOINT.
4. STAGGER SPLICES UNLESS NOTED OTHERWISE.

## 32/37 DETAIL
## VERTICAL WALL - CONSTRUCTION JOINT

SCALE: NTS

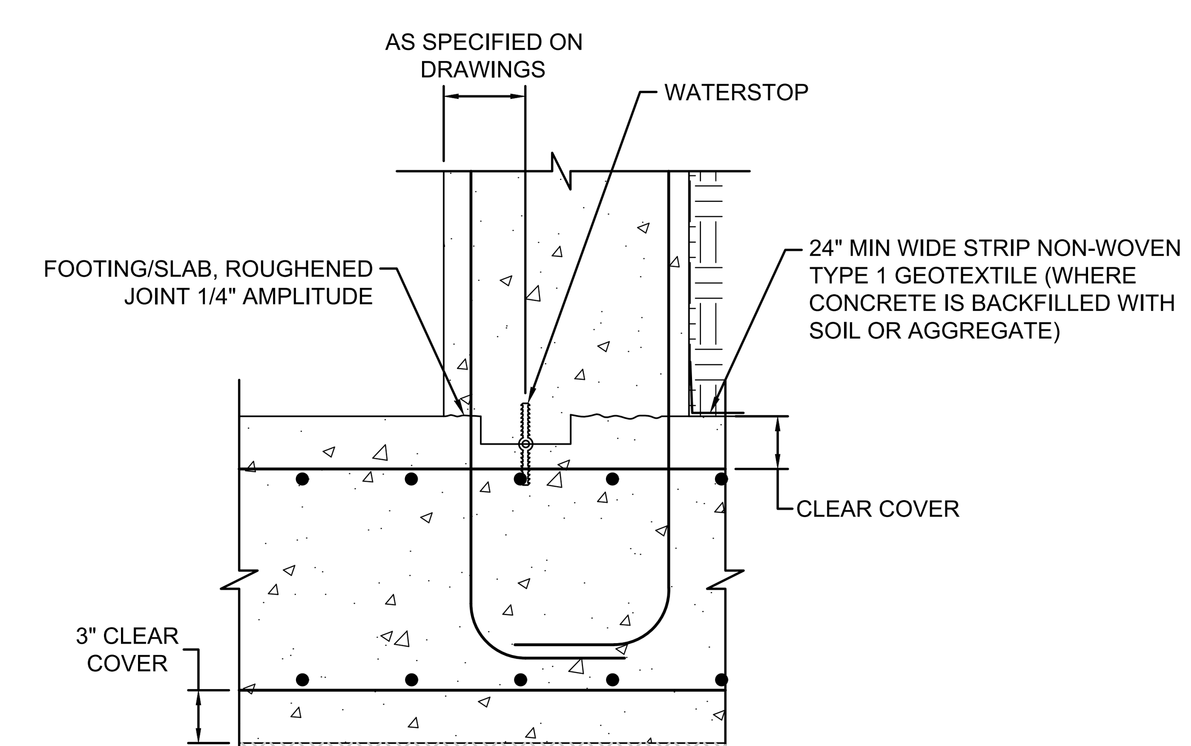



USE THIS DETAILING PROCEDURE WHEN LARGER OR CLOSER SPACED BARS ARE CALLED OUT FOR CORNERS

NOTE:
1. REFER TO DETAIL # FOR STANDARD HOOK & LAP LENGTHS.

## 33/37 DETAIL
## HORIZONTAL REINFORCEMENT AT WALL INTERSECTIONS

SCALE: NTS




## 34/37 DETAIL
## CONSTRUCTION JOINT (CJ AT WALL BASE - SECTION)

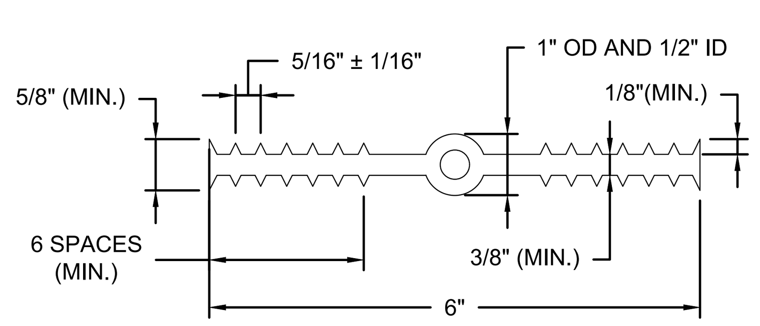
SCALE: NTS

| BAR SIZE | HOOK LENGTH (IN.) | LAP SPLICE LENGTH (IN.) | EMBEDMENT LENGTH (IN.) |
|---|---|---|---|
| #3 | 6 | 18 (23) | 14 (18) |
| #4 | 6 | 24 (31) | 18 (24) |
| #5 | 9 | 30 (38) | 23 (30) |
| #6 | 11 | 35 (46) | 27 (35) |
| #7 | 14 | 41 (53) | 32 (41) |
| #8 | 17 | 47 (61) | 36 (47) |
| #9 | 20 | 53 (69) | 41 (53) |
| #10 | 23 | 59 (76) | 45 (59) |
| #11 | 27 | 64 (84) | 50 (64) |

NOTES:

1. USE LENGTH IN PARENTHESES FOR WALL HORIZONTAL REBARS AND SLAB BARS WITH 12 IN. OR MORE OF FRESH CONCRETE UNDERNEATH.
2. THE TABLE SHOWN IN FOR F'C = 4,000 PSI, FY = 50,000 PSI, 1.5 MIN CONCRETE COVER AND 3" MIN BAR SPACING.
3. WHEN BARS OF DIFFERENT SIZES ARE LAP SPLICES, LAP LENGTH SHALL BE THE LARGER OF:
A) EMBEDMENT LENGTH OF LARGER BAR
B) LAP LENGTH OF SMALLER BAR.
4. STAGGER ADJACENT BAR SPLICES IN SLABS AND WALLS.
EXCEPTION: SPLICES OF VERTICAL BARS AT DOWELS EMBEDDED IN BASE OF SLABS OR FOOTINGS NEED NOT BE STAGGERED.
5. ALL DOWEL BARS SHALL EXTEND AN EMBEDMENT LENGTH INTO ANOTHER MEMBER OR ACROSS A CONSTRUCTION JOINT UNLESS SHOWN TO SPLICE WITH OTHER BARS OR TO EXTEND TO THE FAR FACE OF THE MEMBER AND END WITH A STANDARD HOOK.

## 36/37 TABLE
## REINFORCEMENT TABLE




NOTE:

1. SIKA GREENSTREAK #717 OR APPROVED EQUAL. USE CENTERBULB WATERSTOP UNLESS APPROVED OTHERWISE BY THE ENGINEER.

## 35/37 DETAIL
## WATERSTOPS 6IN CENTER-BULB

SCALE: NTS

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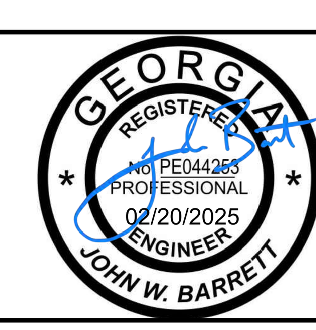




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| DESIGN BY: | JWB |
| DRAWN BY: | KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: MISCELLANEOUS DETAILS 1

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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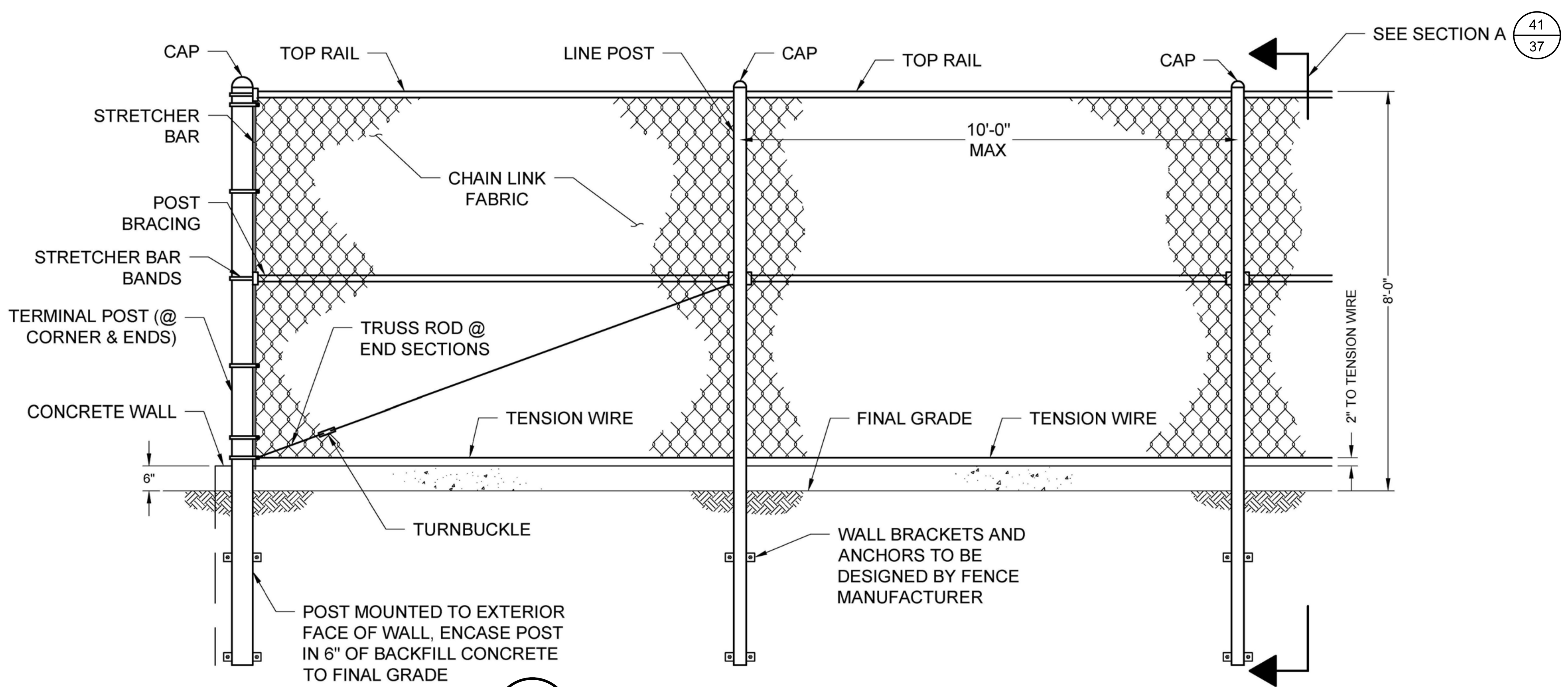
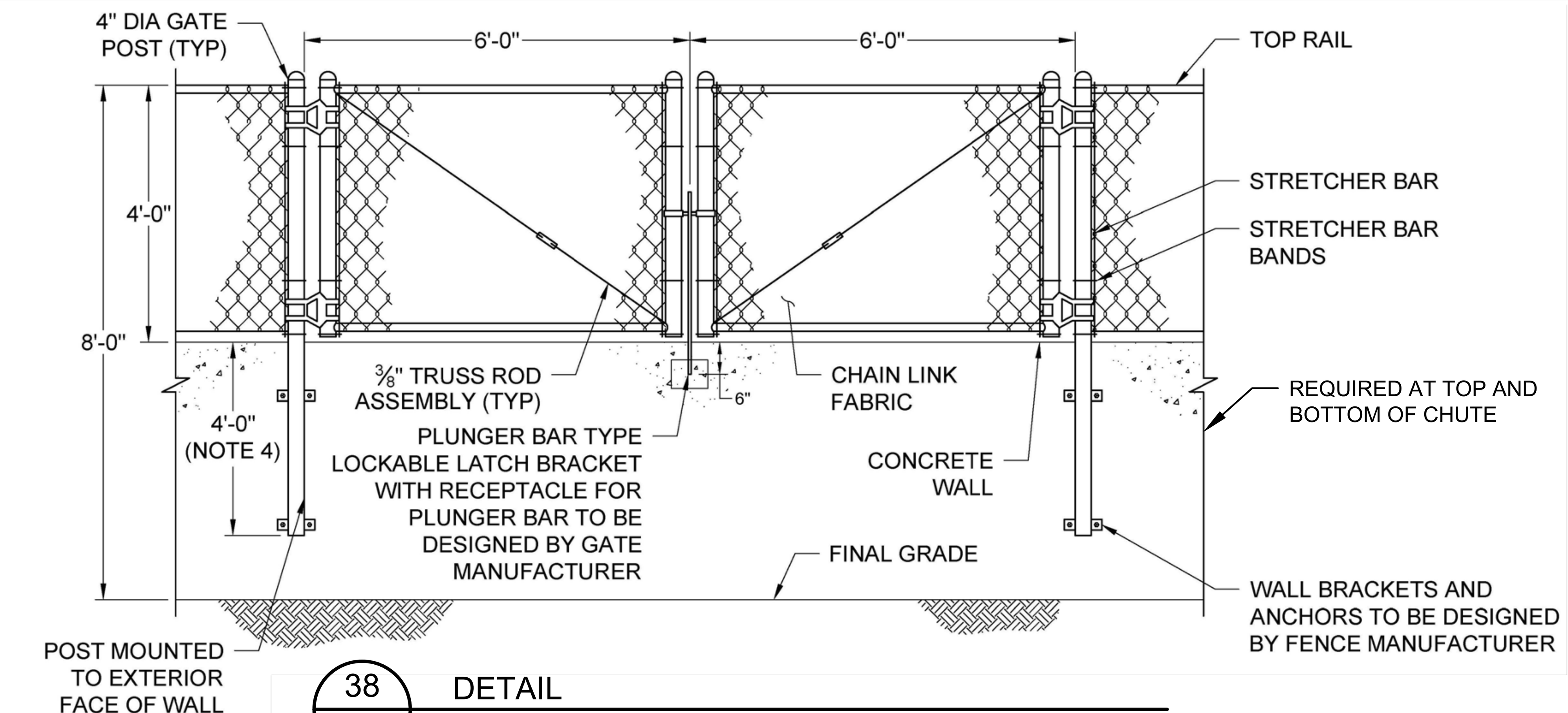
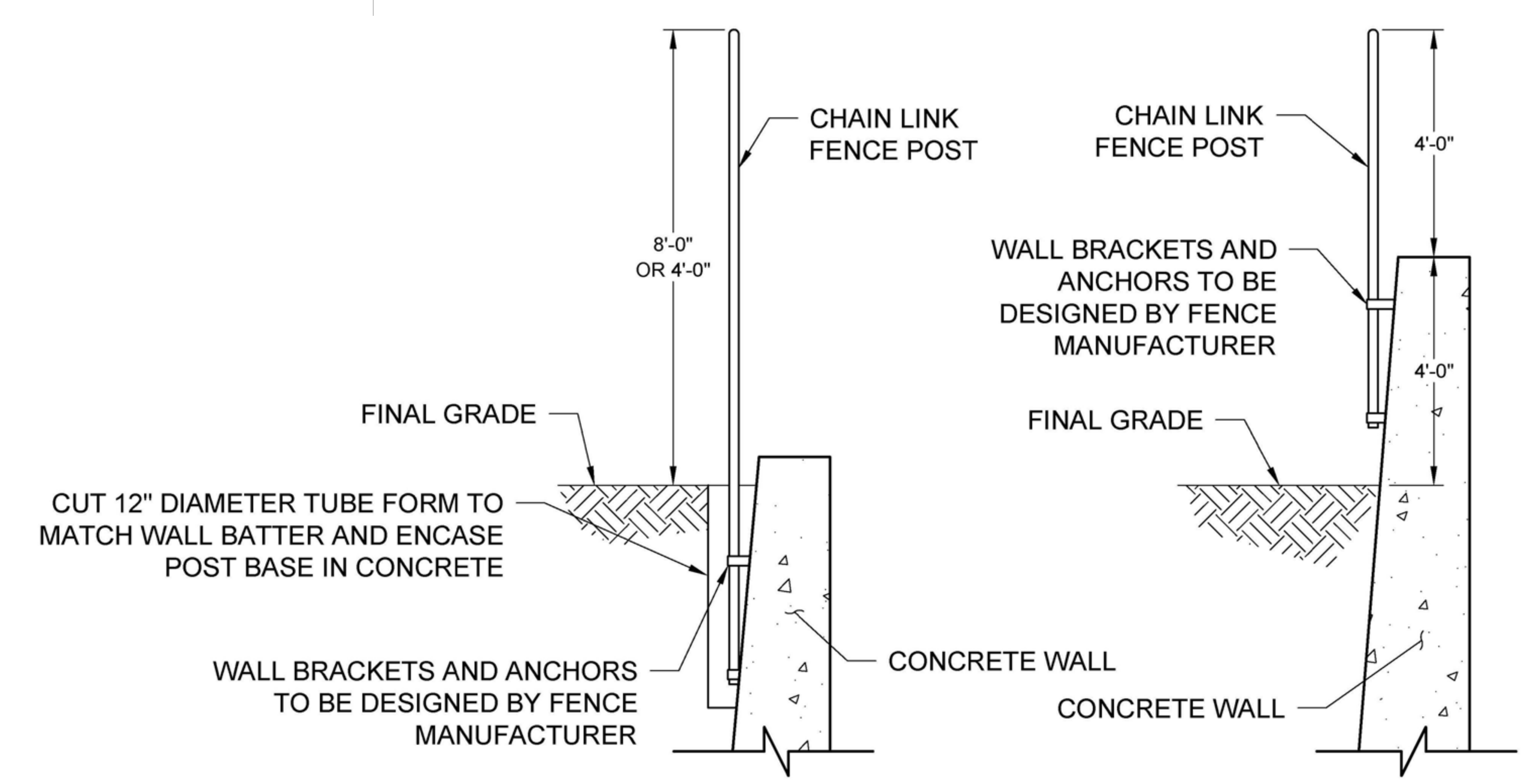
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C37 |
| SHEET NO.: | 37 OF 41 |



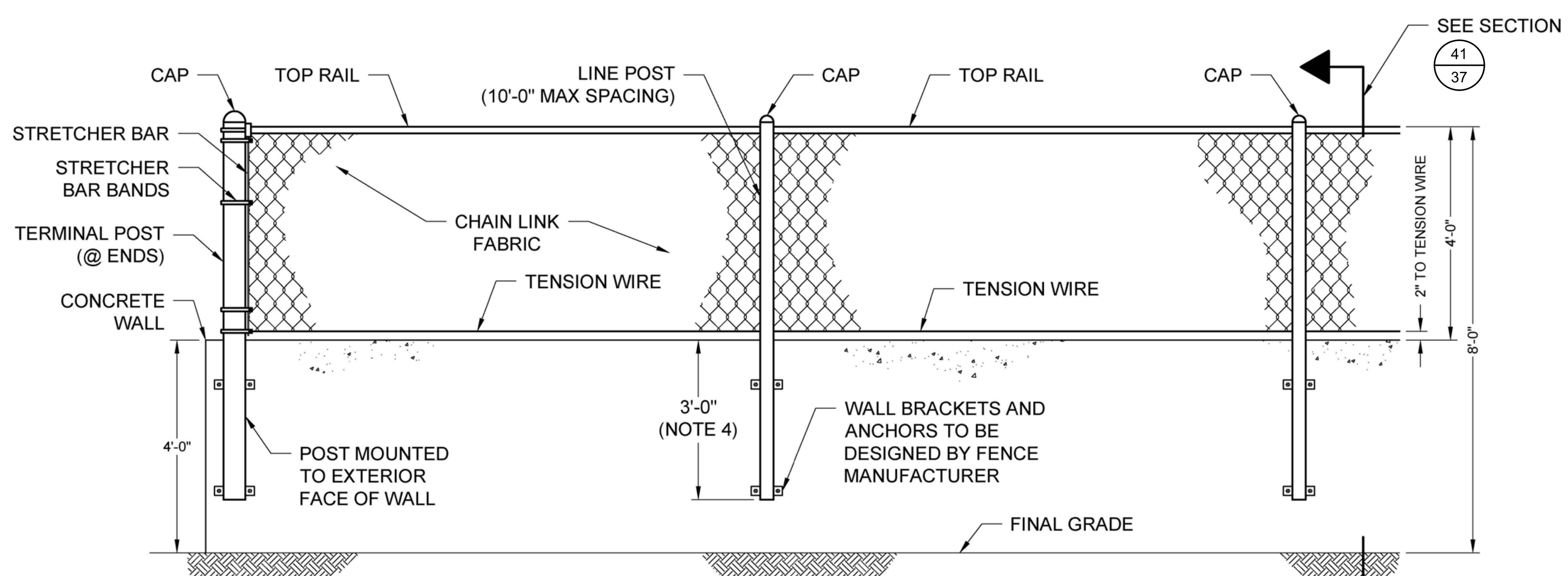

37/38 DETAIL
8-FT TALL CHAIN LINK FENCE
SCALE: 1" = 2'



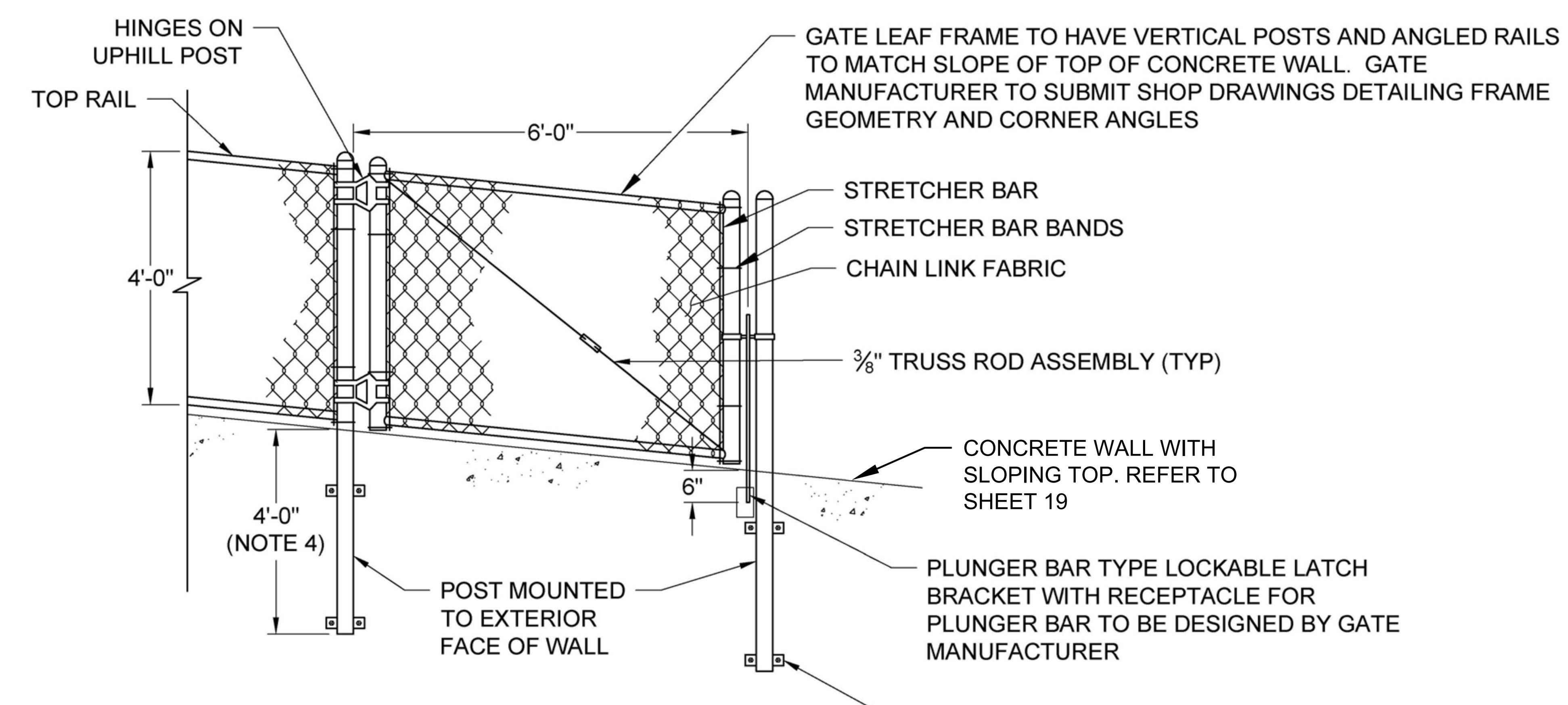

38/38 DETAIL
DOUBLE LEAF CHAIN LINK FENCE SWING GATE
SCALE: 1" = 2'




40/38 DETAIL
CHAIN LINK FENCE SECTIONS
SCALE: 1" = 2'




39/38 DETAIL
4-FT TALL CHAIN LINK FENCE
SCALE: 1" = 2'




41/38 DETAIL
SINGLE LEAF CHAIN LINK FENCE SWING GATE
SCALE: 1" = 2'

NOTES:

1. DETAIL XX APPLIES TO SPILLWAY CONTROL SECTION AND UPSTREAM TRAINING WALLS. REFER T DETAIL XX FOR POST CONNECTION.
2. DETAIL XX APPLIES TO THE SPILLWAY CHUTE AND STILLING BASIN. REFER TO DETAIL XX FOR POST CONNECTION DETAIL TO WALL.
3. DETAIL XX APPLIES TO THE OUTLET WORKS OUTLET STRUCTURE. REFER TO DETAIL XX FOR CONNECTION DETAIL TO WALL.
4. FENCING MANUFACTURER TO DESIGN TRANSITION SECTION FOR AREA OF SLOPING SIDEWALL BETWEEN THE SPILLWAY CONTROL SECTION AND CHUTE FOR REVIEW BY THE ENGINEER.
5. MINIMUM POST LENGTHS UNLESS OTHERWISE REQUIRED BY THE FENCE MANUFACTURER.
6. REFER TO SPECIFICATION SECTION XX FOR FENCE POST AND RAIL SIZING AND DESIGN REQUIREMENTS.

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| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: MISCELLANEOUS DETAILS 2
PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT
SITE: LAKE PETIT DAM JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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|---|---|
| DATE: | FEBRUARY 2025 |
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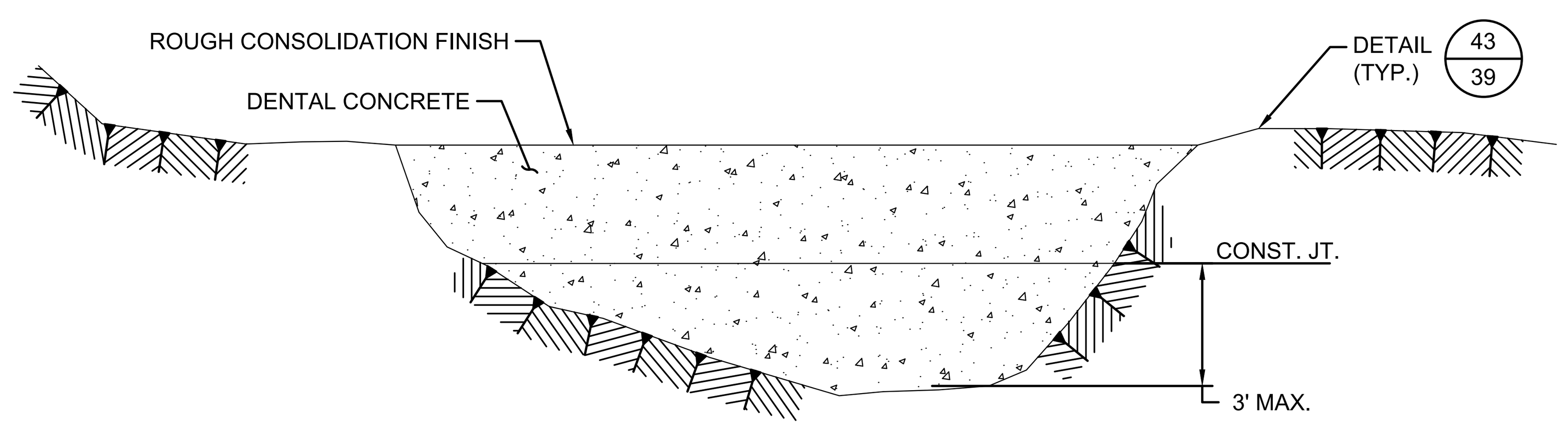
| FILE: | TJD10771.01 C38 |
| SHEET NO.: | 38 OF 41 |

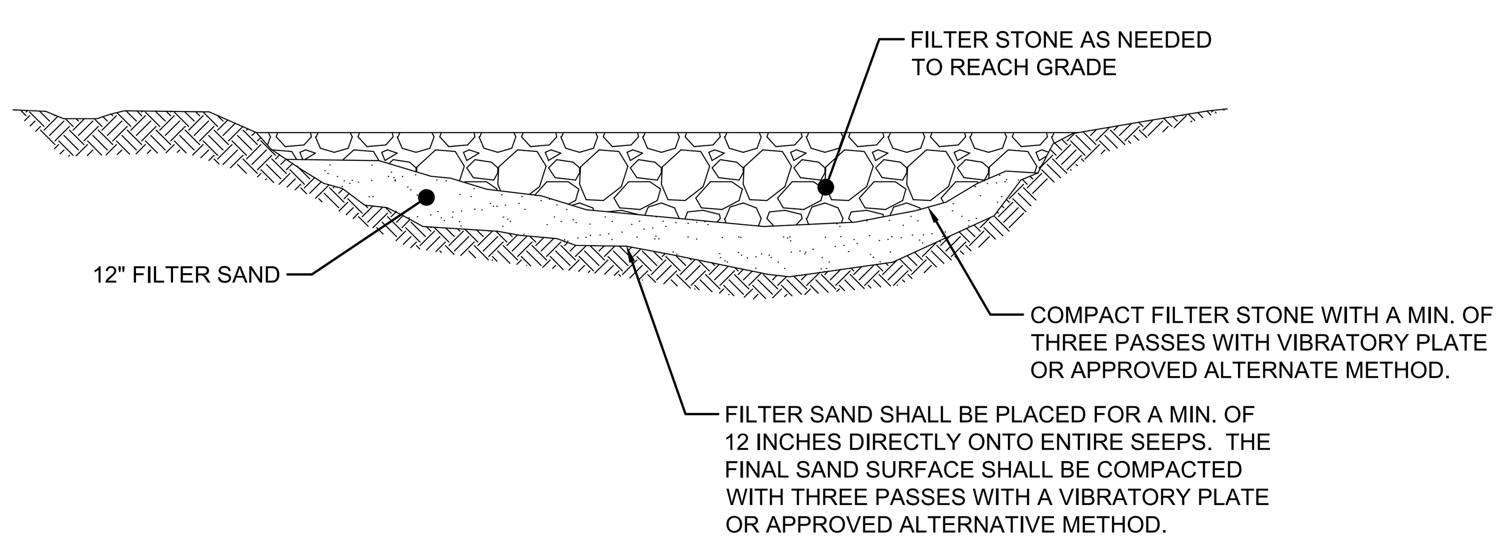



NOTES:

1. OVER EXCAVATION REQUIRED WHERE SOFT GROUND IS OBSERVED DURING FOUNDATION PREPARATION. OVER-EXCAVATION SHALL BE BACKFILLED WITH CLSM WITH A 28-DAY STRENGTH OF 100 PSI.

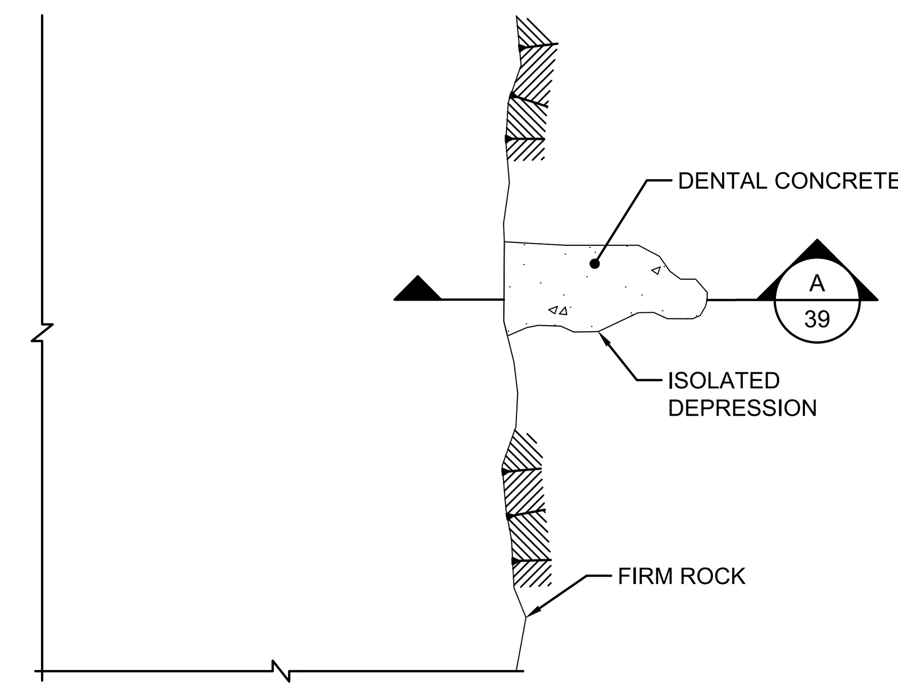
42/39 DETAIL
## DENTAL CONCRETE IN DEPRESSION OR SOFT GROUND

SCALE: NTS

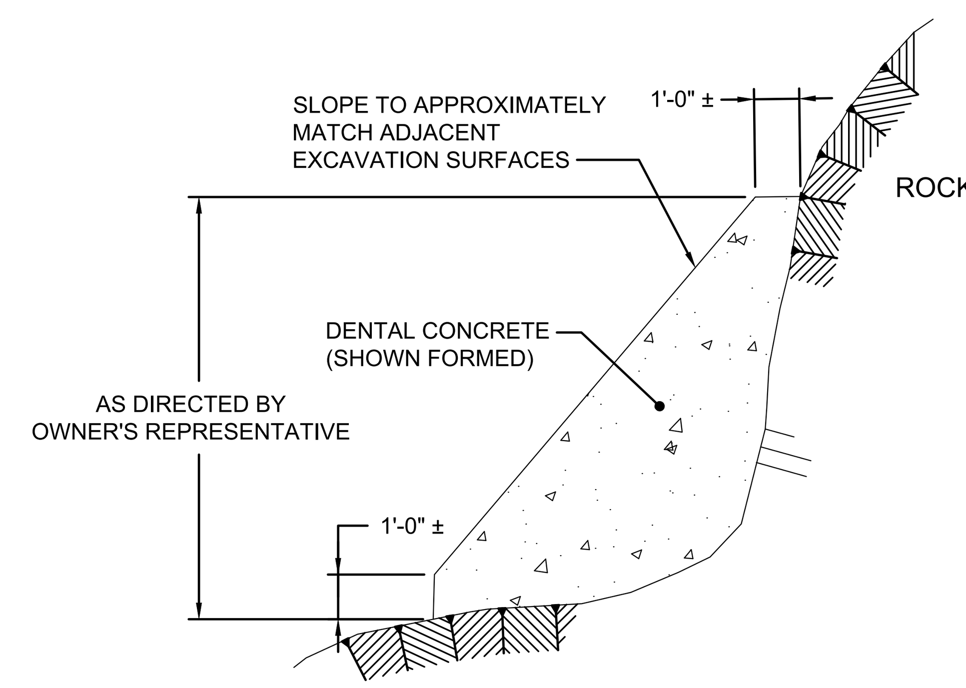



44/39 DETAIL
## ACTIVE SEEP IN EXCAVATION

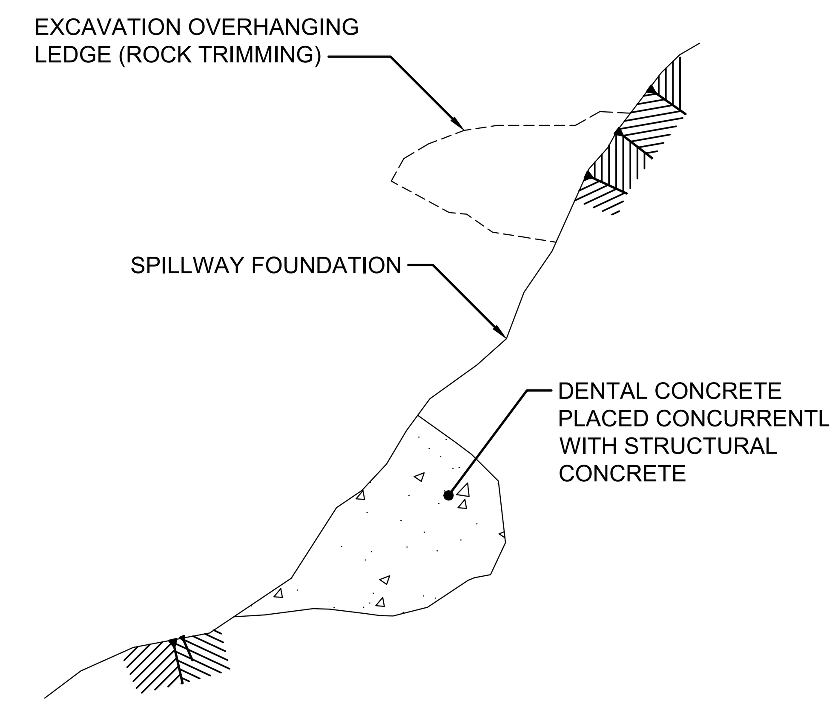
SCALE: NTS




PLAN




A/39 SECTION




COMBINATION DAM FOUNDATION EXCAVATION AND DENTAL CONCRETE

43/39 DETAIL
## DENTAL CONCRETE TREATMENT AT ISOLATED DEPRESSIONS AND OVERHANGS

SCALE: NTS

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DESIGN BY: JWB
DRAWN BY: KL
CHECKED BY: JAM
REVIEWED BY: WMM
APPROVED BY: JWB

TITLE: MISCELLANEOUS DETAILS 3

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

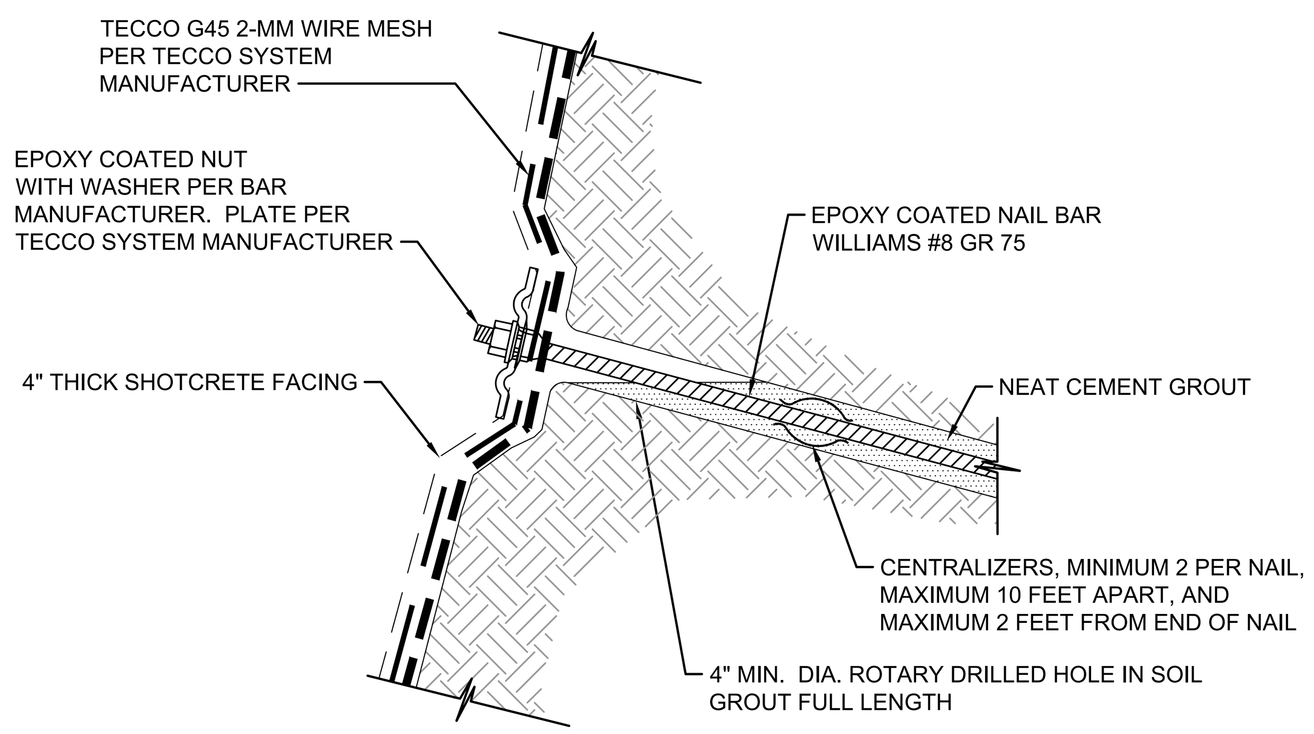
SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

DATE: FEBRUARY 2025
PROJECT NO.: TJD10771
FILE: TJD10771.01 C39
SHEET NO.: 39 OF 41

C:_GEO-ACCADCDOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CADD\01_SPILLWAY DESIGN\DWGS\SHEETS\TJD10771.01 C39

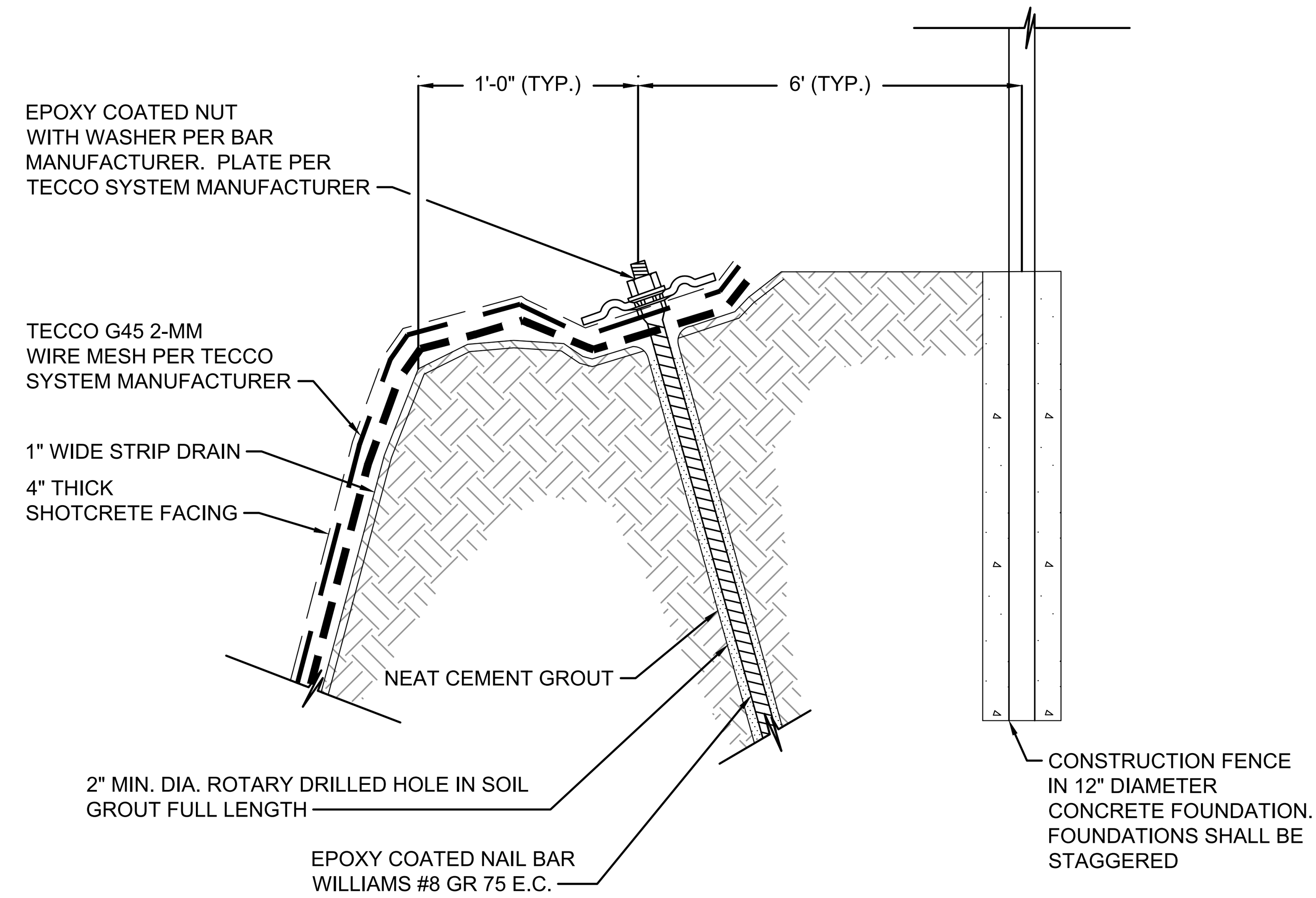



NOTE:

1. HYDROSEEDING BY OTHERS UPON COMPLETION. TORQUE COMPLETED NAILS TO 250 FT-LBS.

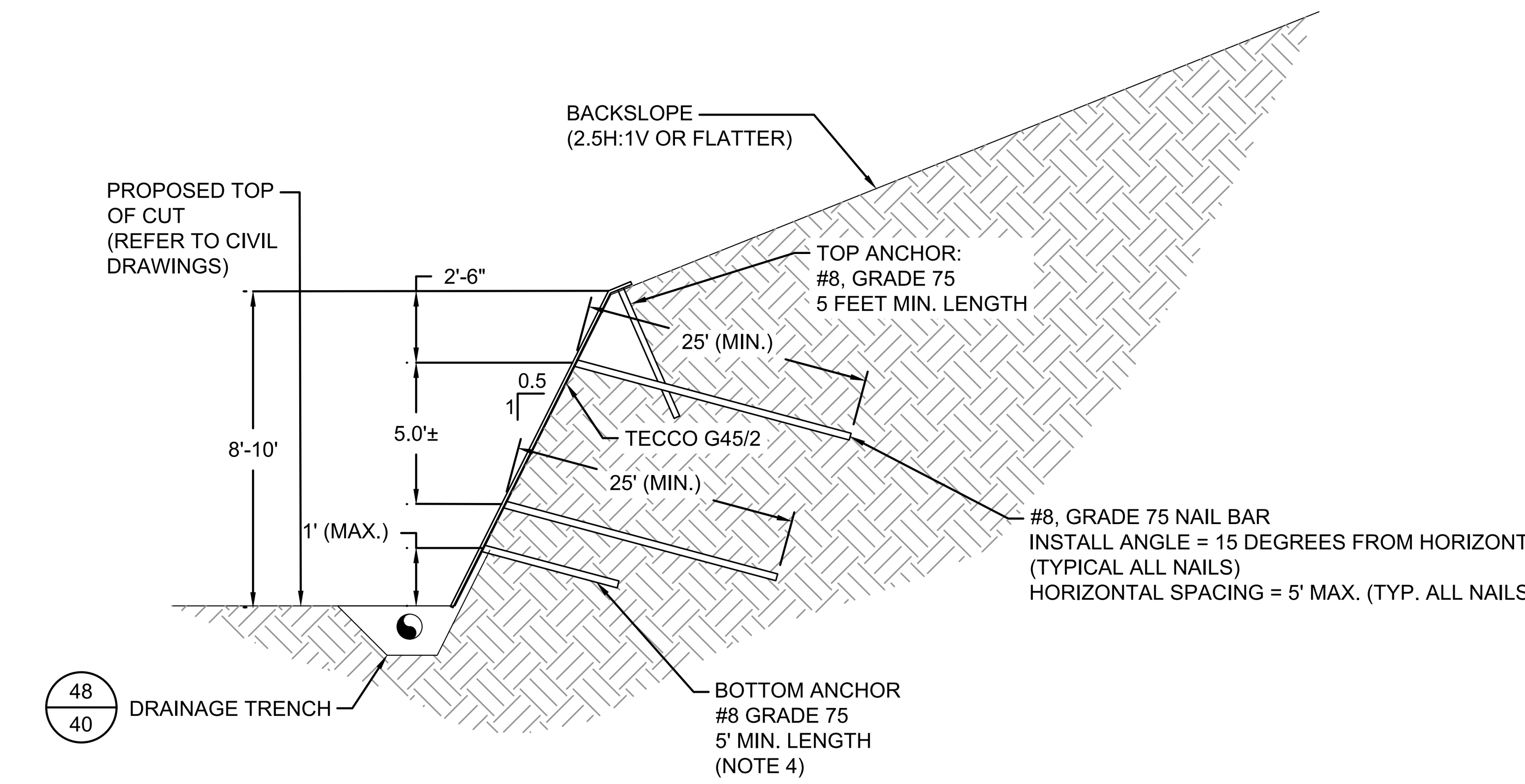
45/40 DETAIL
**TYPICAL SOIL NAIL HEAD AND BOTTOM ANCHOR**

SCALE: NTS




46/40 DETAIL
**TYPICAL TOP ANCHOR**

SCALE: NTS

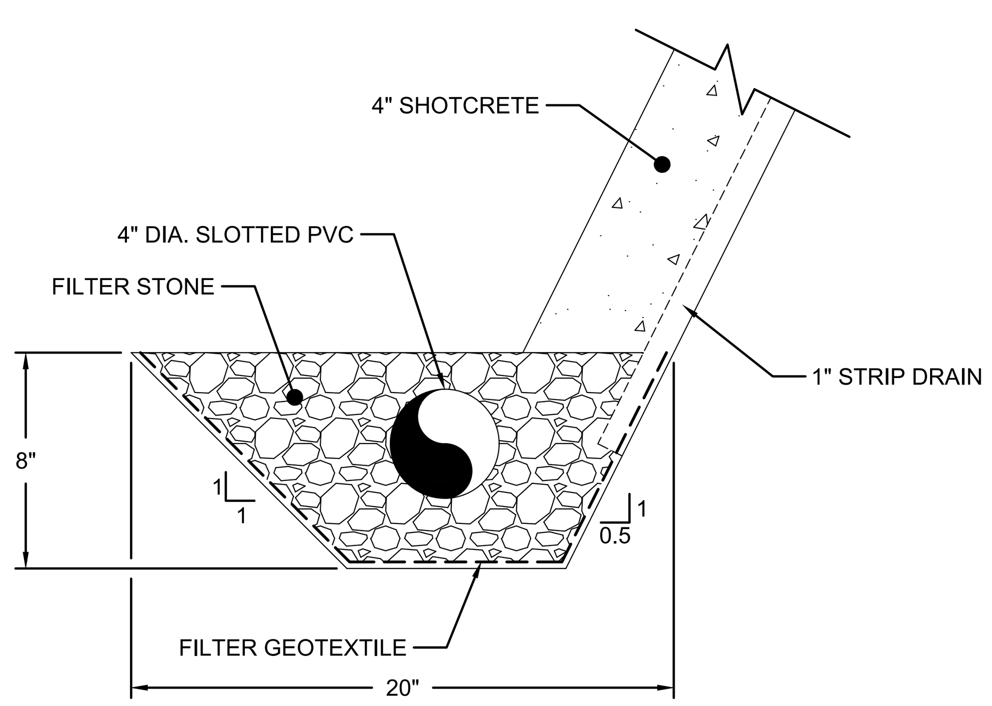



NOTES:

1. ANCHORS SHALL BE INSTALLED AT 5' ON CENTER (HORIZONTALLY) ALONG THE TOP OF THE WALL ALIGNMENT, SPACED EVENLY BETWEEN SOIL NAIL LOCATIONS AS SHOWN IN DETAIL 46/40.
2. SOIL NAILS SHALL BE INSTALLED 5' ON CENTER (HORIZONTALLY) ALONG THE WALL ALIGNMENT.
3. TECCO MESH FACING SHALL BE INSTALLED AS 5' ON CENTER (HORIZONTALLY) PER THE DETAILS SHOWN ON THIS SHEET. ANY CHANGES IN THE INSTALLATION METHOD SHALL BE APPROVED BY THE DESIGN ENGINEER.
4. 12'-WIDE VERTICAL STRIP DRAINS SHALL BE INSTALLED 5' ON CENTER (HORIZONTALLY) IN-LINE WITH AND ANCHORED BY THE TOP ROW OF ANCHORS, EACH STRIP DRAIN SHALL DISCHARGE INTO THE DRAINAGE CHANNEL AT THE BASE OF THE EXCAVATION AS SHOWN IN DETAIL 45/40.
5. BOTTOM ANCHORS SHALL BE INSTALLED WHERE VERTICAL DISTANCE BETWEEN BOTTOM ROW OF NAILS AND BOTTOM OF CUT EXCEEDS 12 INCHES.
6. THIS DETAIL IS ACCEPTABLE FOR ALL PROJECT AREAS WHERE SOIL IS ENCOUNTERED ABOVE ROCK CUTS AND THE SOIL HEIGHT IS 8 TO 10 FEET.

47/40 DETAIL
**TYPICAL CROSS-SECTION (SOIL AREAS 8 TO 10 FT ABOVE ROCK CUTS)**

SCALE: NTS




48/40 DETAIL
**TYPICAL NAIL WALL DRAIN**

SCALE: 2" = 1'

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| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: SOIL NAIL WALL DETAILS 1

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

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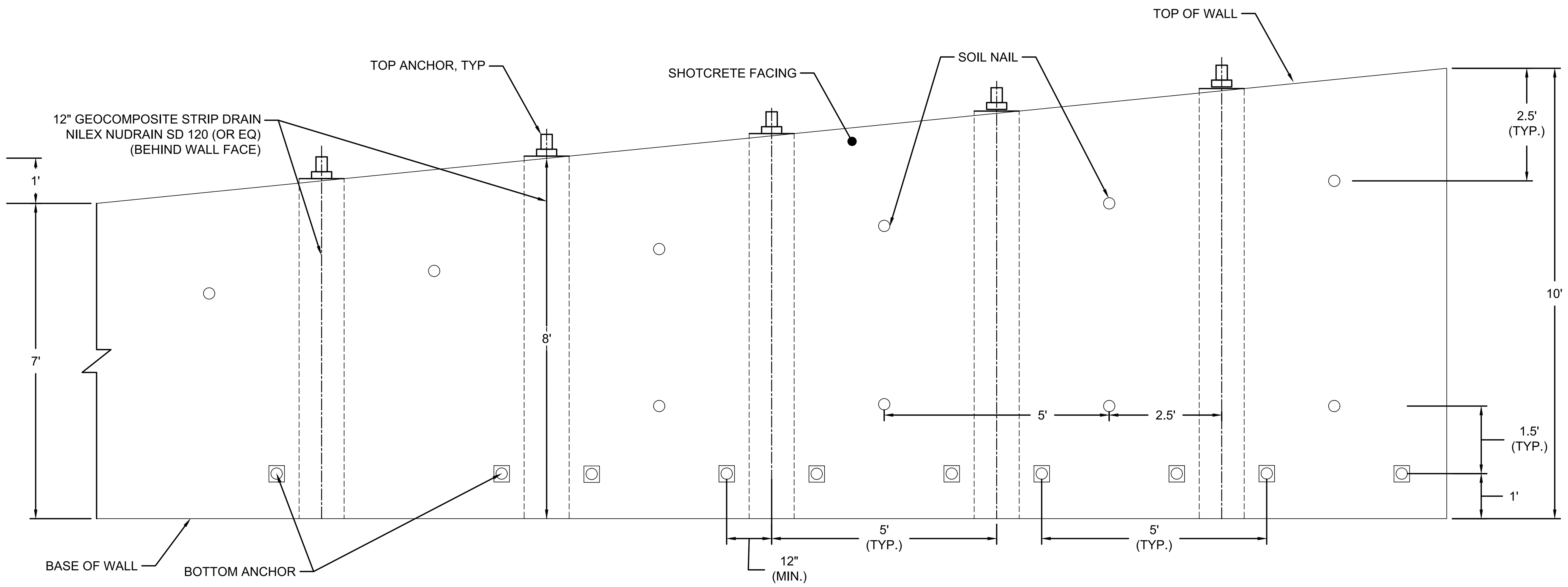
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C40 |
| SHEET NO.: | 40 OF 41 |

C:_GEO-ACC\ACCDOCS\GEOSYNTEC\BIG CANOE POA_LAKE PETIT\PROJECT FILES\CADD\01_SPILLWAY DESIGN\DWGS\SHEETS\TJD10771.01 C40

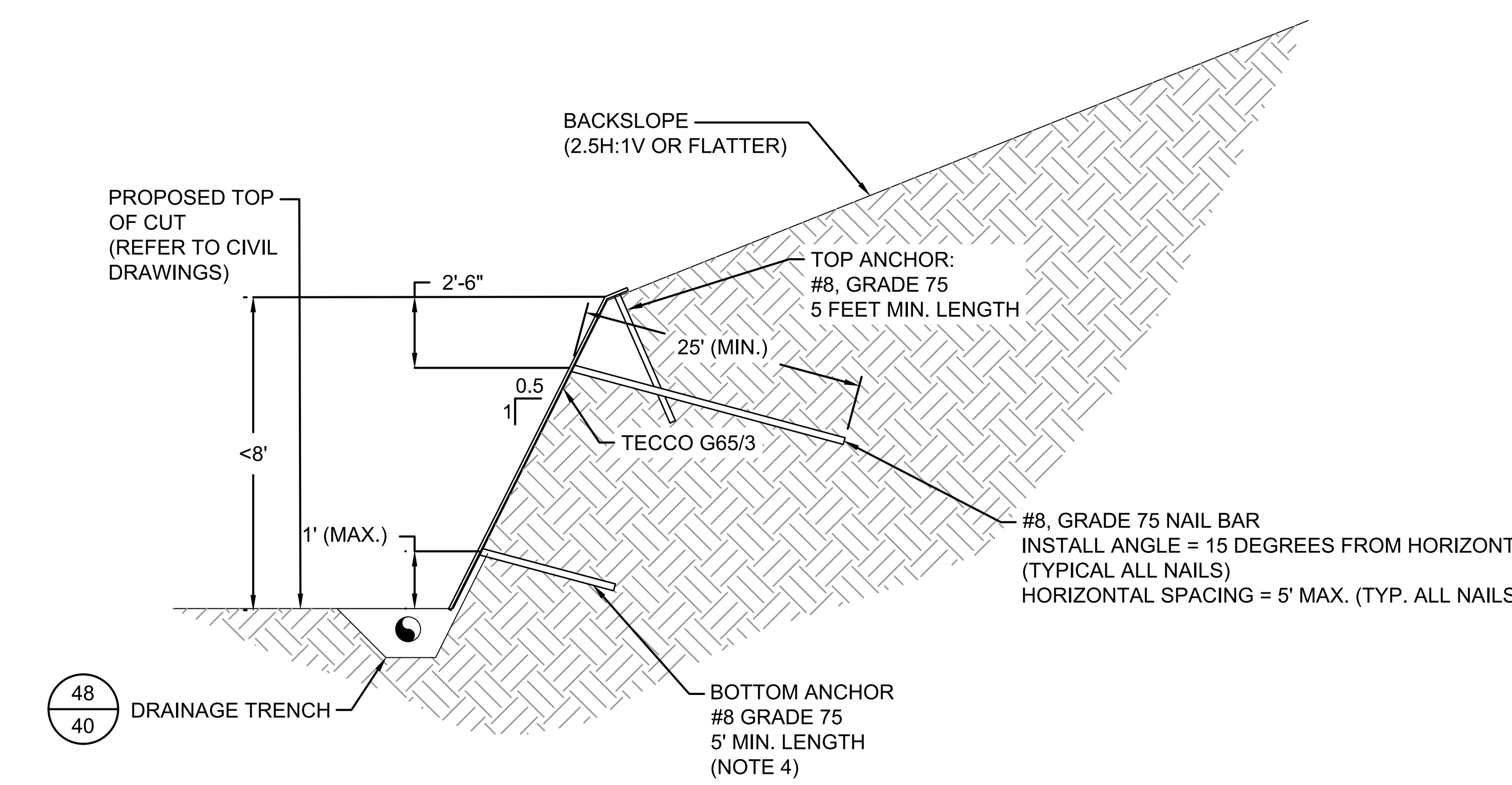



NOTES:

1. BOTTOM ANCHORS SHALL BE INSTALLED AT 5' ON CENTER (HORIZONTALLY), WHERE VERTICAL DISTANCE BETWEEN BOTTOM ROW OF NAILS AND BOTTOM OF CUT EXCEEDS 12 INCHES.
2. BOTTOM ANCHORS SHOULD BE OFFSET A MINIMUM OF 12 INCHES FROM THE STRIP DRAINS AND TOP ANCHORS TO AVOID INTERFERENCE WITH THE STRIP DRAINS. ACTUAL OFFSET SHALL BE DETERMINED IN THE FIELD BASED ON ENCOUNTERED SUBSURFACE CONDITIONS.

49/41 DETAIL
TYPICAL LONGITUDINAL SPACING

SCALE: 1" = 2'




NOTES:

1. ANCHORS SHALL BE INSTALLED AT 5' ON CENTER (HORIZONTALLY) ALONG THE TOP OF THE WALL ALIGNMENT, SPACED EVENLY BETWEEN SOIL NAIL LOCATIONS AS SHOWN IN DETAIL 46/40.
2. SOIL NAILS SHALL BE INSTALLED 5' ON CENTER (HORIZONTALLY) ALONG THE WALL ALIGNMENT.
3. TECCO MESH FACING SHALL BE INSTALLED AS 5' ON CENTER (HORIZONTALLY) PER THE DETAILS SHOWN ON THIS SHEET. ANY CHANGES IN THE INSTALLATION METHOD SHALL BE APPROVED BY THE DESIGN ENGINEER.
4. 12'-WIDE VERTICAL STRIP DRAINS SHALL BE INSTALLED 5' ON CENTER (HORIZONTALLY) IN-LINE WITH AND ANCHORED BY THE TOP ROW OF ANCHORS, EACH STRIP DRAIN SHALL DISCHARGE INTO THE DRAINAGE CHANNEL AT THE BASE OF THE EXCAVATION AS SHOWN IN DETAIL 48/40.
5. BOTTOM ANCHORS SHALL BE INSTALLED AT 5' ON CENTER (HORIZONTALLY) WHERE VERTICAL DISTANCE BETWEEN BOTTOM ROW OF NAILS AND BOTTOM OF CUT EXCEEDS 12 INCHES.
6. THIS DETAIL IS ACCEPTABLE FOR ALL PROJECT AREAS WHERE SOIL IS ENCOUNTERED ABOVE ROCK CUTS AND THE SOIL HEIGHT IS 8' FEET.

50/41 DETAIL
TYPICAL SOIL CROSS SECTION (SOIL AREAS LESS THAN 8 FT ABOVE ROCK CUTS)

SCALE: NTS

FOR REVIEW PURPOSES ONLY
DRAFT PERMIT DRAWING - NOT FOR CONSTRUCTION

| REV | DATE | DESCRIPTION | DRN | APP |
|---|---|---|---|---|
| A | 02/20/2025 | ISSUE FOR PERMITTING | TAW | JWB |

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. PE044285 JOHN W. BARRETT 02/20/2025



| | |
|---|---|
| DESIGN BY: | JWB |
| DRAWN BY: | KL |
| CHECKED BY: | JAM |
| REVIEWED BY: | WMM |
| APPROVED BY: | JWB |

TITLE: SOIL NAIL WALL DETAILS 2

PROJECT: BIG CANOE PROPERTY OWNER'S ASSOCIATION
SPILLWAY CHUTE AND STILLING BASIN REPLACEMENT PROJECT

SITE: LAKE PETIT DAM
JASPER, GEORGIA

Big Canoe POA

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TN 37402

| | |
|---|---|
| DATE: | FEBRUARY 2025 |
| PROJECT NO.: | TJD10771 |
| FILE: | TJD10771.01 C41 |
| SHEET NO.: | 41 OF 41 |

# SPECIFICATION

Big Canoe Property Owner's Associations

Lake Petit Dam

Chute Spillway and Stilling Basin Replacement Project

Specification Section 03300

# CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

1-1. SCOPE. This section covers procurement of all cast-in-place concrete, including concrete materials, limiting requirements, mixture design, and performance requirements, and delivery to the Site through discharge at the end of the delivery truck chute.

Work beyond the end of the delivery truck chute is covered in the project drawings.

1-2. GENERAL. All cast-in-place concrete shall conform to the limiting requirements of this specification including Table 1.

1-2.01. Concrete Classifications. Concrete classifications shall be defined and used as indicated for the following classes:

Concrete Classifications

Class    Class Description

A. Structural Concrete

A1. Concrete for Liquid-Containing Structures. Concrete for liquid-containing environmental structures, below grade structures exposed to groundwater under normal conditions, and all other concrete not otherwise indicated.

A2. Small Aggregate Concrete; Congested Areas. Structural small aggregate concrete shall be used in all areas (including liquid-containing structures) where the clear distance between reinforcement, conduit, or embedded items is less than the largest dimension of coarse aggregate particles in the structural concrete.

A3. Concrete for Non-Liquid-Containing Structures. Not Used

A4. Mortar Puddle. Placed in a lift 2 inches or more deep at the bottom of forms for walls immediately before structural concrete is placed.

A5. Drilled Pier Concrete. Not Used.

B. Exterior Flatwork Concrete. Concrete for exterior slabs on grade, plant pavement, sidewalks, curbs and gutters, and small equipment pads.

C. Architectural Concrete. Not Used

D. Miscellaneous Concrete

D1. Ductbanks, Pipe Blocking, Concrete Fill, and Pipe Encasement Concrete. Concrete for the electrical duct bank.

D2. Underwater Concrete. Not Used.

D3. Mass Concrete. Not Used.

D4. Pan Stairs Concrete. Not Used.

D5. Wash Water Trough Concrete. Not Used.

D6. Composite Topping Concrete. Not Used.

D7. Dental Concrete. Used as a fill material for over-excavations or for mud slabs below foundations.

1-3. SUBMITTALS. All data shall be submitted to the Engineer.

The required submittal data for each Class of concrete shall be as indicated in Tables 2A, 2B, and 2C.

1-3.01. Preliminary Review of Materials. Reports covering the source and quality of concrete materials proposed for the work shall be submitted to Engineer for review within 30 days after the preconstruction conference. The submittal shall include Submittal Cover Page #1, provided in the Appendix of this section. The cover page shall indicate the page numbers in the submittal where the respective data may be found during Engineer review.

A manufacturer's certificate of compliance, which includes copies of independent test results confirming compliance with specified requirements, shall be submitted for the following materials:

Cement.

Admixtures.

Fly Ash.

Slag Cement (if accepted by Engineer).

1-3.02. Proposed Mixture Proportions. Data indicating the proposed material quantities in each Class of concrete shall be submitted to Engineer for review within 30 days after the preconstruction conference. The submittal shall include Submittal Cover Page #2, provided in the Appendix of this section. The cover page shall indicate the page numbers in the submittal where the respective data may be found during Engineer review.

1-3.03. Mixture Test Results. Concrete mixture test results shall be submitted to the Engineer for review and acceptance. The submittal shall include Submittal Cover Page #3, provided in the Appendix of this section. The cover page shall indicate the page numbers in the submittal where the respective data may be found during Engineer review.

Compressive strength shall be qualified by field test record data only for the Classes of concrete indicated as such in Table 2C. Compressive strength shall be qualified by laboratory testing for other Classes. Laboratory trial mixture testing shall not begin until materials and proposed mixture proportions have been reviewed and are acceptable to Engineer.

1-4. STORAGE AND HANDLING. Cement, slag cement and fly ash shall be stored in suitable moistureproof enclosures. Cement, slag cement and fly ash which have become caked or lumpy shall not be used.

Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used.

## PART 2 - PRODUCTS

2-1. LIMITING REQUIREMENTS. Unless otherwise specified, each concrete mixture shall be designed and controlled, within the following limits, to provide a dense, durable concrete suitable for the expected service conditions.

Concrete materials shall be selected and concrete shall be proportioned, batched, mixed, and delivered in a manner that will minimize shrinkage and cracking as specified herein, and in accordance with Chapters 3 and 8 of ACI 224R. Concrete temperatures shall be controlled before and until delivery at the end of the delivery truck chute to minimize cracking. Any rise in concrete temperature caused by environmental conditions that will be conducive to excessive shrinkage shall be controlled.

For each class of concrete, each concrete mixture shall be designed and concrete shall be controlled within the limits in this specification and in Table 1.

2-1.01. Cementitious Material Content Limits. The minimum quantity of Portland cement in the concrete shall be as indicated in Table 1.

The cementitious material content shall not be increased beyond the Table 1 values more than necessary to achieve the required $f'_{cr}$.

Contractor may substitute fly ash for Portland cement within the percentage ranges indicated in Table 1, on the basis of 1.0 lbs of fly ash added for each lb of Portland cement reduction.

Contractor may substitute slag cement for Portland cement within the percentage ranges indicted in Table 1 on the basis of 1.0 lbs of slag cement added for each lb of Portland cement reduction. Mixtures using slag cement in combination with fly ash will not be acceptable.

Contractor may substitute Portland cement with other blended cements (e.g., Type 1L) provided they meet the requirements of the specification and upon approval by the Engineer.

In the absence of test data indicating that the proposed cement will not contribute to long term development of Alkali-Aggregate-Reactivity (AAR), the Engineer may require substitution of cement with low calcium fly ash on the order of 20% to 30% by weight.

2-1.02. Maximum Water-Cementitious Material Ratio. The maximum water-cementitious material ratio shall be on a cement mass basis, or, if fly ash or slag cement is used, the combined mass of cement plus fly ash or slag cement shall be used to determine the water-cementitious materials ratio. Limiting maximum water-cementitious material ratios are indicated in Table 1.

2-1.03. Aggregates. Aggregates shall comply with ASTM C33 except as specified herein. Fine aggregate shall be clean natural sand. Artificial or manufactured sand shall not be used unless acceptable to Engineer. Coarse aggregate shall be crushed rock, washed gravel, or other inert granular material, meeting Class 4S requirements, except that clay and shale particles shall not exceed values indicated in Table 1.

Gradation of coarse aggregate shall conform to maximum nominal size grading requirements of ASTM C33. When a combination of two or more sizes is used, the combined gradation shall meet ASTM C33 requirements.

Aggregates used in concrete shall have a combined aggregate distribution similar to the aggregates used in the concrete trial mixtures. Reports of individual aggregates shall include sieve sizes 1-1/2 inch, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, and No. 50 in accordance with ASTM E11.

Specified sand equivalent for fine aggregate shall be not less than indicated in Table 1 for an average of 3 samples tested in accordance with ASTM D2419.

To comply with the specified concrete shrinkage test requirements, the clay and shale content of the aggregates may need to be reduced by washing the aggregate.

2-1.04. Ratio of Fine to Total Aggregates. The ratio of fine to total aggregates, based on solid volumes (not weights), shall be as follows:

| Maximum Nominal Coarse Aggregate Size | Minimum Ratio | Maximum Ratio |
|---|---|---|
| 3/8 inch | 0.45 | 0.60 |
| 1/2 inch | 0.40 | 0.55 |
| 3/4 inch | 0.35 | 0.50 |
| 1 inch | 0.30 | 0.46 |
| 1-1/2 inch | 0.25 | 0.40 |

2-1.05. Slump. Concrete slump shall be kept as low as possible, consistent with proper handling and thorough consolidation. Prior to the addition of admixtures, slump shall be at least 2 inches and shall not exceed the maximum slump as indicated in Table 1.

When superplasticizer is dispensed at the ready-mix plant, the concrete mixture design shall be based on a maximum slump as indicated in Table 1. When superplasticizer is dispensed at the Site, the slump of the concrete delivered shall not exceed the maximum slump as indicated in Table 1 before superplasticizer is added.

2-1.06. Initial Set. The initial set, as determined by ASTM C403, shall be attained 5-1/2 hours ±1 hour after the water and cementitious materials are added to the aggregates for each concrete mixture. The quantity of retarding admixture shall be adjusted to compensate for variations in temperature and job conditions.

2-1.07. Total Air Content. The total volumetric air content of concrete after placement shall be as indicated in Table 1, and within ±1.5 percent. Air-entraining admixture may be omitted from concrete for interior slabs which are to be steel trowel finished.

2-1.08. Admixtures. Only approved or specified admixtures shall be used.

Unless otherwise acceptable to Engineer, all admixtures shall be from one manufacturer and shall be compatible. Admixtures that are compatible with other admixtures and concrete materials shall not have an adverse effect on the required properties of the concrete nor the specified limiting requirements. The admixture content, batching method, and time of introduction to the mixture shall comply with these specifications and with the manufacturer's recommendations for minimum shrinkage. The admixture manufacturer shall provide qualified field services as necessary, at no additional cost to Owner.

Admixtures used in the concrete shall be reviewed and accepted by Engineer prior to conducting the laboratory trial mixture testing and the shrinkage testing. No calcium chloride nor admixture containing chloride from sources other than residual impurities in admixture ingredients will be permitted.

Combination of admixtures which cause premature or local dehydration or post-consolidation settlement of the concrete surface shall not be used. If any such undesirable characteristics are observed, the use of the mixture shall be discontinued and an alternate mixture design used.

All liquid-containing (Class A1) concrete, and small aggregate (Class A2) concrete that is placed in liquid-containing structures, shall include a high-range water reducing admixture (superplasticizer). Water-reducing admixtures are not required for Classes D7, but may be included at Contractor’s option. For all other non-liquid-containing concrete, a water-reducing admixture shall be used.

Superplasticizer may be dispensed into the concrete at the plant or on the Site and shall be mixed in accordance with the admixture manufacturer's recommendations. Each superplasticizer dose, when dispensed at the Site, shall be easily verifiable and recorded on the delivery ticket. The superplasticizer for each load shall be accurately proportioned into a separate container prior to dispensing the admixture into the concrete. When truck-mounted dispensers are used, the system shall not be flushed or cleaned with water until after the entire load of concrete has been discharged. When permitted by Engineer, redosing of concrete with superplasticizer shall be done only once. Redosing procedures shall be as recommended by the admixture manufacturer.

A shrinkage reducing admixture shall be added to Class A1 and A2 concrete. It shall replace an equal volume of mixing water or as otherwise recommended by the admixture manufacturer. The quantity of air entrainment admixture shall be adjusted as required by the admixture manufacturer to keep mixture air content within specified limits.

2-1.09. Fiber Concrete. Fiber concrete shall be used only where noted on the Drawings. Polypropylene micro fibers shall be added to the concrete materials at the time the materials are batched at the rate of 1.5 lbs/cu yd. Batching and mixing procedures shall be in accordance with the manufacturer's recommendations. Fibers shall be randomly oriented and uniformly distributed throughout the concrete.

2-1.10. Strength. In addition to the other limiting requirements to achieve durability and minimize shrinkage, the minimum acceptable compressive strengths of concrete tested at the end of the delivery truck chute, as determined by ASTM C39, shall be as indicated in Table 1.

Adequate test cylinders taken at the point of placement shall also be made to verify that Contractor's concreting procedures comply with applicable industry standard procedures.

2-1.11. Pumped Concrete. Coarse aggregate size for pumped concrete mixtures shall be limited to a nominal maximum of 1-1/2 inch.

2-1.12. Water-Soluble Chloride. Maximum water-soluble chloride ion concentrations in hardened concrete at an age of 28 days shall not exceed the limits expressed as a percentage of mass of cementitious materials as indicated in Table 1.

Test results shall be reported as the percentage of water-soluble chloride ions in the concrete and as a percentage of chloride ion relative to the mass of cementitious materials in the concrete.

Testing of the concrete components for water-soluble chloride ions may be done at the discretion of Contractor. Copies of the reports on such tests shall be furnished to Engineer.

The hardened concrete and each gradation of aggregate used in the concrete shall be tested each time a chloride ion test is conducted on a concrete mixture.

2-1.13. Laboratory Shrinkage Limits. Based on the modified ASTM C157 test procedures as specified herein, the shrinkage limits of concrete shall be the average drying shrinkage of each set of three test specimens cast in the laboratory from a trial mixture as measured at the 21 days drying age, and shall not exceed the values in Table 1.

2-1.14. NSF/ANSI 61 Compliance. Not Used.

2-1.15. Mineral Colored Concrete. Not Used.

2-1.16. Cold Weather Concrete. Except as modified herein, cold weather concrete shall comply with ACI 306.1. The temperature of concrete at the point of delivery at the end of the delivery truck chute shall be not less than that indicated in ACI 306.1 for corresponding outdoor temperature (in shade) at the time of placement.

When delivered, heated concrete shall be not warmer than 80°F.

2-1.17. Hot Weather Concrete. Except as modified herein, hot weather concrete shall comply with ACI 305.1. At air temperatures of 90°F or above, concrete shall be kept as cool as possible before and during delivery. The temperature of the concrete at the time of delivery at the end of the delivery truck chute shall not exceed the values indicated in Table 1.

2-2. MATERIALS.

| | |
|---|---|
| Cement | ASTM C 150, Type II Low Alkali. |
| Fly Ash | ASTM C618, except that loss on ignition shall not exceed 4 percent.<br>Class F or Class C are acceptable, but Class C shall also be qualified for moderate sulfate resistance as described in ASTM C618, Table 3, Procedure A.<br>The test for sulfate resistance shall be in accordance with ASTM C1012. |
| Slag Cement | ASTM C989, Grade 100 or Grade 120. |
| Aggregates, Fine and Coarse | As specified in Limiting Requirements paragraph. |
| Water | Potable. Water from concrete production operations shall not be used. |
| **Admixtures** | |
| Water Reducing/Normal Set | ASTM C494, Type A, except as otherwise specified herein. |
| Water Reducing/Retarding | ASTM C494, Type D, except as otherwise specified herein. |
| Air-Entraining | ASTM C260. |
| High Range Water Reducing/Normal Set | ASTM C494, Type F, extended slump life type, except as otherwise specified herein. |
| High Range Water Reducing/Retarding | ASTM C494, Type G, extended slump life type, except as otherwise specified herein. |
| Shrinkage Reducing | GCP Applied Technologies (Grace) “Eclipse |

| | |
|---|---|
| Admixture | 4500”, Euclid “Eucon SRA”, or BASF “MasterLife SRA 035”. These admixtures shall not be used when NSF/ANSI 61 certification is required. |

2-3. MIXTURE DESIGN AND TESTING. All reports and tests required for preliminary review of materials and for laboratory trial mixtures shall be made by an independent testing laboratory at the expense of Contractor. Mixtures shall be adjusted in the field as necessary, within the limits specified, to meet the requirements of these specifications. If the source of any concrete materials is changed during the contract, concrete work shall pause until the new materials and the new mixture design are tested in accordance with the specified requirements.

2-3.01. Preliminary Review of Materials. The tests and reports required shall be as indicated in Table 2A. Review of these reports shall be for general acceptability only, and continued compliance with all contract provisions shall be required.

Aggregate reports shall be no more than 90 days old at time of submittal.

Alkali-aggregate reactivity potential shall be determined by one of the following procedures. A satisfactory service record evaluation as described in ASTM C1778 will not be acceptable.

1 Perform Petrographic Examination in accordance with ASTM C295 on fine and coarse aggregates. Test fine and coarse aggregates in accordance with ASTM C1260. Aggregates which are classified as innocuous may be used without further testing. Aggregates which are not innocuous shall be further tested in accordance with ASTM C227 or C1105 (as appropriate), using a cement containing less than 0.6 percent alkalies.

2 Perform Petrographic Examination in accordance with ASTM C295 on fine and coarse aggregates. Test fine and coarse aggregates in accordance with ASTM C1567, using a single aggregate with all cementitious materials selected for the Project. The fine and coarse aggregates shall not be combined and used in a single test. This test may only be used for mixtures that contain slag cement or fly ash, and those products shall not have an alkali content greater than 4.0 percent sodium oxide equivalent. Combinations of cementitious materials and aggregate which do not indicate a potential for alkali reactivity may be used without further testing. Mixture combinations which indicate a potential for alkali reactivity shall have the ingredients and/or proportions modified and then the test shall be repeated.

3 Test fine and coarse aggregates in accordance with ASTM C1293. Concrete mixtures containing only portland cement (without pozzolan or slag cement) shall be tested accordingly and have a measured expansion of 0.04 percent or less at one year duration. Concrete mixtures containing pozzolan or slag cement shall be tested with those ingredients in proportions matching that of the proposed mixture, and shall have a measured expansion of 0.04 percent or less at two years duration.

At the discretion of the Engineer, testing in addition to that indicated herein or in ASTM C1778 may be performed on potentially reactive aggregates. Nonreactive aggregates shall be imported if, in the opinion of Engineer, local aggregates exhibit unacceptable potential reactivity.

2-3.02. Proposed Mixture Proportions. Proposed proportions for each Class of concrete shall meet the limiting requirements indicated herein.

2-3.03. Mixture Testing. Test results on each Class of concrete shall be submitted for review and shall be acceptable to Engineer before concrete work is started. The reports shall include the information indicated in Table 2C.

2-3.03.01. Field Test Record Data. If indicated as acceptable in Table 2C, concrete mixtures may be qualified based upon field test record performance data in lieu of laboratory trial mixtures. Field test data records shall be from the production facility being used on the current Project and shall have been performed in the past 12 months. Field test records shall represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 45 days.

2-3.03.02. Laboratory Trial Mixture Testing. Trial mixtures shall be tested in the laboratory for each size and combined gradation of aggregates and for each consistency as indicated and intended for use on the work and as specified.

Concrete ingredients shall be measured and mixed in the laboratory. Concrete test specimens shall be made, cured, and stored in accordance with ASTM C192 and tested in accordance with ASTM C39.

Concrete proportions shall be established based on laboratory trial mixtures that meet the following requirements:

a. The combination of materials shall be as proposed for use in the work.

b. Mixtures shall conform with the limiting requirements specified herein.

c. The required average compressive strength, $f'_{cr}$, of the trial mixture shall exceed the specified minimum acceptable compressive strength, $f'_{cr}$ , as required in Table 1.

d. Trial mixtures of the proportions and consistencies specified for the work shall be prepared. When a three point curve is required by Table 2C, the three concrete trial mixtures shall reflect the cement content proposed for the Project and for the indicated concrete class at three water-cementitious material ratio contents at or lower than indicated in Table 1. The compressive strength of the cylinders made from the three trial mixtures shall produce a range of compressive strengths exceeding or encompassing the $f'_{cr}$ required for the work.
e. For each proposed concrete mixture that is required to be tested as indicated in Table 2C, compressive strength test cylinders shall be made for each testing age. Each change in the water-cementitious materials ratio shall be considered a new concrete mixture. Each mixture shall be tested at the ages of 7 days and 28 days.
f. When a three point curve is required in Table 2C, the results of the cylinder tests for each water-cementitious materials ratio at each age shall be plotted as a curve showing the relationship between compressive strength (along y-axis) and the water-cementitious materials ratio (along x-axis). The water-cementitious materials ratio and the associated average compressive strength for the Project concrete mixture shall be selected from the 28 day curve. The maximum water-cementitious materials ratio specified in the limiting requirements shall still apply even if the curve indicates that the concrete strength would be adequate at a higher ratio. The cement content and mixture proportions to be used shall be such that the selected water-cementitious materials ratio will not be exceeded at specified maximum slump. These concrete mixture proportions shall be submitted for review in accordance with the Submittals Procedures section.

g. When a shrinkage reducing admixture is proposed, trial mixtures shall be prepared with and without the shrinkage reducing admixture.

2-3.03.03. Testing Procedures. Concrete mixture testing procedures shall be as specified herein, and reports for these tests shall be prepared specifically for this Project.

Aggregates shall be sampled and tested in accordance with ASTM C33. The bulk specific gravity of each aggregate shall be determined in accordance with ASTM C127 and ASTM C128.

Slump shall be determined in accordance with ASTM C143. Unit weight (mass) shall be determined in accordance with ASTM C138. Total air content shall be determined in accordance with ASTM C231 and verified in accordance with ASTM C138. Concrete temperature shall be determined in accordance with ASTM C1064.

Initial set tests shall be made at ambient temperatures of 70°F and 90°F to determine compliance with the specified time for initial set. The test at 70°F shall be made using concrete containing the specified normal set/water-reducing admixture and, when required, air-entraining admixture. The test at 90°F shall be made using concrete containing the specified retarding/water-reducing admixture and, when required, air-entraining admixture. Initial set shall be determined in accordance with ASTM C403.

Cylinders shall be 6 inches diameter by 12 inches high for concrete mixes using a maximum nominal aggregate size of 1 inch or larger. Cylinders may be either 6 inches diameter by 12 inches high, or 4 inches diameter by 8 inches high for concrete mixes using a maximum nominal aggregate size of less than 1 inch. The average compressive strength shall be determined from the results of at least three cylinders when using 4 inch diameter cylinders, and at least two cylinders when using 6 inch diameter cylinders. All tests for a particular class of concrete shall be performed using the same sized cylinders for the duration of the work.

Water-soluble chloride ion shall be determined in accordance with ASTM C1218.

A drying shrinkage test shall be conducted on the trial mixture for Class A mixes with the maximum water-cementitious materials ratio used to qualify each proposed concrete mixture design using the concrete materials, including admixtures, that are proposed for the Project. Three test specimens shall be prepared for each test. Drying shrinkage specimens shall be 4 inch by 4 inch by 11 inch prisms with an effective gauge length of 10 inches, fabricated, cured, dried, and measured in accordance with ASTM C157 except with the following modifications:

Specimens shall be removed from the molds at an age of 23 hours ±1 hour after batching, shall be placed immediately in water at 73°F ±3°F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in lime-saturated water as specified in ASTM C157. Measurement to determine expansion expressed as a percentage of original length shall be taken at age 7 days. The length at 7 days shall be the base length for drying shrinkage calculations ("zero" days drying age). Specimens then shall be stored immediately in a humidity controlled room maintained at 73°F ±3°F and 50 percent ±4 percent relative humidity for the remainder of the test.

Measurements to determine shrinkage expressed as a percentage of the base length shall be reported separately for 7, 14, and 21 days ±4 hours of drying from "zero" days after 7 days of moist curing for a total of 28 days from the date of casting.

Drying shrinkage deformation for each specimen shall be computed as the difference between the base length (at "zero" days drying age) and the length after drying at each test age. Results of the shrinkage test shall be reported to the nearest 0.001 percent. If drying shrinkage of any specimen deviates from the average for that test age by more than 0.004 percent, the results for that specimen shall be disregarded.

The average drying shrinkage of each set of 4 inch by 4 inch by 11 inch test specimens made in the laboratory from a trial mixture shall not exceed the values required in Table 1.

## PART 3 – EXECUTION

3-1. BATCHING, MIXING, AND DELIVERY. Concrete shall be furnished by an acceptable ready-mixed concrete supplier and shall conform to ASTM C94 except as indicated otherwise in this specification.

3-1.01. Delivery Tickets. A delivery ticket shall be prepared for each load of ready-mixed concrete and a copy of the ticket shall be handed to Engineer by the truck operator at the time of delivery. Tickets shall indicate the name and location of Contractor, the project name, the mixture identification, the quantity of concrete delivered, the quantity of each material in the batch, the outdoor temperature in the shade, the time at which the cementitious materials were added, and the numerical sequence of the delivery.

3-1.02. Mixing Water. Mixing water shall not be added in transit. Any amount of water withheld from the truck mixer shall be clearly indicated on the delivery ticket. Water added at the site shall not exceed the amount withheld, and shall not be added without oversight by Owner’s on site inspector.

3-1.03. Consistency. The consistency of concrete shall be suitable for the placement conditions. Aggregates shall flow uniformly throughout the mass, and the concrete shall flow sluggishly when vibrated or spaded. The slump shall be kept uniform.

3-2. CONTRACTOR'S ON GOING MATERIAL CONTROL TESTING. The following tests and test reports are required during the progress of the work and shall be made at the expense of Contractor. The frequency specified herein for each field control test is approximate and subject to change as determined by Engineer.

3-2.01. Aggregate Gradation. Each 200 tons of fine aggregate and each 400 tons of coarse aggregate shall be sampled and tested in accordance with ASTM D75 and C136, for verification that the gradations continue to meet ASTM C33 requirements. If lesser quantities of aggregates are used, the sampling and testing shall occur at least once every 6 months.

3-2.02. Sand Equivalent. The sand equivalent test shall be conducted each time the sand gradation tests are conducted.

3-2.03. Fly Ash. Each 400 tons of fly ash shall be sampled and tested in accordance with ASTM C618 and C311. Contractor shall supply Engineer with certified copies of supplier's (source) test reports showing chemical composition and physical analysis for each shipment delivered to Contractor and certifying that the fly ash complies with the specifications. The certificate shall be signed by the fly ash supplier.

3-2.04. Cement. Each 1500 tons of cement shall be sampled and tested in accordance with ASTM C150. Contractor shall supply Engineer with certified copies of supplier's (source) test reports showing chemical composition and physical analysis and certifying that the cement complies with ASTM C150 and these specifications. The certificate shall be signed by the cement manufacturer.

3-2.05. Slag Cement. Each 800 tons of slag cement shall be sampled and tested in accordance with ASTM C989. Contractor shall supply Engineer with certified copies of supplier's (source) test reports showing chemical composition and physical analysis and certifying that the slag cement complies with ASTM C989 and these specifications. The certificate shall be signed by the slag cement manufacturer.

3-3. OWNER'S FIELD CONTROL TESTING. Field control tests, including slump, air content, and making compression test cylinders, shall be performed by Engineer or Owner's testing laboratory personnel, at the expense of Owner. Contractor shall provide access to all facilities and the services of one or more employees as necessary to assist with the field control testing.

The frequency specified herein for each field control test is approximate and subject to change as determined by Engineer.

Engineer may require field testing prior to the addition of superplasticizer at the Site to determine compliance with the specifications. Field testing after the addition of superplasticizer shall be conducted as specified and as needed to determine that the concrete is in compliance with the specifications. Air content tests shall be conducted whenever field tests are conducted.

3-3.01. Slump. A slump test shall be made a minimum of once per placement and for each 50 cubic yards of concrete. Slump shall be determined in accordance with ASTM C143.

3-3.02. Air Content. An air content test shall be made on concrete from one of the first three batches mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. Air content shall be determined in accordance with ASTM C231 and verified in accordance with ASTM C138.

3-3.03. Unit Weight. A unit weight test shall be made on concrete from each batch of concrete from which concrete compression test cylinders are made. Unit weight shall be determined in accordance with ASTM C138.

3-3.04. Concrete Temperature. A concrete temperature test shall be made on concrete from the first batch of concrete mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. During hot or cold weather concreting operations, temperature shall be checked not less than once per hour. Concrete temperature shall be determined in accordance with ASTM C1064.

3-3.05. Water-Soluble Chloride Ion. Water-soluble chloride ion testing shall be performed once for each 1,000 cubic yards of concrete in accordance with ASTM C1218.

3-3.06. Compression Tests. One set of concrete compression test cylinders shall be made not less than once each day concrete is placed, not less than once for each 100 cubic yards of each class of concrete, and not less than once for each 5000 square feet of surface area for slabs or walls. Half of the cylinders of each set shall be tested at an age of 7 days and the remaining cylinders shall be tested at an age of 28 days.

Test cylinders shall be made, cured, stored, and delivered to the laboratory in accordance with ASTM C31 and tested in accordance with ASTM C39. Cylinders shall be 6 inches diameter by 12 inches high for concrete mixes using a maximum nominal aggregate size of 1 inch or larger. Cylinders may be either 6 inches diameter by 12 inches high, or 4 inches diameter by 8 inches high for concrete mixes using a maximum nominal aggregate size of less than 1 inch. The average compressive strength shall be determined from the results of at least three cylinders when using 4 inch diameter cylinders, and at least two cylinders when using 6 inch diameter cylinders. All tests for a particular mixture class shall be performed using the same sized cylinders for the duration of the work and shall match the cylinder size used for the trial mixtures.

Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the number of the delivery truck or batch, the air content, the slump, the unit weight, and the concrete temperature.

3-3.07. Shrinkage Tests. Concrete shrinkage tests shall be performed once for each 1,000 cubic yards of concrete with controlled shrinkage that is placed and shall be made on concrete from a batch of concrete from which concrete compression test cylinders are made. Shrinkage testing shall be conducted as specified for the preliminary trial mixtures.

The average drying shrinkage of each set of test specimens cast in the field from concrete delivered to the Site and sampled at the end of the delivery truck chute, as measured at the 21 days drying age, shall not exceed the values indicated in Table 1.

3-3.08. Test Reports. Five copies of each test report shall be prepared and distributed by the testing laboratory to the Owner, Resident Project Representative (two copies), Engineer, and Contractor, in accordance with the Quality Control section.

3-4. EVALUATION AND ACCEPTANCE OF CONCRETE. Concrete will be evaluated for compliance with all requirements of the specifications. Concrete strength will be only one of the criteria used for evaluation and acceptance of the concrete. The results of all tests performed on the concrete and other data and information concerning the procedures for handling, placing, and curing concrete will be used to evaluate the concrete for compliance with the specified requirements.

Compression tests will be evaluated in accordance with ACI 318 and as specified herein. A strength test shall be the average of the compressive strengths of two 6 inch diameter cylinders or three 4 inch diameter cylinders, made from the same concrete sample tested at 28 days.

3-4.01. Compression Test Evaluation. Compressive strength test results will be evaluated for compliance with the specified strength requirements. The strength level of the concrete will be considered satisfactory when the averages of all sets of three consecutive strength tests equal or exceed the specified compressive strength, $f'_c$, and no individual strength test result falls below the specified compressive strength by more than 500 psi.

3-4.02. Inspection of Concrete Supplier. Both scheduled and unscheduled visits by inspectors on days of concrete pours shall be accommodated. Inspectors shall be allowed access to delivery tickets and mixture proportions.

| TABLE 1 – LIMITING REQUIREMENTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Concrete Class** | **A1** | **A2** | **A3** | **A4** | **A5** | **B** | **C** | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** |
| 1. | **Minimum Cement Content**, lbs/cubic yard; based on maximum slump and maximum water-cementitious material ratio. | | | | | | | | | | | | | | |
| | Maximum Nominal Aggregate Size, ASTM C33 aggregate | | | | | | | | | | | | | | |
| | Size No. 467 (1-1/2") | --- | --- | --- | --- | --- | 464 | --- | --- | --- | --- | --- | --- | --- | --- |
| | Size No. 57 (1") | 536 | --- | --- | --- | --- | 489 | --- | --- | --- | --- | --- | --- | --- | 460 |
| | Size No. 67 (3/4") | 564 | --- | --- | --- | --- | 514 | --- | --- | --- | --- | --- | --- | --- | 480 |
| | Size No. 7 (1/2") | --- | 601 | --- | --- | --- | 526 | --- | --- | --- | --- | --- | --- | --- | 500 |
| | Size No. 8 (3/8") | --- | 636 | --- | --- | --- | 555 | --- | --- | --- | --- | --- | --- | --- | 520 |
| | Fine Aggregate, (Sand) | --- | --- | --- | 750 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. | **Compressive Strength**, minimum; psi | | | | | | | | | | | | | | |
| | Field, 7 days; | 3375 | 3375 | --- | 3000 | --- | 3000 | --- | --- | --- | --- | --- | --- | --- | 2250 |
| | Field, 28 days; $f'_c$ | 4500 | 4500 | --- | 4000 | --- | 4000 | --- | --- | --- | --- | --- | --- | --- | 3000 |
| 3. | **Maximum water-cementitious material ratio** | 0.42 | 0.42 | --- | 0.45 | --- | 0.48 | --- | --- | --- | --- | --- | --- | --- | 0.45 |
| 4. | **Maximum nominal coarse aggregate size, inches** | 1 | 1/2 | --- | Sand | --- | 1-1/2 | --- | --- | --- | --- | --- | --- | --- | 1 |
| 5. | **Maximum slump**, inches | | | | | | | | | | | | | | |
| | Slump before super-plasticizer added | 3 | 3 | --- | 4 | --- | 4 | --- | --- | --- | --- | --- | --- | --- | 5 |
| | Slump after adding superplasticizer | 8 | 8 | --- | 8 | --- | 8 | --- | --- | --- | --- | --- | --- | --- | 8 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TABLE 1 – LIMITING REQUIREMENTS** | | | | | | | | | | | | | | | |
| | **Concrete Class** | **A1** | **A2** | **A3** | **A4** | **A5** | **B** | **C** | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** |
| 6. | **Total air content**, percent, (± 1.5 %) | 6 | 6 | --- | 6 | --- | 6 | --- | --- | --- | --- | --- | --- | --- | --- |
| 7. | **Fly ash replacement, percent range** | 15-25 | 15-25 | --- | 15-25 | --- | 15-25 | --- | --- | --- | --- | --- | --- | --- | 25-35 |
| 8. | **Slag cement replacement, percent range** | 25-50 | 25-50 | --- | 0 | --- | 25-30 | --- | --- | --- | --- | --- | --- | --- | 25-50 |
| 9 | **Testing limits** | | | | | | | | | | | | | | |
| | Sand equivalent, min. percent | 75 | 75 | --- | 75 | --- | 75 | --- | --- | --- | --- | --- | --- | --- | 75 |
| | Chloride ion, max. percent | 0.08 | 0.08 | --- | 0.08 | --- | 0.15 | --- | --- | --- | --- | --- | --- | --- | 0.30 |
| | Shrinkage, max. percent; based 4 x 4 x 11 inch specimen | | | | | | | | | | | | | | |
| | Laboratory | 0.036 | 0.036 | --- | --- | --- | 0.048 | --- | --- | --- | --- | --- | --- | --- | --- |
| | Field | 0.048 | 0.048 | --- | --- | --- | 0.064 | --- | --- | --- | --- | --- | --- | --- | --- |
| | Coarse Aggregate: Clay and shale combined particles shall not exceed, max. percent | 1 | 1 | --- | 1 | --- | 3 | --- | --- | --- | --- | --- | --- | --- | 1 |
| 10 | **Concrete temperature at time of delivery and placement, max. °F** | 85 | 85 | --- | 85 | --- | 90 | --- | --- | --- | --- | --- | --- | --- | 90 |

NOTES:
1. "--" indicates that mix will not be used or the relevant item is not required.
2. Mix A1 or A2 shall be used for spillway structural concrete.
3. Mix A4 shall be used at the bottom of vertical sections to ensure adequate bond between underlying concrete and vertical element.
4. Mix B shall be used for incidental or ancillary concrete such as sidewalks, duct bank, etc.

| TABLE 2A – SUBMITTAL REQUIREMENTS (PRELIMINARY REVIEW OF MATERIALS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Concrete Class** | **A1** | **A2** | **A3** | **A4** | **A5** | **B** | **C** | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** |
| 1 | **Aggregate reports** (ASTM C33) | | | | | | | | | | | | | | |
| | Fine aggregate | | | | | | | | | | | | | | |
| | Source and type | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Gradation | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Deleterious materials | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Fineness modulus | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Alkali-aggregate reactivity | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Sand equivalent | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Coarse aggregate | | | | | | | | | | | | | | |
| | Source and type | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Gradation | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Deleterious materials | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Abrasion loss | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Soundness test | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Alkali-aggregate reactivity | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Combined aggregate gradation | **X** | **X** | --- | --- | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| 2 | **Cement**, mill report | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| 3 | **Cementitious material**, type, data sheet, and test report (fly ash, slag cement) | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| 4 | **Admixtures** | | | | | | | | | | | | | | |
| | Data sheets and certifications | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| | Manufacturer's approval letter | **X** | **X** | --- | **X** | --- | **X** | --- | --- | --- | --- | --- | --- | --- | **X** |
| 5 | **NSF/ANSI 61 compliance**, for each proposed concrete constituent, where applicable | --- | --- | --- | --- | --- | --- | --- | --- | --- | ** | --- | --- | --- | --- |

| TABLE 2B – SUBMITTAL REQUIREMENTS (PROPOSED MIXTURE PROPORTIONS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Concrete Class** | **A1** | **A2** | **A3** | **A4** | **A5** | **B** | **C** | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** |
| 6 | **Mixture proportions**, reports | **X** | **X** | **---** | **X** | **---** | **X** | **---** | **---** | **---** | **---** | **---** | **---** | **---** | **X** |

NOTES:
1. “--” indicates that mix will not be used or the relevant item is not required.

| TABLE 2C – SUBMITTAL REQUIREMENTS (MIXTURE TESTING) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Concrete Class** | **A1** | **A2** | **A3** | **A4** | **A5** | **B** | **C** | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** |
| 7 | **Type of testing** | | | | | | | | | | | | | | |
| | Field test records acceptable | --- | --- | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Trial mixtures required | X | X | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8 | **Test Reports Required** | | | | | | | | | | | | | | |
| | Confirmation of materials tested | | | | | | | | | | | | | | |
| | Cement brand, type, composition, quantity | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Fly ash brand, type, composition, quantity | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Specific gravity of each aggregate | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Ratio of fine to total aggregates | X | X | --- | --- | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Water content | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Water-cementitious materials ratio | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Slump | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Unit weight | X | X | --- | --- | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Air content | X | X | --- | --- | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Temperature | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Time of initial set at 70°F and 90°F. | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Three point curves | X | X | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | X |
| | Compressive strength at 7 and 28 days | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Water-soluble chloride ion | X | X | --- | X | --- | X | --- | --- | --- | --- | --- | --- | --- | X |
| | Drying shrinkage | X | X | --- | --- | --- | X | --- | --- | --- | --- | --- | --- | --- | X |

NOTES:
** “--” indicates that mix will not be used or the relevant item is not required.

Appendix – Submittal Cover Pages

| Submittal Cover Page #1 – Preliminary Review of Materials | |
|---|---|
| Subject | Insert Submittal Page Number(s) |
| FINE AGGREGATE REPORTS | |
| Source and Type | |
| Gradation | |
| Deleterious Materials | |
| Fineness Modulus | |
| Alkali-Aggregate Reactivity | |
| Sand Equivalent | |
| COARSE AGGREGATE REPORTS | |
| Source and Type | |
| Gradation | |
| Deleterious Materials | |
| Abrasion Loss | |
| Soundness Test | |
| Alkali-Aggregate Reactivity | |
| Combined Aggregate Gradation | |
| CEMENTITIOUS MATERIAL REPORTS | |
| Cement Mill Report | |
| Fly Ash Report | |
| Slag Report (if accepted by Engineer) | |
| ADMIXTURES | |
| Data Sheets and Certifications | |
| Manufacturer’s Approval Letter | |

| Submittal Cover Page #2 – Proposed Mixture Proportions | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Insert Submittal Page Number(s) | | | | | | | | | | | | | | | |
| Subject | A1 | A2 | A3 | A4 | A5 | A6 | A7 | B | C | D1 | D2 | D3 | D4 | D5 | D6 | D7 |
| Water-Cementitious Material Ratio | | | --- | | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | |
| Ratio of Fine-to-Total Aggregates | | | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | |

| Submittal Cover Page #3 – Mixture Test Results | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Insert Submittal Page Number(s) | | | | | | | | | | | | | |
| Subject | A1 | A2 | A3 | A4 | A5 | B | C | D1 | D2 | D3 | D4 | D5 | D6 | D7 |
| Slump (pre HRWR) | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Slump (after HRWR) | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Unit Weight | | | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Air Content | | | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Temperature | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Time of Set | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Lab Compessive Strength (7 days) | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Lab Compressive Strength (28 days) | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Three point curves | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Field Compressive Strength (28 days) | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| Water-soluble chloride | | | --- | | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| Shrinkage | | | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- |
| ANSI/NSF 61 | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

End of Section

# CALCULATION PACKAGES

# LAKE PETIT DAM

## Pickens County, Georgia
## State ID No. 112-009-00462
## NID No. GA00685

## Hydrology and Hydraulics for Spillway Design of Lake Petit Dam
## Calculation Package
## Revision 0

*Prepared for:*

**Big Canoe® Property Owners Association, Inc.**
10586 Big Canoe
Jasper, GA 30143

*Prepared by:*

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Johnson City, TN 37604

Project No: TJD10771

Document No: GA250004

February 2025

Geosyntec
consultants

## CALCULATION PACKAGE COVER SHEET

**Client:** Big Canoe Property Owners Association **Project:** Spillway Design of Lake Petit Dam

**Project No.:** TJD10771 **Task #:** 03/04

**TITLE OF COMPUTATION** Hydrology and Hydraulics Calculation Package

**COMPUTATIONS BY:** Signature [signature] 01/08/2025 DATE

Printed Name and Title: Al Preston, Principal Engineer

**ASSUMPTIONS AND PROCEDURES CHECKED BY:** (Peer Reviewer) Signature [signature] 01/08/2025 DATE

Printed Name and Title: James Barbis, Principal Engineer

**COMPUTATIONS CHECKED BY:** Signature [signature] 01/08/2025 DATE

Printed Name and Title: James Barbis, Principal Engineer

**COMPUTATIONS BACKCHECKED BY:** (Originator) Signature [signature] 01/08/2025 DATE

Printed Name and Title: Al Preston, Principal Engineer

**APPROVED BY:** (PM or Designate) Signature [signature] 02/21/2025 DATE

Printed Name and Title: John W. Barrett, P.E. (GA), Principal Engineer

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### LIST OF TABLES



### LIST OF FIGURES



### LIST OF ATTACHMENTS

## RECORD OF REVISIONS

| Revision Number & Date | Description of Revision |
|---|---|
| Rev. 0 – 21 February 2025 | Initial Submittal |

# CALCULATION PACKAGE

## 1 PURPOSE AND SCOPE

This Calculation Package (Package) was prepared by Geosyntec Consultants, Inc. (Geosyntec) for the design of a spillway chute (chute) replacement for the Lake Petit Dam (Dam). This Package presents the hydraulic analysis, minimum wall dimensions, and hydraulic loading forces needed to support the structural design.

## 2 MAIN ASSUMPTIONS/CONSTRAINTS

For the analyses, the following main assumptions were considered:

- The spillway replacement will occur downstream of the existing spillway inlet, which consist of a concrete weir and a double box culvert located on the roadway (i.e., Wilderness Parkway) running along the crest of the Dam. Figure 1 presents the existing culverts design elevations and dimensions for the spillway inlet. The culverts crossing at the upstream extend of the spillway chute will remain without modification. It is assumed that the current stage-discharge curve for the impoundment will not be impacted because of this spillway replacement project.
- The chute and stilling basin design flow is based on the flow capacity of the Wilderness Bridge crossing downstream of the spillways control weir (Sill) prior to the overtopping the roadway at elevation 1641.5 ft. The proposed spillway chute and stilling basin will be designed to contain the design flow and provide a stilling basin that transitions the super critical flow in the chute to a subcritical flow regime in the existing downstream channel.
- The width of the proposed spillway chute is assumed be 15 ft.
- The proposed smooth spillway chute will be constructed of reinforced concrete with no steps.
- The existing Wolfscratch Drive bridge crossing at the downstream extent of the current spillway chute will remain without modification.

- For the SpillwayPro calculations, it is assumed that water stops will be installed between the joints to prevent flow between joints. Therefore, for the SpillwayPro analysis, the joint gap is assumed to be zero.

- The joint offset for the SpillwayPro Analysis was assumed to be 0.25 inches. However, because this is a newly constructed spillway the joint offsets are expected to be less than 0.25 inches. Therefore, this assumption is assumed to be conservative and will be only used to evaluate the potential cavitation associated with the spillway and the need for the spillway design to include mitigate against the potential damage from cavitation.

# 3 METHODOLOGY

The hydraulic analysis of the proposed spillway chute was performed in the following three phases:

1. To verify the design flow rate through the Wilderness Parkway culverts assuming an upstream stage elevation 1641.5 ft, a culvert flow calculation was performed using the Federal Highway Administration's (FHWA) HY-8 Culvert Analysis Program, (FHWA, 2024) using the design spillway control weir and culverts dimensions as input into the HY-8 program.

2. The minimum proposed spillway chute dimensions and preliminary stilling basin design parameters were calculated using the United States Bureau of Reclamations (USBR) *SpillwayPro*, Engineering Monograph 42 (EM42) Cavitation in Chutes and Spillways spreadsheet (SpillwayPro) (USBR, 2019).

   SpillwayPro integrates a standard-step water surface profile with a calculator for cavitation analyses and aerated flow calculations for smooth and stepped chute spillways to support cavitation-related design needs (aerators, controlled-pressure spillway profiles, and the estimation of damage indices for extended operational periods) (USBR, 2019).

   In SpillwayPro, the water surface profile program begins by calculating the flow profile for the first two stations listed in the Input Geometry Worksheet, with the depth at the first station specified in the Initial Depth input cell and the depth at the second station calculated using the program's depth-solver subroutine. The energy grade line elevation is also calculated for these first two stations, and the results are used to linearly extrapolate the energy grade line elevation at the crest station. A key assumption in this routine is minimal losses from the reservoir to the spillway crest and that the initial depth should match the reservoir water surface elevation. However, if the computed reservoir elevation does not closely match the reservoir elevation specified on the input sheet, then it is an indication that the starting depth needs to be adjusted. The program will then compute a new estimate of the initial depth using the Newton-Raphson method, and the program will adjust the initial depth estimate until the computed energy grade line elevation at the crest matches the reservoir water surface elevation. When a match is achieved the program proceeds with the water surface profile calculation.

Alternately, when the crest energy grade line and reservoir level do not match, as in the Lake Petit Spillway Chute downstream of the culverts, the user can choose to force the water surface profile to be calculated using the specified starting depth. This effectively ignores the reservoir elevation setting and lets the program determine the reservoir level that would correspond to the specified initial depth at the first station.

The SpillwayPro Computed Flow Profile results for the Hydraulic Properties, Aerated Flow Properties, and Cavitation Properties are displayed in in the following spreadsheet tabs in the SpillwayPro workbook, provided in Attachment 2.

**Hydraulic Properties Spreadsheet:**

The hydraulic outputs results for the spillway geometry such as flow depth, velocity, piezometric pressure, energy grade line elevation, air/water flow fraction, the flow profile designation, critical and normal depths, the Froude Number, the thickness of the boundary layer, and a roll-wave check is performed at each cross section in the Hydraulic Properties tab. In addition, the equivalent value of Manning’s n is calculated.

**Aerated Flow Properties Spreadsheet:**

SpillwayPro’s simulation of aerated flow in smooth chutes uses the approach outlined by Wilhelms and Gulliver with reference to the non-aerated and aerated flow zones. The aeration inception point and the mean air concentration in the fully developed aerated flow zone are predicted, and then the transitional conditions in the developing flow zones between those limits. Reductions of hydraulic friction due to aeration are estimated and the mean and bottom air concentrations are calculated. The following are calculated

- Boundary Layer Thickness
- Entrained Air
- Total Air (entrained+ entrapped)
- Bulked Depth
- Friction Factor
- USBR Small Dams Suggested Freeboard
- Training Wall Elevation
- Bulked Depth Elevation

**Cavitation Properties Spreadsheet:**

The Cavitation Properties calculation presents essential cavitation results for the evaluation of a chute spillway, such as the cavitation index of the flow, the cavitation index of the surface, the chamfers required to stop cavitation, damage potentials for three sizes of circular arc and three sizes of 90-degree offsets, the turbulence intensity of the flow, and the computed stream power applied to the spillway surface. The key cavitation calculations provided along the spillway profile are (USBR, 2019):

- **Flow sigma column (cavitation index)** — Values less than 0.2 generally indicate a high potential for cavitation damage. For spillways with design cavitation index values in the range of 0.1 to 0.2, cavitation damage has traditionally been mitigated through surface tolerance specifications and maintenance programs designed to ensure a smooth surface free of offsets and other anomalies. When cavitation index values drop below 0.1, the USBR typically employs aerators to add air to the flow and protect the spillway surface from damaging cavitation.

Aerators are typically located just upstream from the station at which the cavitation index drops below 0.2.

- **Sigma of Uniform Roughness** — When cavitation index (flow sigma) values drop to or below the values of “Sigma of Uniform Roughness” this is also an indicator of high potential for cavitation damage.

- **Damage Potential —** The damage potential column incorporates the influence of the size and shape of surface anomalies, the relative cavitation indices of the anomalies compared to the flow sigma, and the flow velocity. If a spillway is expected to operate for long periods, damage potential values give a direct indication of the severity of damage that can be expected, with 500 indicating incipient damage, 1000 indicating major damage, and 2000 or more indicating catastrophic damage.

3. The Computational Fluid Dynamics (CFD) software FLOW-3D HYDRO (Flow Science, 2023) was used to validate the spillway chute calculations, estimate superelevation and cross-wave depths in the chute, and design the stilling basin at its downstream extent. FLOW-3D was required to support the design of the proposed stilling basin due to the limited space between the downstream bridge and the sharp turn from the spillway into the existing stream channel.

The proposed spillway chute design used in Phases 2 and 3 were developed in Autodesk Civil3D software through iteratively incorporating the proposed design into the existing 3D surface for the dam until the hydraulic analysis showed that design met the minimum criteria of containing the design flow rate and transitioning from the super critical flow in the proposed chute to subcritical flow in the existing downstream channel.

# 4 INPUT PARAMETERS

The following input parameters were utilized for the analysis:

## 4.1 Phase 1 – Culvert Flow Analysis Inputs

Upstream of the spillway chute is the spillway inlet, which consists of a concrete weir and a double box culvert located on the roadway (i.e., Wilderness Parkway) running along the crest of the Dam. Utility pipes run through the culvert (longitudinally to the Dam and perpendicular to the flow of the spillway), decreasing the flow height by 1.75 ft. The inputs into the HY-8 software are presented below in Table 1 and represent the existing spillway weir and culvert dimensions. The HY-8 inputs are shown in the HY-8 report that is provided in Attachment 1. The Phase 1 Results are presented in Section 5.1.

## 4.2 Phase 2 – SpillwayPro Inputs

The flow rate through the upstream culvert with a headwater elevation of 1641.5 ft, calculated in Phase 1 using the HY-8 software, was used as an input into the SpillwayPro Excel spreadsheet along with the Civil-3D profile provided in Figure 2. Table 2 presents the inputs used in the SpillwayPro analysis. The channel's Rugosity input, physical surface roughness, was assigned to be 0.00328 ft to represent smooth concrete. The Phase 2 Results are presented in Section 5.2.

## 4.3 Phase 3 – FLOW-3D Inputs

Two CFD models were developed using FLOW-3D HYDRO (Flow Science, 2023). The first model covered the curved spillway chute, while the second model covered the lower portion of the spillway chute and the stilling basin. Inputs for the models are described below.

### 4.3.1 Spillway Chute Model

The spillway chute model domain is shown in Figure 2 and includes three straight portions and two bends. The model geometry is composed of a geometry representing the channel built in CAD and exported to a stereolithography (STL) file. The channel walls and floor were thickened in CAD compared to the design to facilitate computational meshing, while the interior dimensions of the channel matched the design. The terrain surrounding the channel was imported into the software as a geotiff. The software converts the geotiff file to a STL file internally for use in the simulation. An additional STL file was also created to represent a filled channel, which was used to “remove” the surrounding terrain by implementing it as a “hole”. The channel geometry was then placed within this hole. The stilling basin was not included in the spillway model since it does not affect the supercritical flow in the spillway.

The physical roughness of the channel was assigned to be 0.003 ft to represent concrete. The roughness of the surrounding terrain was set to 0.1 ft, but this does not influence the simulation since the water is contained within the channel. Default discretization and solution parameters, including the renormalized group (RNG) turbulence model, were used in the simulation.

The upstream boundary condition used a specified flow rate of 500 cfs using baffles to ensure the flow was confined to only enter the channel. The inflow elevation (i.e., free surface elevation) was set to 1631.0 ft. Simulation results downstream of the inflow boundary (i.e., beyond a few channel widths) were insensitive to this value. The downstream boundary condition was set to an outflow to enable the water to leave the domain.

Two different model grid sizes were used for the simulations. An initial grid of 1.0 ft size in all three directions was used to "initialize" the flow. The FLOW-3D software uses the FAVOR™ method that cuts grid cells along geometry boundaries to enable smooth representation of the geometry without "stair-stepping" (Flow Science, 2023). The initialization involved running the simulation long enough to "fill up" the entire channel to an approximate flow depth. This required approximately 40 seconds of simulation time, which took about 2 hours of computing time.

The simulation was then restarted using a smaller 0.5-ft grid size. The "mapping" of the larger grid to the smaller grid can lead to flow disturbances, and for these disturbances to dissipate, the simulation was required to run for approximately 10 seconds. This took about 8 hours of computing time.

Results of the simulations are presented in Section 5.3.

#### 4.3.2 Stilling Basin Model

A similar approach was used for the stilling basin model geometry. The same geotiff was used to represent the surrounding terrain, while stilling basin geometries were created in CAD and exported as a STL files. A range of basin geometries were investigated, including designs with and without baffle blocks and different sizes and wall heights. The alternative analyses enabled the selection of a cost-effective design that utilized baffle blocks to minimize size and, therefore, construction costs. The final design geometry is shown in Figure 3. Baffle blocks were designed based on the USBR Design of Small Dams guidance, but the turning of the flow approximately 90 degrees to exit the basin required additional CFD analysis.

The physical roughness of the channel and stilling basin was assigned to be 0.003 ft to represent concrete. The roughness of the surrounding terrain was set to 0.1 ft, but this has minimal influence on the simulation since the water only interacts with the terrain in a backwater condition (i.e., low velocities). Default discretization and solution parameters were used in the simulation, including the renormalized group (RNG) turbulence model.

The upstream boundary condition used a specified flow rate of 500 cfs using baffles to ensure the flow was confined to only enter the channel. The inflow elevation (i.e., free surface elevation) was set to 1557.0 ft. Simulation results downstream of the inflow boundary (i.e., beyond a few channel widths) were insensitive to this value. The downstream boundary condition was set to an outflow to enable the water to leave the domain.

Two different model grid sizes were used for the simulations. An initial grid of 1.0 ft size in all three directions was used to “initialize” the flow. The initialization involved running the simulation long enough to “fill up” the spilling basin. This required approximately 60 seconds of simulation time, which took about 1 hour of computing time.

The simulation was then re-started using a smaller 0.5 ft grid size and run for approximately 10 seconds of simulation time to enable initial disturbances to dissipate. This took about 4 hours of computing time.

Results of the simulations are presented in Section 5.3.

# 5 ANALYSIS OF RESULTS

## 5.1 <u>Phase 1 – Culvert Flow Analysis Results</u>

The flow profile through the culverts for a headwater elevation 1641.5 cfs, assuming no overtopping of the roadway, were used to calculate the design flow (HY-8 Total discharge) and initial depth (HY-8 Outlet Depth) inputs for the SpillwayPro calculations. The HY-8 Results used in the SpillwayPro calculations are presented below:

- Total Discharge – 530.8 cfs
- Outlet Depth – 2.58 ft

Figure 4 shows the hydraulic profile and the Total Discharge versus Headwater Elevation Rating Curve from the HY-8 calculation. The HY-8 output report is provided in Attachment 1.

## 5.2 <u>Phase 2 - SpillwayPro Results</u>

Using the results calculated in Phase 1, presented above, as inputs into the SpillwayPro Calculation, the minimum spillway chute dimensions for a 15 ft wide reinforced concrete channel are as follows:

- Maximum Bulked Flow Depth at culvert outlet – 2.6 ft
- Minimum Wall Height with USBR suggested freeboard culvert outlet – 5.6 ft

- Maximum Bulked Depth in Spillway Chute – 1.4 ft
- Minimum Wall Height with USBR suggested freeboard in spillway chute – 4.0 ft
- Required Chamfer to Stop Cavitation – 2:1
- Minimum Cavitation Index (Flow Sigma) – 1.23
- Stilling Basin Conjugate Depth – 6.0 ft
- Approximate USBR Stilling Basin Lengths
  - Type I – 37 ft
  - Type II – 26 ft
  - Type III 16 ft
  - Low Froude – Not recommended

Figure 5 presents the Bulked Flow Profile versus the proposed chute Invert Elevation and suggested USBR Wall Height. The SpillwayPro Inputs, Hydraulic Properties, Aerated Flow Properties, and Cavitation Properties spreadsheets are provided as Attachment 2.

## 5.3 Phase 3 – FLOW-3D Results

The CFD results for the spillway and stilling basin are presented in the following sections.

### 5.3.1 Spillway

The simulated flow depth and velocity for the spillway are presented in Figure 6. Both images indicate the presence of superelevation at the outside of the curves, as well as cross-waves that reflect off the channel walls. Average flow depth and velocity were approximately 1 ft and 34 ft/s, respectively.

The superelevation and the cross-waves are further illustrated in Figure 7 that includes four cross sections. Two cross sections [(a) and (c)] were taken at the spillway bends and indicate combined depth of the superelevation and cross-waves exceeded 4 ft at the outside of the bends. Cross-section (b) is located between the two bends and indicates the effect of the cross-waves that result in depths exceeding 2 ft on the inside of the spillway wall. The final cross-section (d) located in the straight portion of the spillway indicates near uniform flow. These flow depths were used to design the spillway chute wall heights at the bends.

### 5.3.2 Stilling Basin

The simulated flow depth and velocity for the stilling basin are presented in Figure 8. These are a typical snapshot from the simulation, which generally indicates small oscillations in the waves within the spilling basin. The results indicate that the baffle blocks effectively slow down the high-speed flow in the spillway from approximately 34 ft/s to approximately 20 ft/s. The flow depth then increases in the stilling basin as the velocity continues to decrease and turn the corner to the outflow where the exit velocity is approximately 10 to 15 ft/s.

Additional understanding of the flow patterns, and particularly in the vertical dimension, are illustrated in profiles taken along the spillway centerline (Figure 9) and through the center-right baffle block (Figure 10). Each figure plots the velocity and pressure. Figure 9 illustrates the flow "launching" over the ramp at the end of the end sill in the stilling basin design. Similar results are indicated in Figure 10, with the primary difference being the effect of the upstream baffle block that results in the flow going around it (i.e., "out of the page"). The combined effect of the baffle block and ramp is a substantial reduction of velocities and energy within the stilling basin.

The pressures in Figure 10 indicate high pressure of up to 1,000 lbf/ft$^2$ at the upstream end of the baffle block. This pressure is slightly less than the stagnation pressure, $p_s = \frac{1}{2}\rho u_\infty^2$ = 1,100 lbf/ft$^2$, based on the upstream flow velocity, $u_\infty$= 34 ft/s and water density, $\rho$ = 1.94 slug/ft$^3$. This pressure can be used to design the baffle block.

Figures 8, 9, and 10 indicate flow depths up to approximately 7 ft within the stilling basin and particularly along the downstream wall. Analyses of the pressure near the downstream wall (Figures 9 and 10) indicate that the pressures are approximately hydrostatic, which is due to the baffle blocks and stilling basin design effectively reducing the velocity and energy of the flow. The hydrostatic pressure at the base can be estimated as, $p_h = \rho g h$ = 440 lbf/ft$^2$, based on a depth, $h$ = 7 ft, acceleration due to gravity, $g$ = 32.2 ft/s$^2$, and water density, $\rho$ = 1.94 slug/ft$^3$. This pressure can be used to design the walls.

Simulations were also conducted for lower flow rates of 250 and 100 cfs. Results of these simulations are provided in Attachment 3.

## 6 REFERENCES

Federal Highway Administration (FHWA). (2024). HY8 Culvert Analysis Program (8.8.0.0.1). U.S. Department of Transportation. May29, 2024.

Flow Science (2023). "Flow-3D HYDRO User Manual, Release 2023R2."

U.S. Department of the Interior, Bureau of Reclamation (USBR). (2019). SpillwayPro: Tools for Analysis of Spillway Cavitation and Design of Chute Aerators, A Supplement to Engineering Monograph 42 – Cavitation in Chutes and Spillways, Hydraulic Laboratory Report HL-2019-03. Technical Service Center, Hydraulic Investigations and Laboratory Services Group. April, 2019.

**TABLES**

**Table 1 – HY-8 Culvert Flow Analysis Inputs**

| Inputs | Value: | Units: |
|---|---|---|
| Shape | Concrete Box | Unitless |
| Material | Concrete | Unitless |
| Span | 6.50 | ft |
| Rise | 3.25 | ft |
| Embedment Depth | 0.00 | In |
| Manning's n | 0.012 | Unitless |
| Culvert Type | Straight | Unitless |
| Inlet Configuration | Square Edge (30-75$^o$) Wingwall ($K_e$= 0.4) | Unitless |
| Inlet Depression | Yes | |
| Depression | 1.71 | Ft |
| Depression Slope | 2:1 | (Xh:1V) |
| Crest Width | 22.00 | Ft |
| Site Data Input | Culvert Invert Data | Unitless |
| Inlet Station (Spillway Weir) | 0.00 | Ft |
| Inlet Elevation (Spillway Weir) | 1635.05 | ft |
| Outlet Station | 29.00 | ft |
| Outlet Elevation | 1633.05 | ft |
| Number of Culverts | 2 | Unitless |
| Computed Culvert Slope | 0.069 | ft/ft |
| Roadway Profile Shape | Constant | Unitless |
| First Roadway Station | 1225.00 | ft |
| Crest Length | 105.00 | ft |
| Crest Elevation | 1641.50 | ft |
| Roadway Surface | Paved | Unitless |
| Top Width | 24.00 | ft |

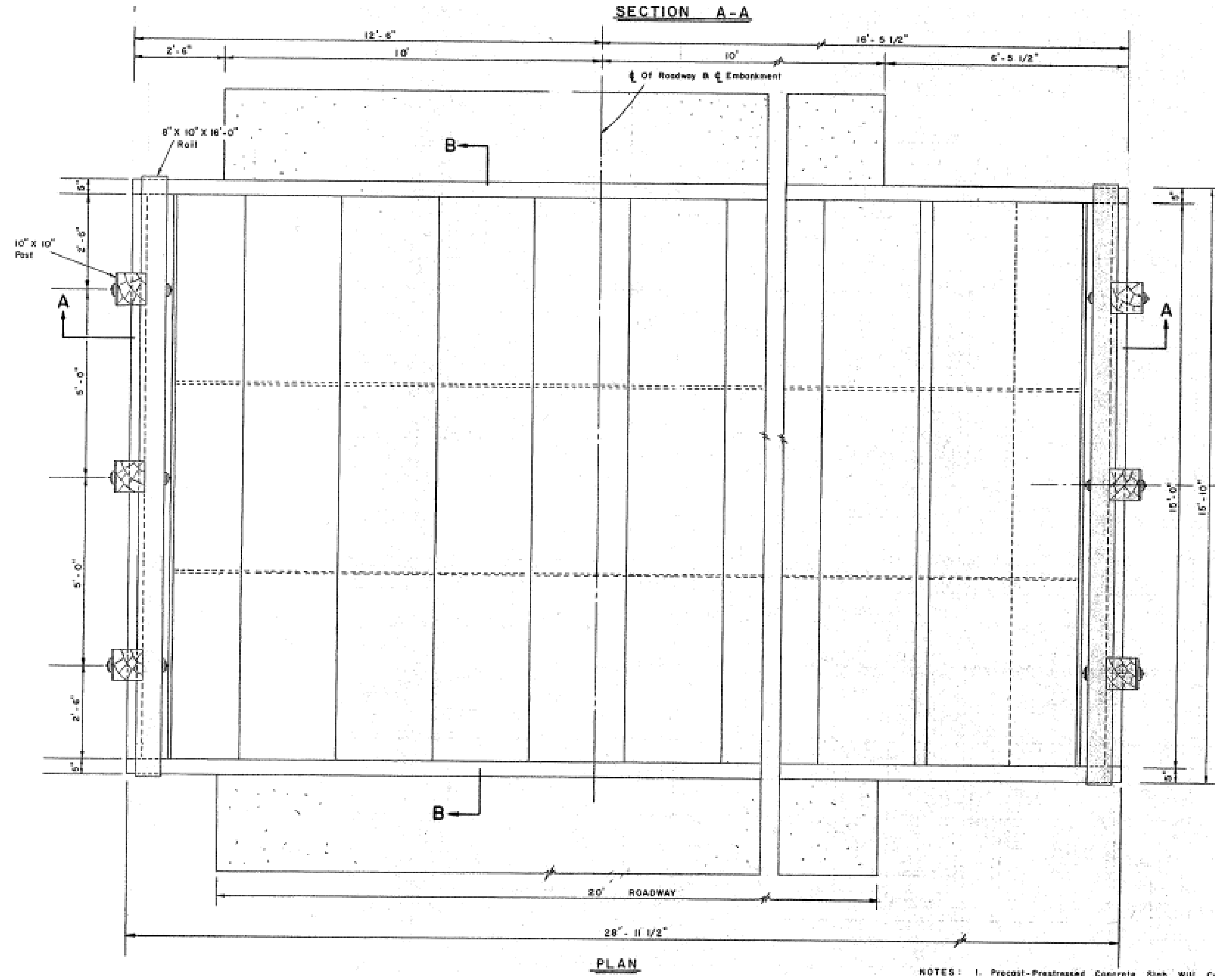
**Table 2 – SpillwayPro Inputs**

| Input Parameter: | Value: | Units: |
|---|---|---|
| Discharge, Q (From Phase 1) | 530.8 | cfs |
| Initial Depth (At first Station in Profile)[1] | 2.58 | ft |
| Initial Slope (At first Station in Profile) | 0.4822 | Ft/ft |
| Units | English | |
| Default Rugosity (Ordinary concrete) | .0032808 | ft |
| Crest Station | 88.42 ft | ft |
| Crest Elevation | 1633.6 | ft |
| Aeration Calculators | Enabled | |
| Reservoir Elevation[2] | 1636.20 | ft |
| Assumed Joint Offset | 0.25 | in |
| Assumed Joint Gap | 0.00 | in |

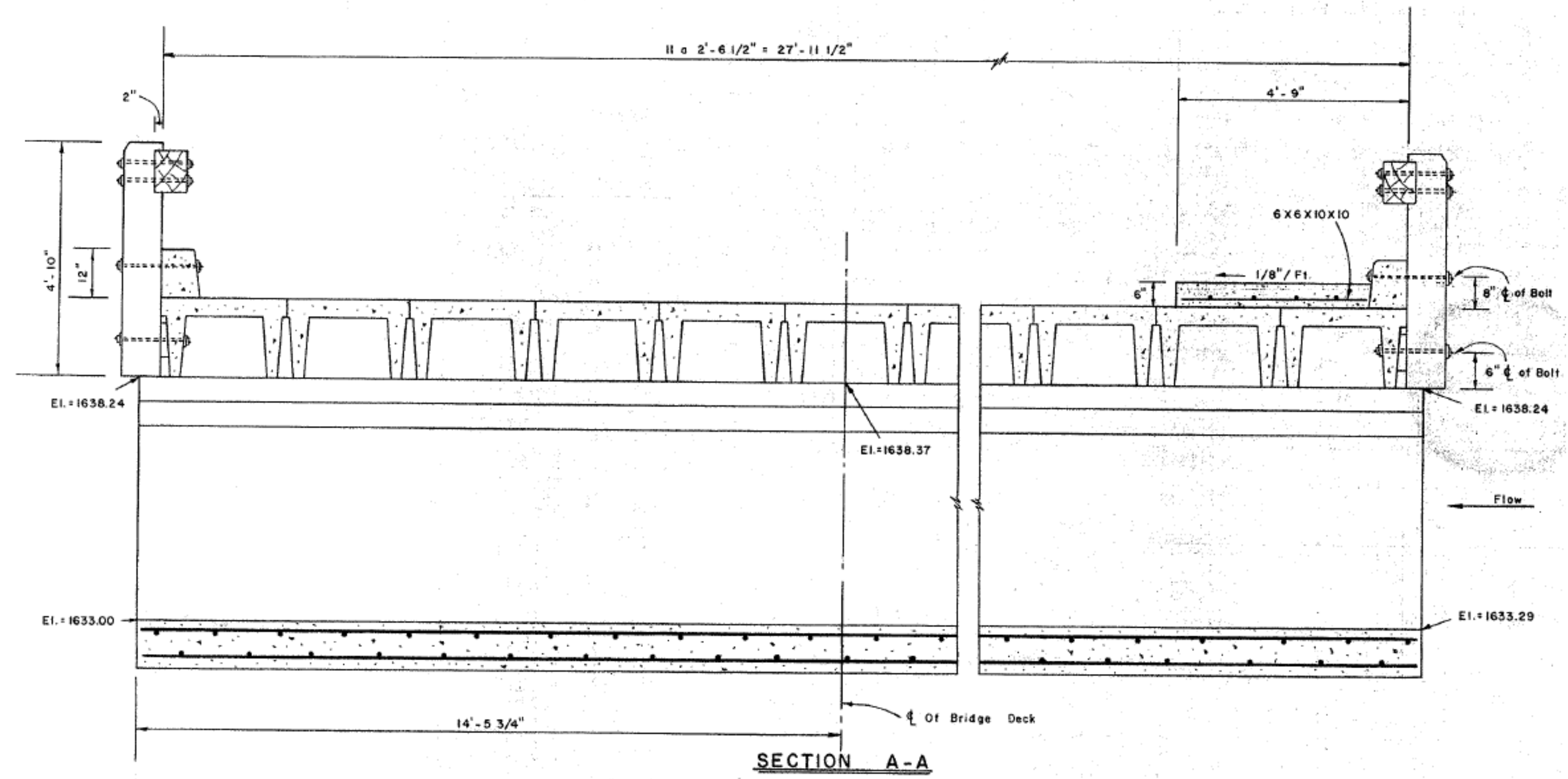
**Notes:**

1. HY-8 Calculated Outlet Depth for design flow
2. Depth above the proposed profile invert elevation at Station 88+42 (1633.62 ft)

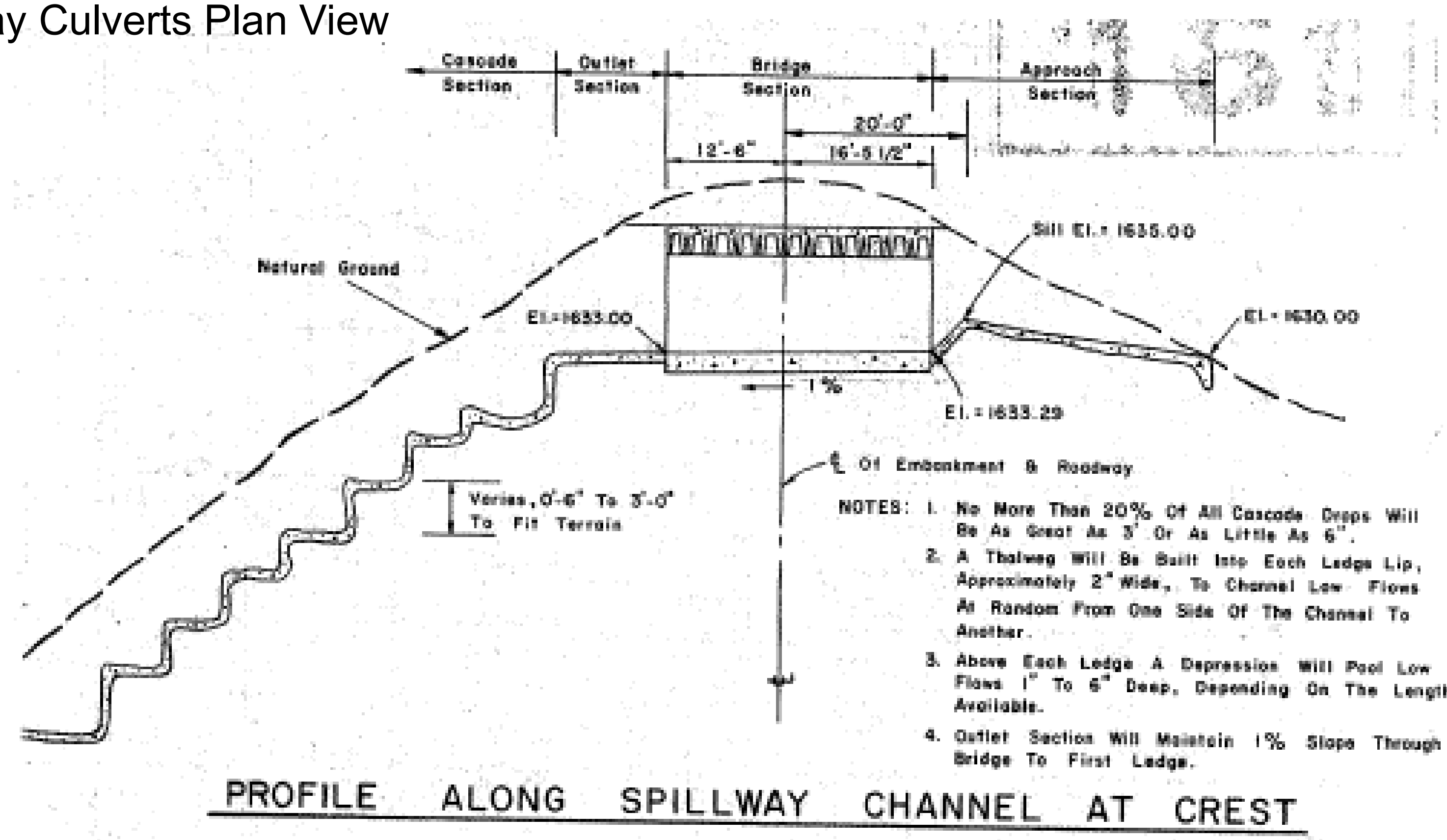
**FIGURES**




Existing Wilderness Parkway Culverts Plan View



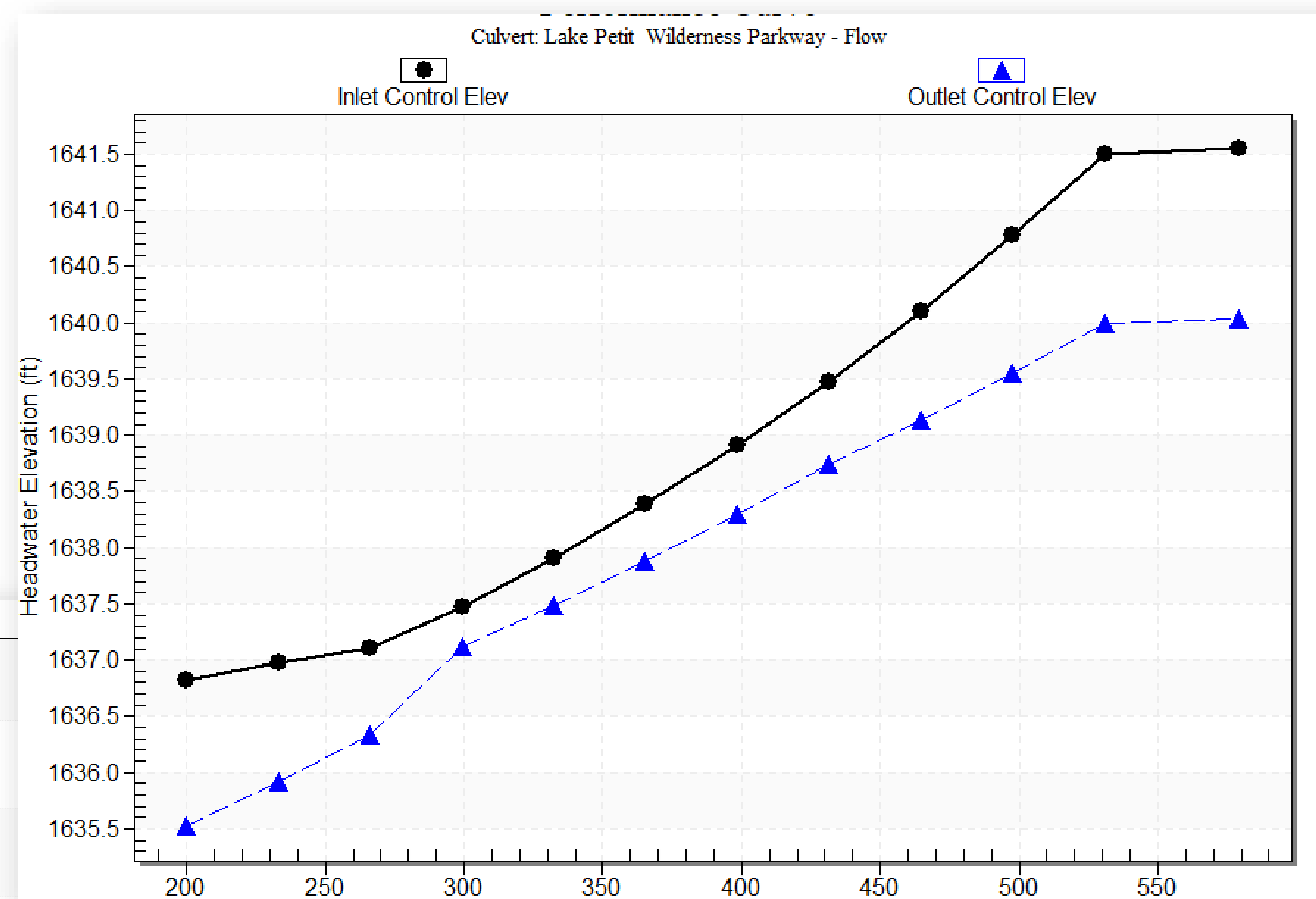

Existing Wilderness Parkway Culverts Profile View

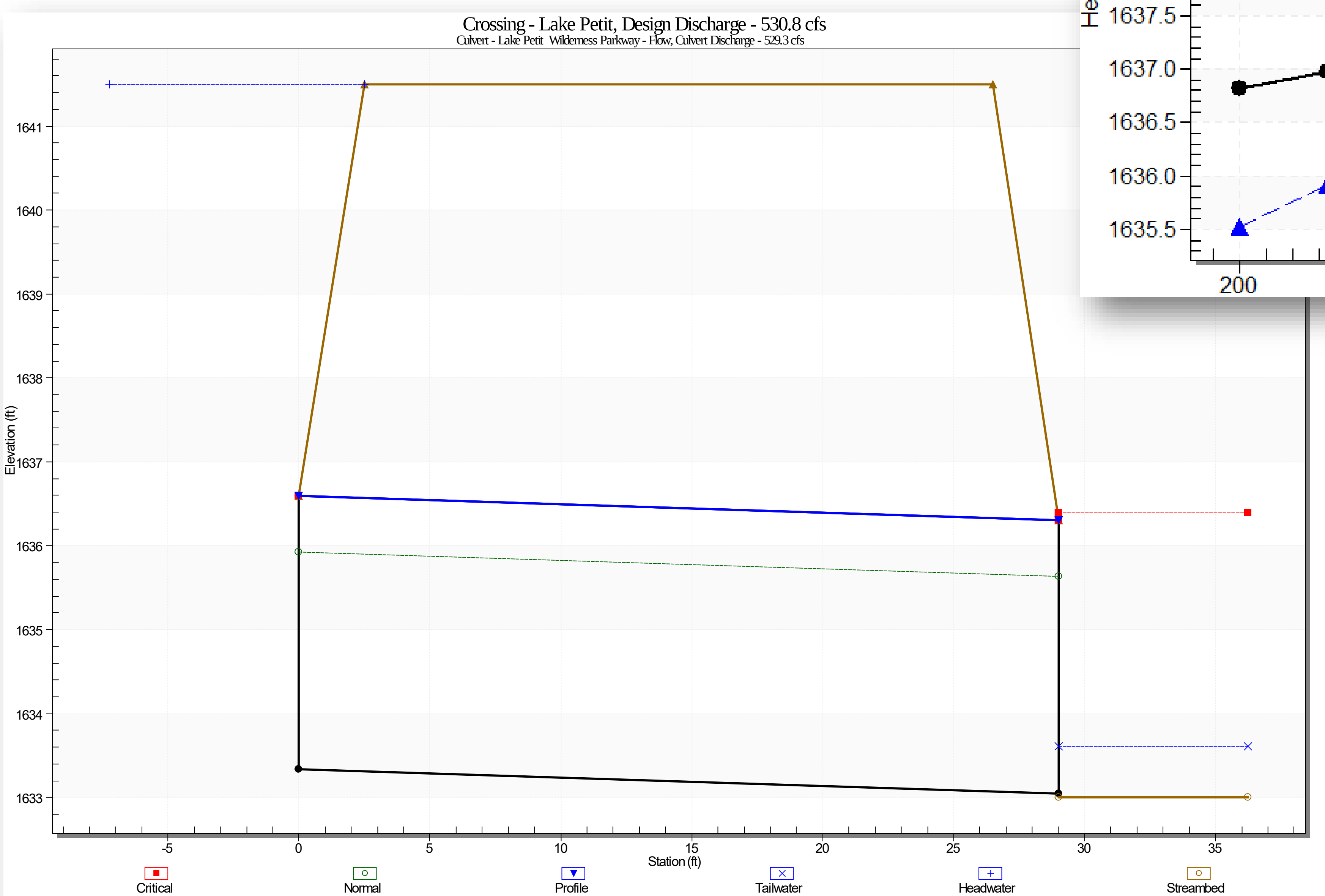



| | |
|---|---|
| **Existing Spillway Inlet Design Elevations and Dimensions** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>1 |
| Project No.: TJD10771 / October 2024 | |

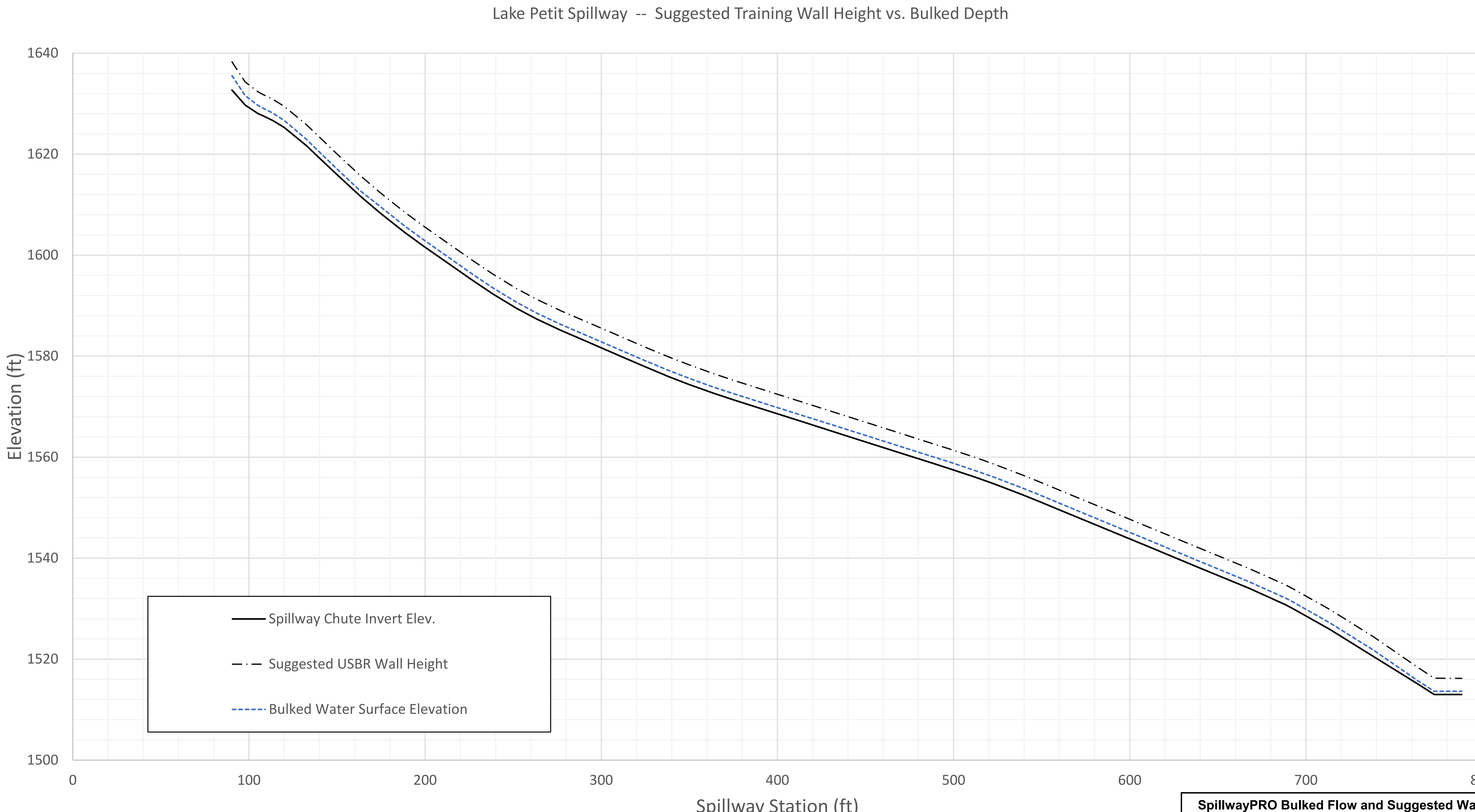
| Proposed Spillway Model Geometry | | |
|---|---|---|
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | Figure<br>2 |
| Project No.: TJD10771 | October 2024 | |

| Proposed Stilling Basin Model Geometry | | |
| --- | --- | --- |
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | Figure 3 |
| Project No.: TJD10771 | October 2024 | |




| HY-8 Culvert Analysis Results | | |
|---|---|---|
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | Figure<br>4 |
| Project No.: TJD10771 | October 2024 | |



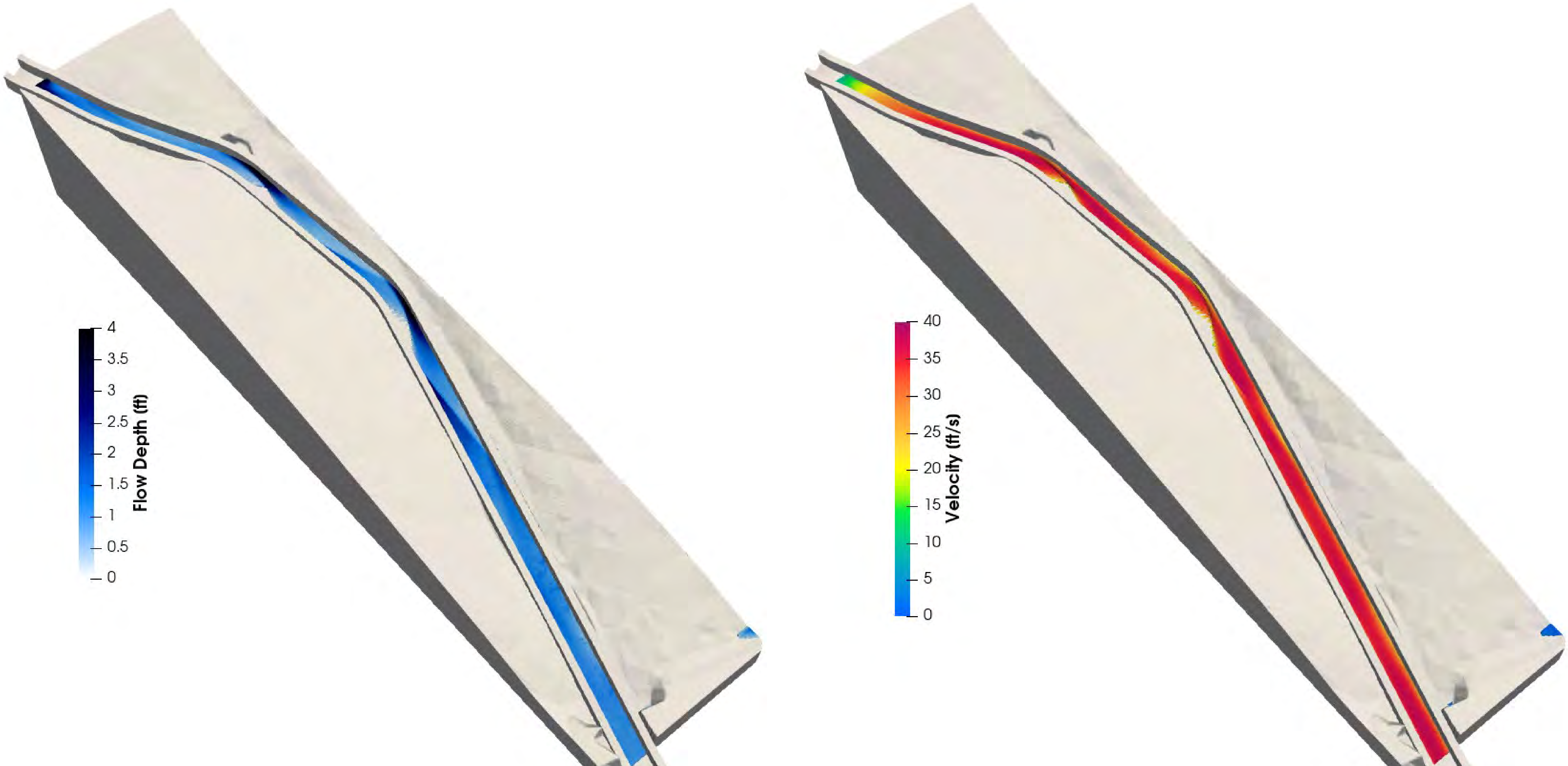

**SpillwayPRO Bulked Flow and Suggested Wall Height Profiles**

Lake Petit Dam
Big Canoe

Geosyntec consultants

**Figure** 5

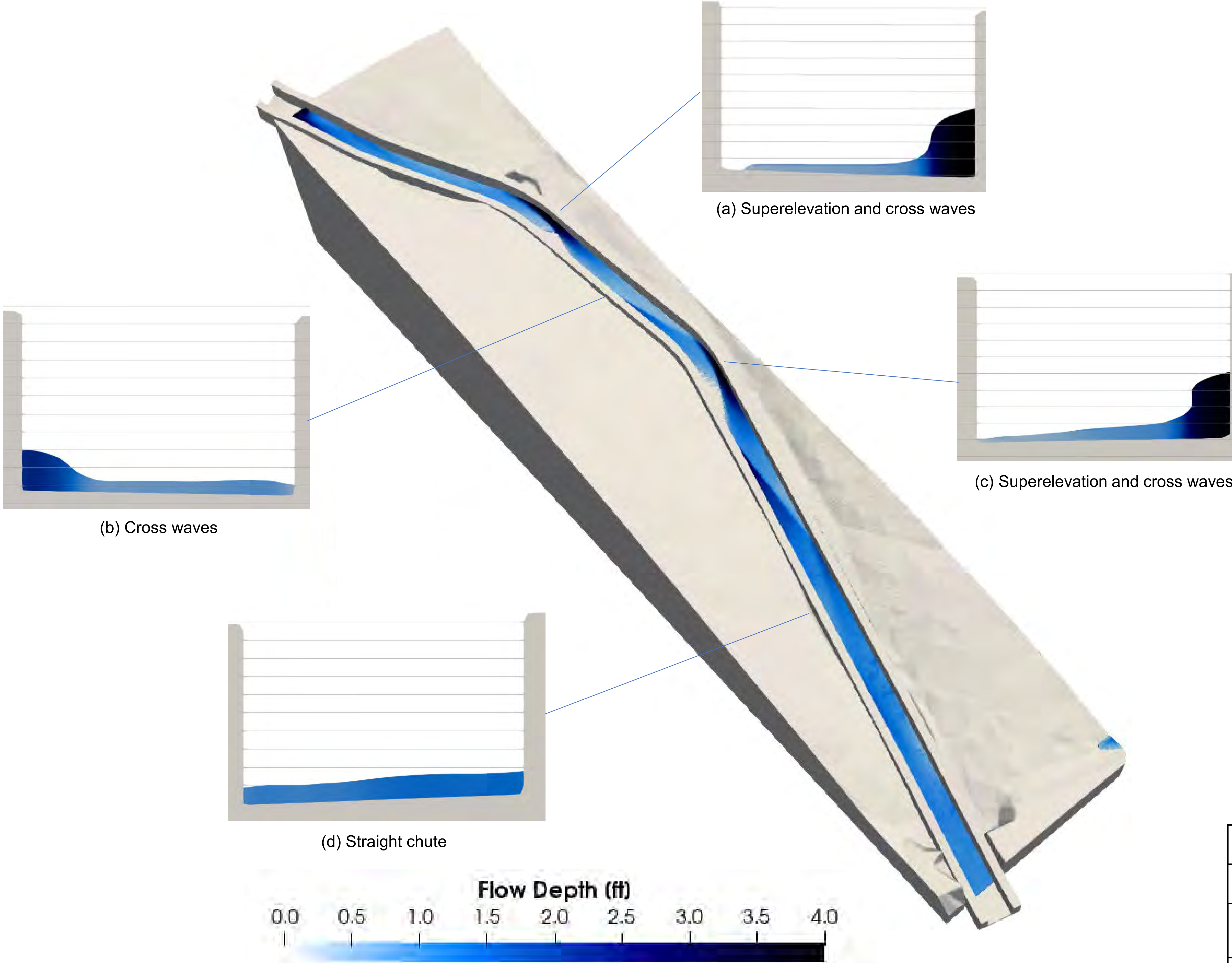
Project No.: TJD10771 | October 2024




(a) Flow depth

(b) Flow velocity

| | |
|---|---|
| **Flow-3D HYDRO Spillway Flow Depth and Velocity (500cfs)** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>6 |
| Project No.: TJD10771 | October 2024 |



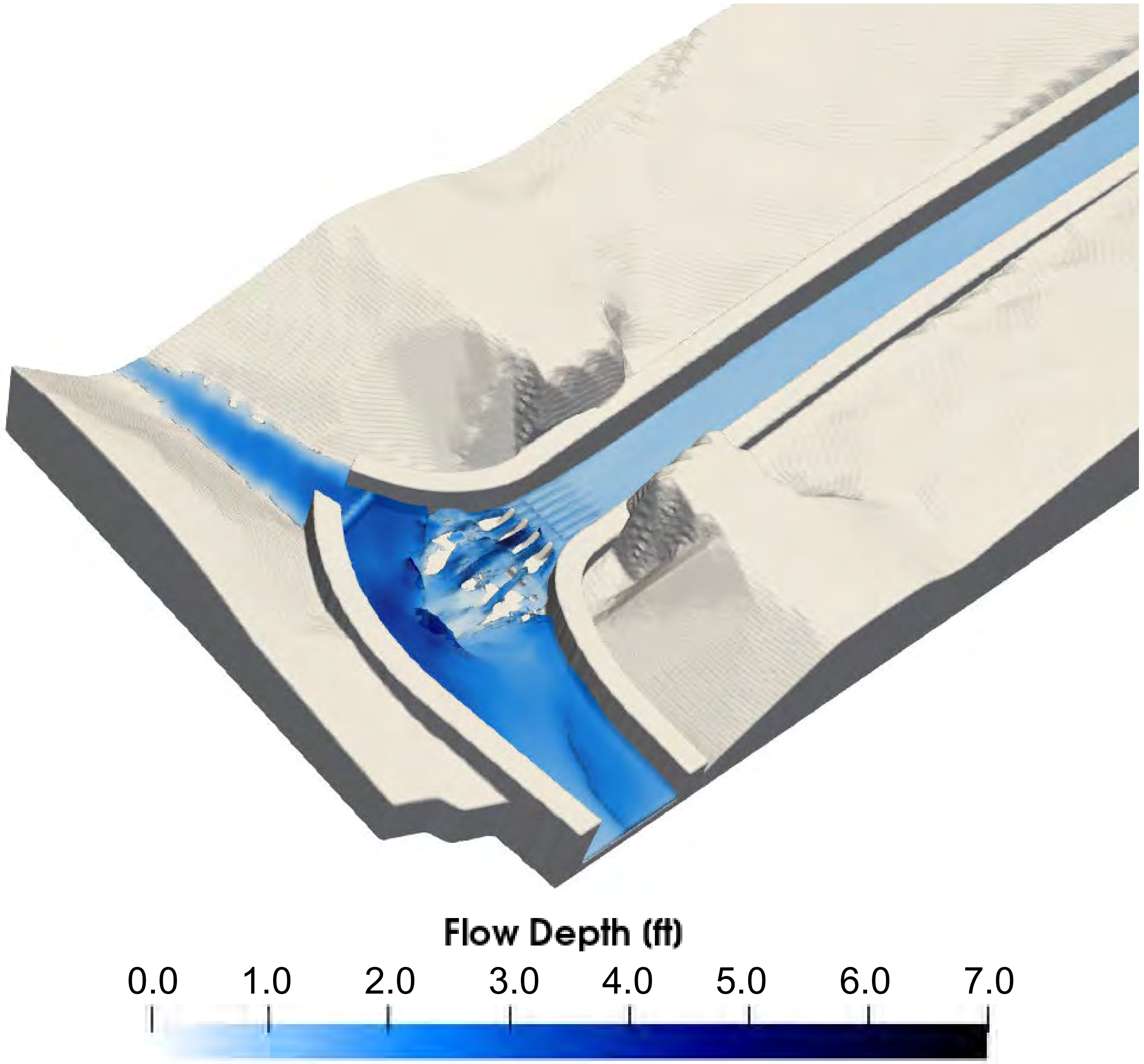

**Flow-3D HYDRO Spillway Flow Depth and Cross Sections (500 cfs)**

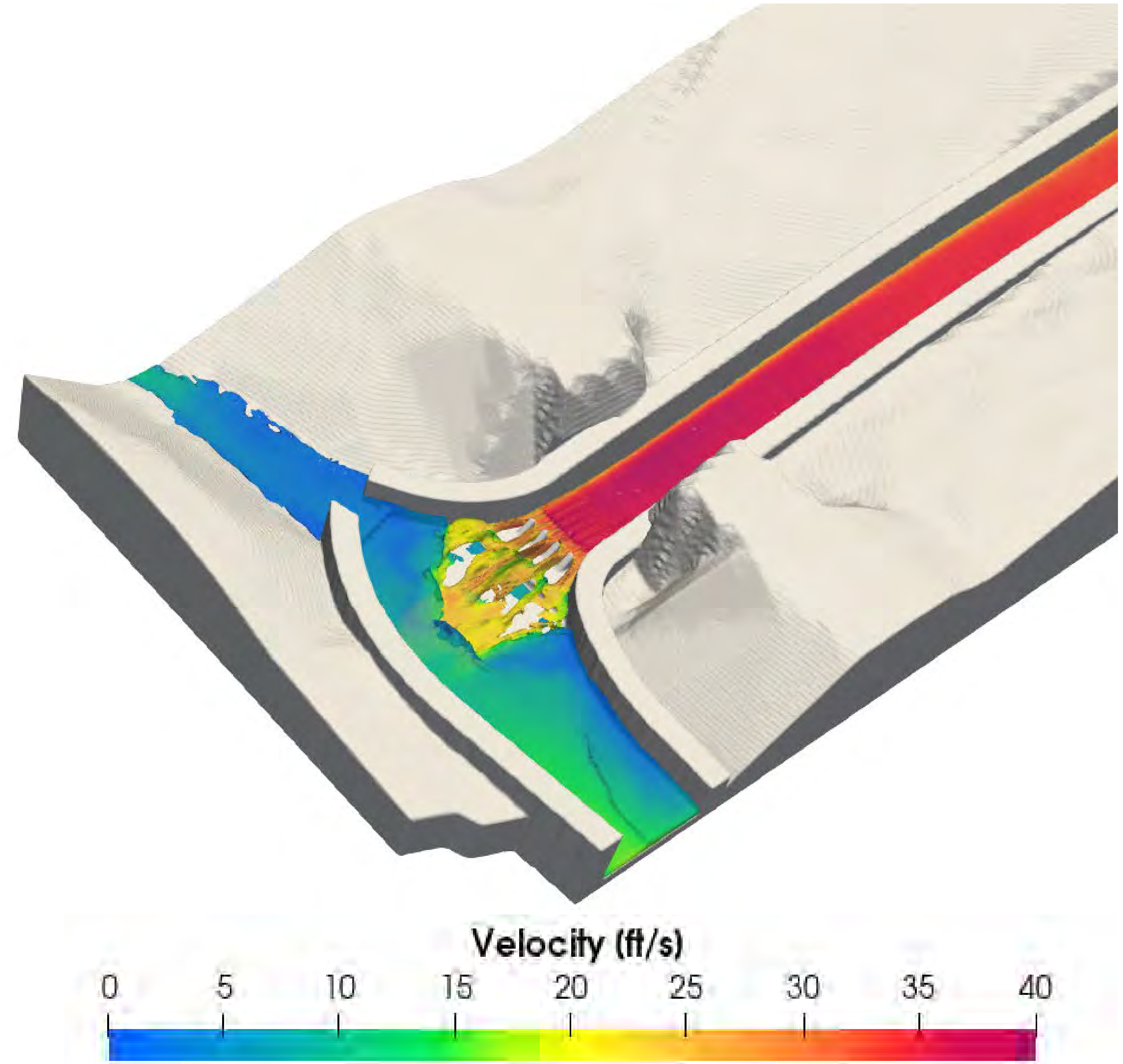
Lake Petit Dam
Big Canoe

Geosyntec consultants

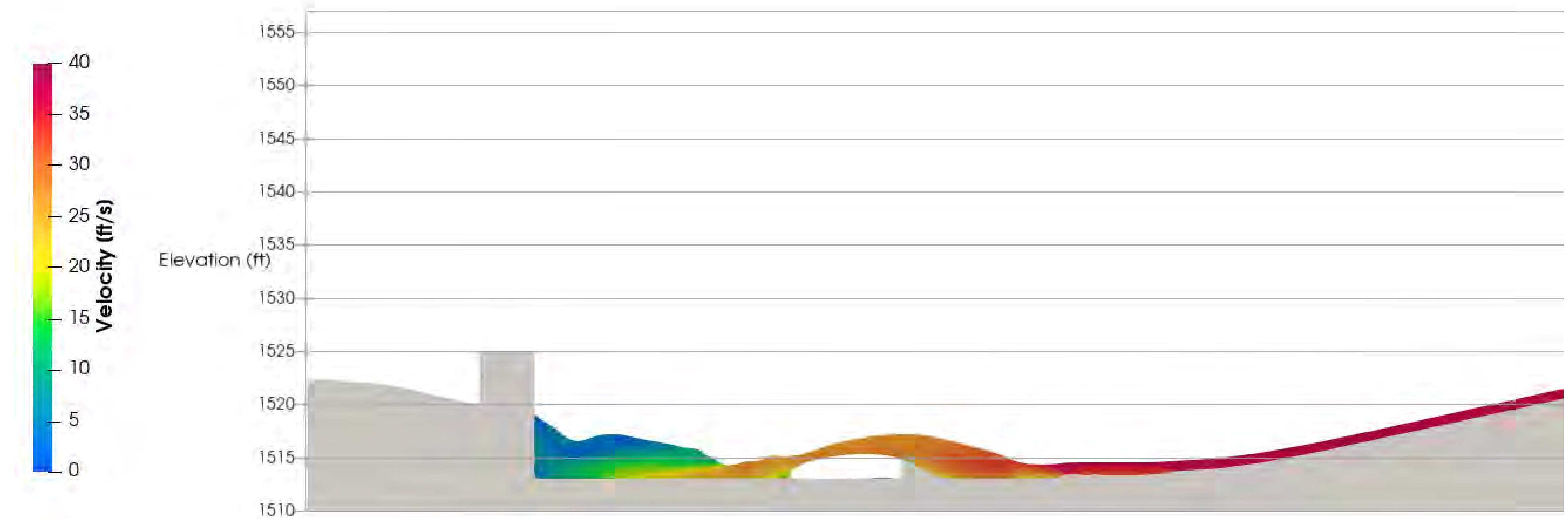
Figure 7

Project No.: TJD10771 | October 2024

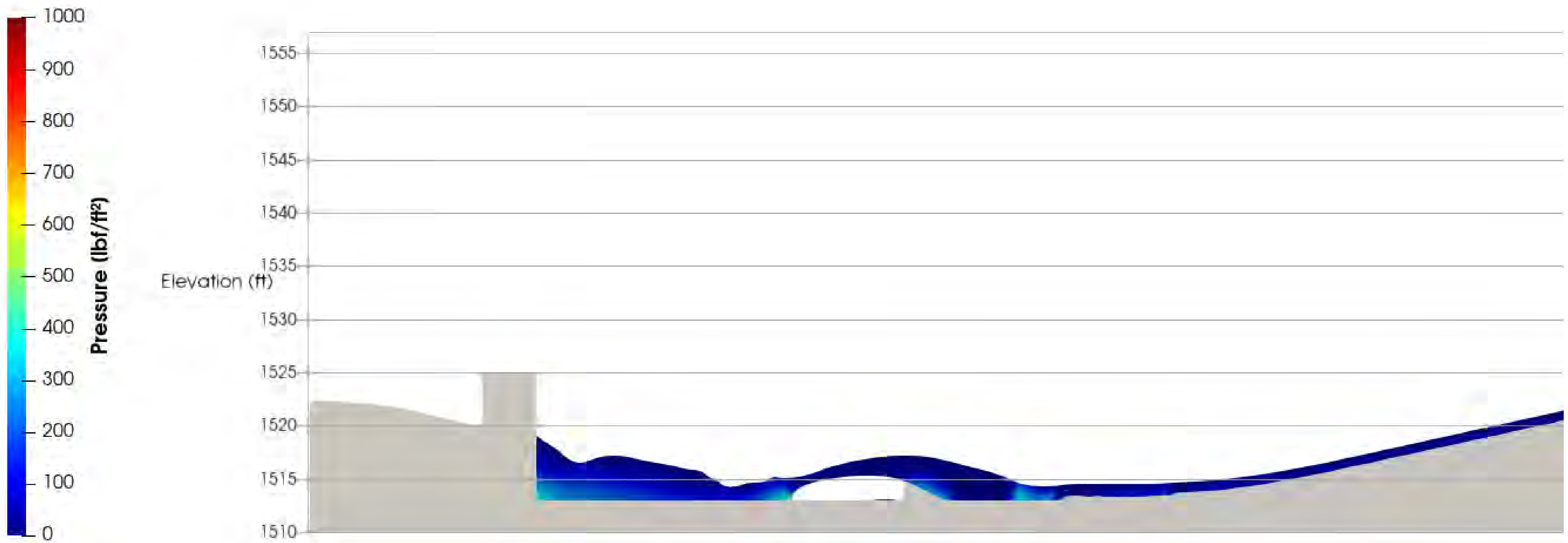


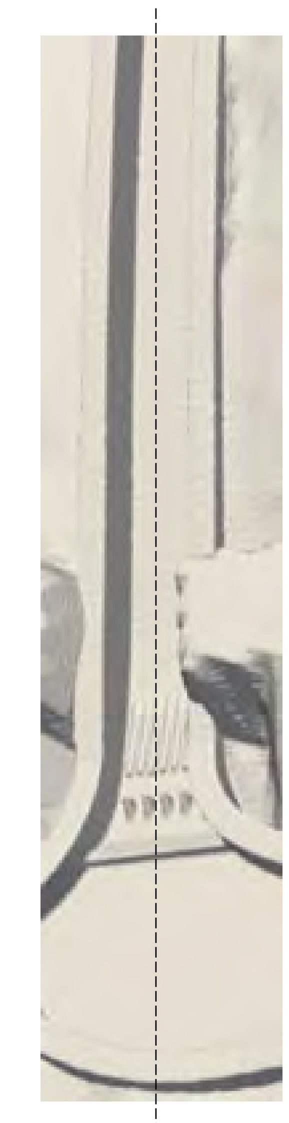

| | | |
|---|---|---|
| **Flow-3D HYDRO Stilling Basin Flow Depth and Velocity (500 cfs)** | | |
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | **Figure**<br>8 |
| Project No.: TJD10771 | October 2024 | |




(a) Velocity




(b) Pressure



Profile 1
Centerline between force blocks

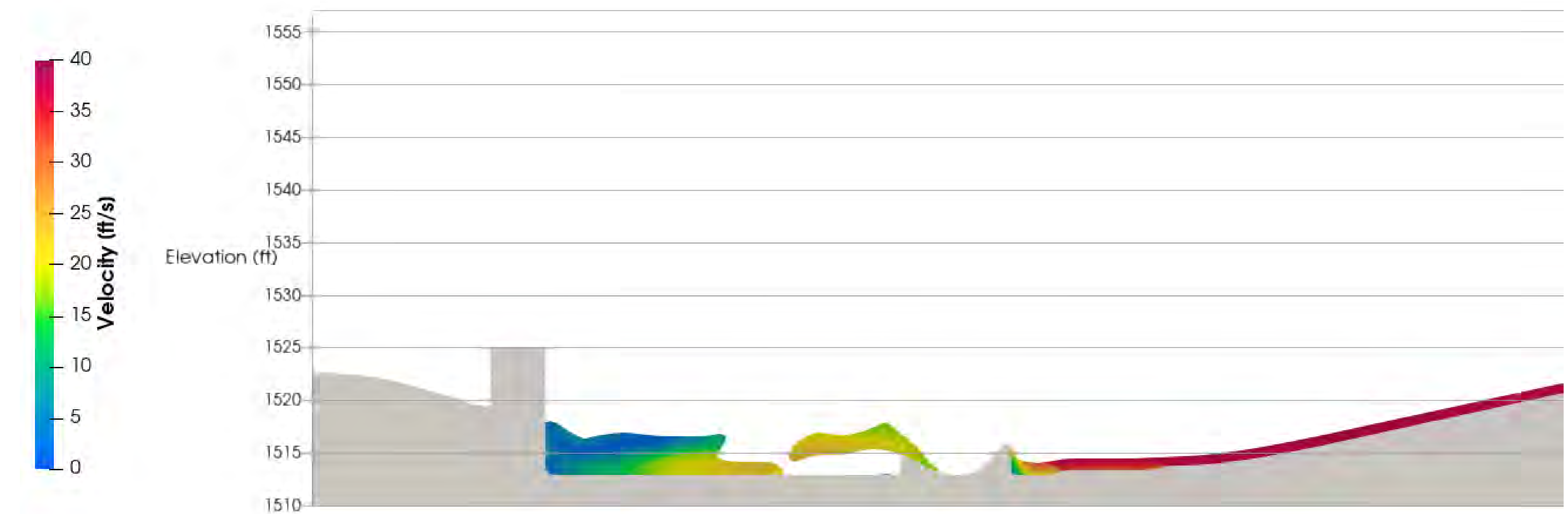
**Flow-3D HYDRO Stilling Basin Results along Profile 1 (500 cfs)**

Lake Petit Dam
Big Canoe

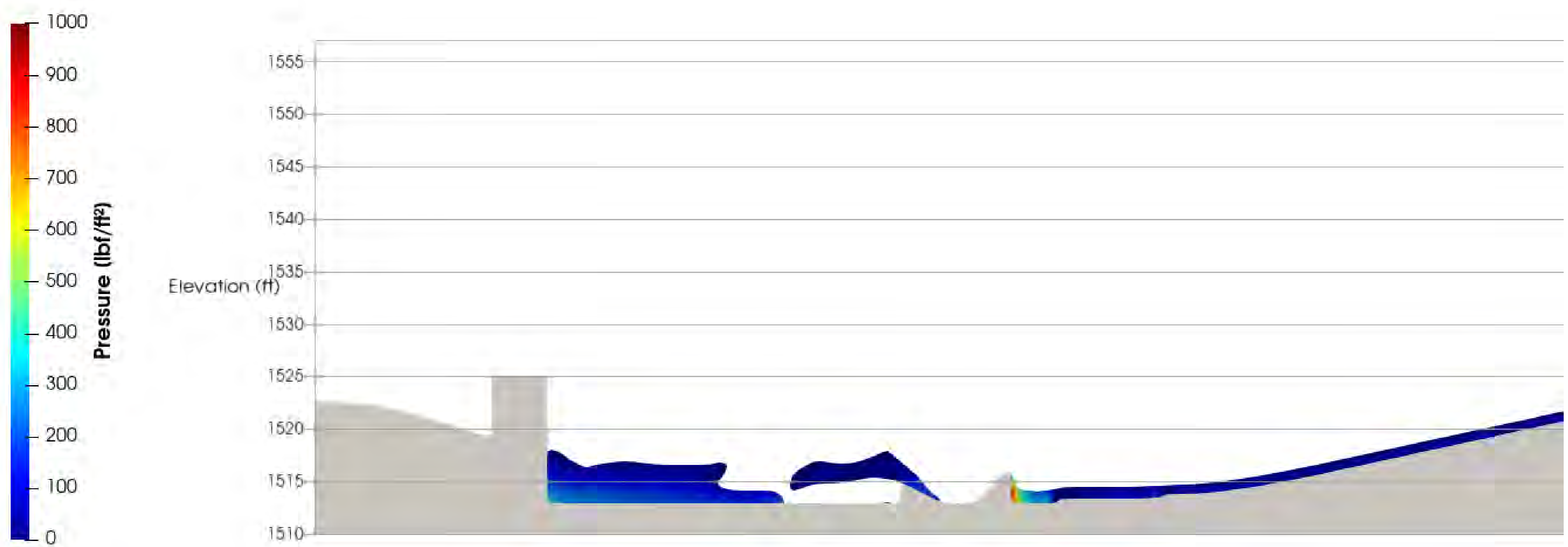
Geosyntec consultants

**Figure** 9

Project No.: TJD10771 | October 2024




(a) Velocity




(b) Pressure

Profile 2
Through center-right force block

| Flow-3D HYDRO Stilling Basin Results along Profile 2 (500 cfs) | |
|---|---|
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | Figure 10 |
| Project No.: TJD10771 | October 2024 |

**ATTACHMENT 1**

**FHWA HY-8 Report- Lake Petit Dam Existing Culverts**

# HY-8 Culvert Analysis Report

## Table 1 - Project Headwater Table

| Crossing Name | Culvert Name | Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | HW / D (ft) | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Outlet Velocity (ft/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake Petit** | Lake Petit Wilderness Parkway - Flow | 530.80 | 529.29 | 1641.50 | 8.16 | 6.659 | 1.98 | 2.58 | 3.25 | 2.58 | 15.81 |

## Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 200.00 cfs
Design Flow: 530.80 cfs
Maximum Flow: 530.80 cfs

Table 2 - Summary of Culvert Flows at crossing: Lake Petit

| Headwater Elevation (ft) | Total Discharge (cfs) | Lake Petit Wilderness Parkway - Flow Discharge (cfs) | Roadway Discharge (cfs) | Iterations |
|---|---|---|---|---|
| **1636.82** | 200.00 | 200.00 | 0.00 | 1 |
| **1636.97** | 233.08 | 233.08 | 0.00 | 1 |
| **1637.11** | 266.16 | 266.16 | 0.00 | 1 |
| **1637.47** | 299.24 | 299.24 | 0.00 | 1 |
| **1637.91** | 332.32 | 332.32 | 0.00 | 1 |
| **1638.38** | 365.40 | 365.40 | 0.00 | 1 |
| **1638.91** | 398.48 | 398.48 | 0.00 | 1 |
| **1639.48** | 431.56 | 431.56 | 0.00 | 1 |
| **1640.10** | 464.64 | 464.64 | 0.00 | 1 |
| **1640.78** | 497.72 | 497.72 | 0.00 | 1 |
| **1641.50** | 530.80 | 529.29 | 0.00 | 76 |
| **1641.50** | 530.79 | 530.79 | 0.00 | Overtopping |

## Rating Curve Plot for crossing: Lake Petit

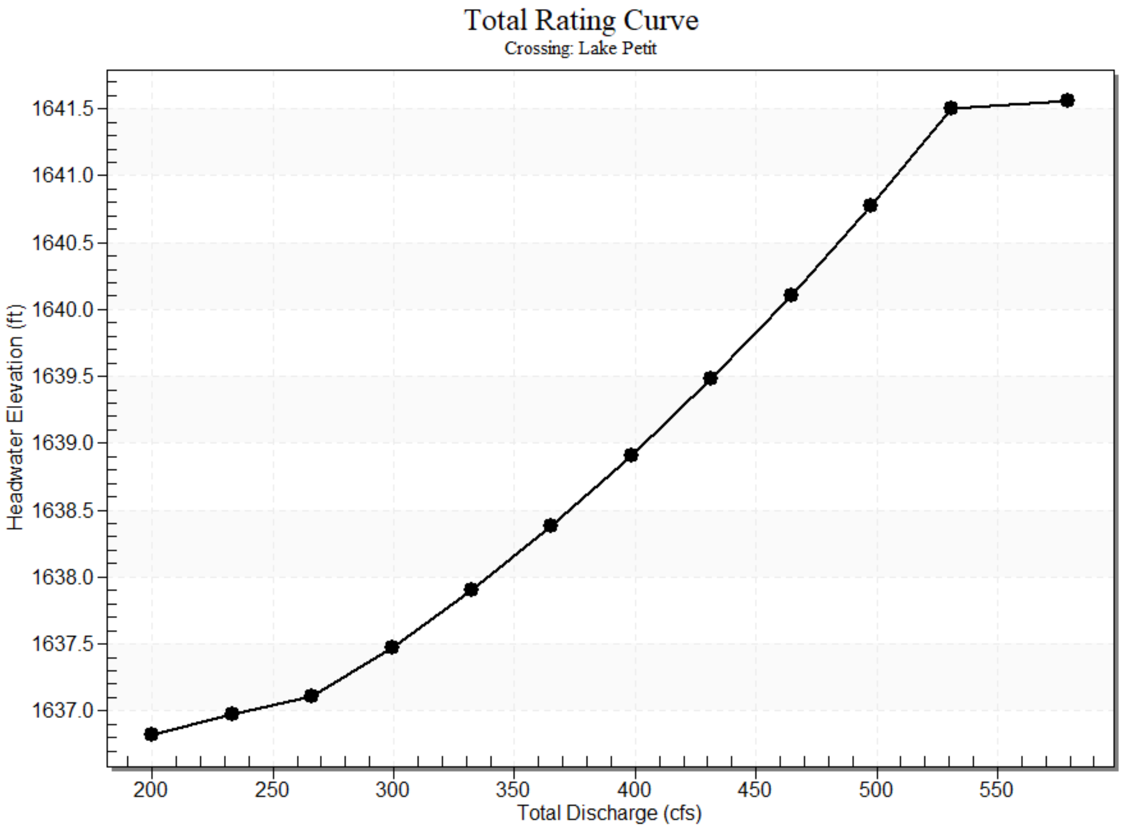


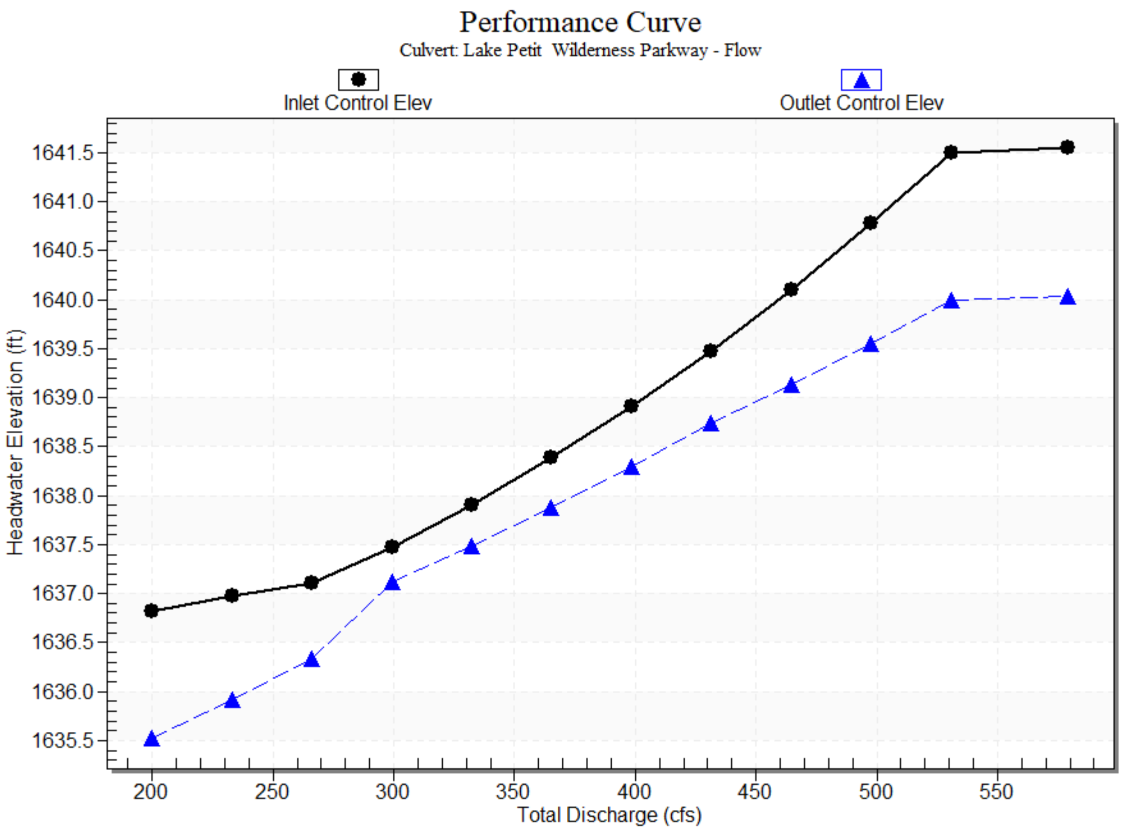
Table 3 - Culvert Summary Table: Lake Petit Wilderness Parkway - Flow

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | HW / D (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **200.00** | 200.00 | 1636.82 | 3.48 | 2.179 | 0.55 | 6-FFc | 1.30 | 1.94 | 1.30 | 0.33 | 11.82 | 39.84 |
| **233.08** | 233.08 | 1636.97 | 3.63 | 2.576 | 0.59 | 6-FFc | 1.44 | 2.15 | 1.44 | 0.37 | 12.41 | 42.28 |
| **266.16** | 266.16 | 1637.11 | 3.77 | 2.992 | 0.63 | 6-FFc | 1.58 | 2.35 | 1.58 | 0.40 | 12.94 | 44.51 |
| **299.24** | 299.24 | 1637.47 | 4.13 | 3.782 | 0.75 | 6-FFc | 1.72 | 2.54 | 1.72 | 0.43 | 13.41 | 46.59 |
| **332.32** | 332.32 | 1637.91 | 4.57 | 4.149 | 0.88 | 6-FFc | 1.85 | 2.73 | 1.85 | 0.46 | 13.84 | 48.50 |
| **365.40** | 365.40 | 1638.38 | 5.04 | 4.541 | 1.03 | 6-FFc | 1.97 | 2.91 | 1.97 | 0.48 | 14.23 | 50.31 |
| **398.48** | 398.48 | 1638.91 | 5.57 | 4.959 | 1.19 | 6-FFc | 2.10 | 3.08 | 2.10 | 0.51 | 14.60 | 52.02 |
| **431.56** | 431.56 | 1639.48 | 6.14 | 5.403 | 1.36 | 6-FFc | 2.22 | 3.25 | 2.22 | 0.54 | 14.93 | 53.63 |
| **464.64** | 464.64 | 1640.10 | 6.76 | 5.794 | 1.55 | 6-FFc | 2.34 | 3.25 | 2.34 | 0.56 | 15.25 | 55.18 |
| **497.72** | 497.72 | 1640.78 | 7.44 | 6.212 | 1.76 | 6-FFc | 2.46 | 3.25 | 2.46 | 0.59 | 15.54 | 56.65 |
| **530.80** | 529.29 | 1641.50 | 8.16 | 6.659 | 1.98 | 6-FFc | 2.58 | 3.25 | 2.58 | 0.61 | 15.81 | 58.05 |
| **579.05** | 533.32 | 1641.56 | 8.22 | 6.694 | 2.00 | 6-FFc | 2.59 | 3.25 | 2.59 | 0.64 | 15.83 | 60.01 |

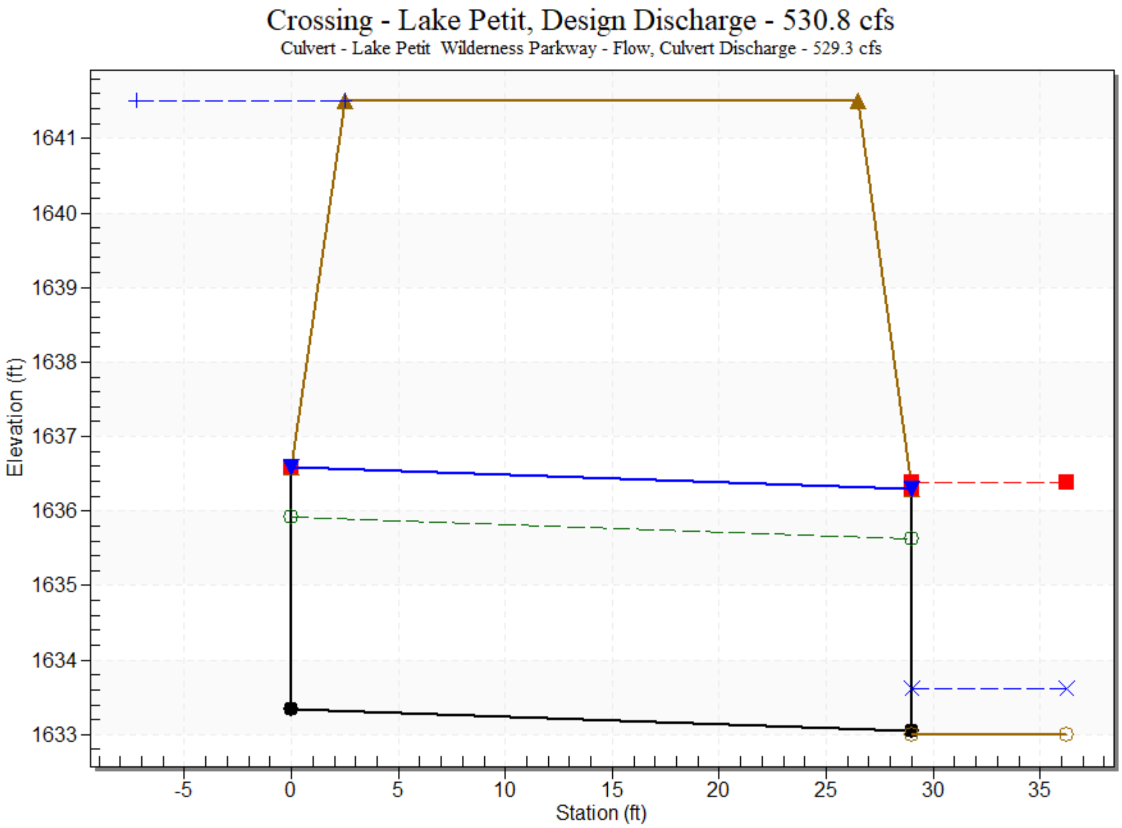
## Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 1633.34 ft
Outlet Elevation (invert): 1633.05 ft
Culvert Length: 29.07 ft
Culvert Slope: 0.01 ft/ft
Inlet Throat Elevation: 1633.34 ft
Inlet Crest Elevation: 1635.45 ft

## Culvert Performance Curve Plot: Lake Petit Wilderness Parkway - Flow



### Water Surface Profile Plot for Culvert: Lake Petit Wilderness Parkway - Flow




### Site Data - Lake Petit Wilderness Parkway - Flow

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 1635.05 ft
Outlet Station: 29.00 ft
Outlet Elevation: 1633.05 ft
Number of Barrels: 2

### Culvert Data Summary - Lake Petit Wilderness Parkway - Flow

Barrel Shape: Concrete Box
Barrel Span: 6.50 ft
Barrel Rise: 3.25 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall (Ke=0.4)
Inlet Depression: Yes

## Tailwater Channel Data for Crossing: Lake Petit

Tailwater Channel Option: Rectangular Channel
Bottom Width: 15.00 ft
Channel Slope: 0.47 ft/ft

Channel Manning's n: 0.0120
Channel Invert Elevation: 1633.00 ft

### Table 4 - Downstream Channel Rating Curve (crossing: Lake Petit)

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) | Velocity (ft/s) | Shear (psf) | Froude Number |
|---|---|---|---|---|---|
| **200.00** | 1633.33 | 0.33 | 39.84 | 9.86 | 12.14 |
| **233.08** | 1633.37 | 0.37 | 42.28 | 10.82 | 12.29 |
| **266.16** | 1633.40 | 0.40 | 44.51 | 11.74 | 12.42 |
| **299.24** | 1633.43 | 0.43 | 46.59 | 12.61 | 12.55 |
| **332.32** | 1633.46 | 0.46 | 48.50 | 13.45 | 12.65 |
| **365.40** | 1633.48 | 0.48 | 50.31 | 14.26 | 12.74 |
| **398.48** | 1633.51 | 0.51 | 52.02 | 15.04 | 12.83 |
| **431.56** | 1633.54 | 0.54 | 53.63 | 15.80 | 12.90 |
| **464.64** | 1633.56 | 0.56 | 55.18 | 16.53 | 12.98 |
| **497.72** | 1633.59 | 0.59 | 56.65 | 17.25 | 13.04 |
| **530.80** | 1633.61 | 0.61 | 58.05 | 17.95 | 13.10 |

### Roadway Data for crossing: Lake Petit

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 105.00 ft
Crest Elevation: 1641.50 ft
Roadway Surface: Paved
Roadway Top Width: 24.00 ft

**ATTACHMENT 2**
**USBR SpillwayPro – Lake Petit Dam Proposed Profile-15 ft Wide Channel**

Highlight Input Cells

Clear Highlights

## INPUT - Spillway Geometry

**Lake Petit Spillway**

Compute Invert Cur

Show Section Help

| Discharge, Q | Initial Depth, $Y_o$ | Initial Slope | Computation Direction | Units | Default Rugosity | Crest Station | Crest Elevation | Aeration Calculations | Reservoir Elevation | Stepped Training Wall F.S. | Step Face | Pre-aeration Station | Pre-aeration % entrained |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft³/s | ft | ft/ft | | | ft | ft | ft | | ft | - | - | ft | % |
| 530.8 | 2.58 | 0.472 | DS | English | 0.0032808 | 88.42 | 1633.62 | Enabled | 1636.2 | | Vertical | | |

| Section | Station | Invert Elevation | Width, Diameter, or Invert Radius | Side Slope, Upper Fillet or Crown Radius | Height or Side Radius | Lower Radius or Height of Crown Radius | Pier Width or Height of Side Radius | Invert Curvature Radius | Rugosity | Step Height | Joint Offset | Joint Gap | Slab Thickness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | ft | ft | ft | - or ft | ft | ft | ft | ft | ft | ft | ft | ft | ft |
| Rectangular | 90.360 | 1632.685 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 97.860 | 1629.700 | 15.000 | 0.000 | | | | 51.5 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 105.360 | 1627.979 | 15.000 | 0.000 | | | | 60.8 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 107.490 | 1627.669 | 15.000 | 0.000 | | | | -193.8 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 113.420 | 1626.678 | 15.000 | 0.000 | | | | -141.2 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 119.990 | 1625.273 | 15.000 | 0.000 | | | | -147.7 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 132.490 | 1621.713 | 15.000 | 0.000 | | | | -226.3 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 138.420 | 1619.748 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 149.500 | 1616.078 | 15.000 | 0.000 | | | | 1221.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 163.420 | 1611.633 | 15.000 | 0.000 | | | | 650.4 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 174.500 | 1608.339 | 15.000 | 0.000 | | | | 647.7 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 188.420 | 1604.503 | 15.000 | 0.000 | | | | 630.2 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 199.500 | 1601.693 | 15.000 | 0.000 | | | | 1428.8 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 213.420 | 1598.296 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 227.150 | 1594.947 | 15.000 | 0.000 | | | | 1309.1 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 238.420 | 1592.315 | 15.000 | 0.000 | | | | 571.8 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 252.150 | 1589.431 | 15.000 | 0.000 | | | | 569.4 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 263.420 | 1587.326 | 15.000 | 0.000 | | | | 558.6 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 277.150 | 1585.083 | 15.000 | 0.000 | | | | 1014.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 288.420 | 1583.386 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 313.420 | 1579.622 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 324.560 | 1577.945 | 15.000 | 0.000 | | | | 2371.3 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 338.420 | 1575.934 | 15.000 | 0.000 | | | | 1299.4 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 349.560 | 1574.428 | 15.000 | 0.000 | | | | 1309.2 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 363.420 | 1572.690 | 15.000 | 0.000 | | | | 1294.6 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 374.560 | 1571.403 | 15.000 | 0.000 | | | | 2883.6 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 388.420 | 1569.863 | 15.000 | 0.000 | | | | 0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 413.420 | 1567.085 | 15.000 | 0.000 | | | | 0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 438.420 | 1564.307 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 463.420 | 1561.529 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 488.420 | 1558.751 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 497.720 | 1557.717 | 15.000 | 0.000 | | | | -2519.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 513.420 | 1555.892 | 15.000 | 0.000 | | | | -1523.8 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 522.720 | 1554.733 | 15.000 | 0.000 | | | | -1554.6 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 538.420 | 1552.647 | 15.000 | 0.000 | | | | -1545.4 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 547.720 | 1551.334 | 15.000 | 0.000 | | | | -4356.7 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 563.420 | 1549.071 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |

Highlight Input Cells

Clear Highlights

## INPUT - Spillway Geometry

**Lake Petit Spillway**

Compute Invert Cur

Show Section Help

| Discharge, $Q$ | Initial Depth, $Y_o$ | Initial Slope | Computation Direction | Units | Default Rugosity | Crest Station | Crest Elevation | Aeration Calculations | Reservoir Elevation | Stepped Training Wall F.S. | Step Face | Pre-aeration Station | Pre-aeration % entrained |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft³/s | ft | ft/ft | | | ft | ft | ft | | ft | - | - | ft | % |
| 530.8 | 2.58 | 0.472 | DS | English | 0.0032808 | 88.42 | 1633.62 | Enabled | 1636.2 | | Vertical | | |

| Section | Station | Invert Elevation | Width, Diameter, or Invert Radius | Side Slope, Upper Fillet or Crown Radius | Height or Side Radius | Lower Radius or Height of Crown Radius | Pier Width or Height of Side Radius | Invert Curvature Radius | Rugosity | Step Height | Joint Offset | Joint Gap | Slab Thickness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | ft | ft | ft | - or ft | ft | ft | ft | ft | ft | ft | ft | ft | ft |
| Rectangular | 588.420 | 1545.466 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 613.420 | 1541.861 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 638.420 | 1538.256 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 663.420 | 1534.651 | 15.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 667.890 | 1534.006 | 15.000 | 0.000 | | | | -1026.9 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 688.420 | 1530.785 | 15.000 | 0.000 | | | | -411.5 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 692.890 | 1529.942 | 15.000 | 0.000 | | | | -1757.9 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 713.420 | 1525.916 | 15.000 | 0.000 | | | | -729.3 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 717.890 | 1524.958 | 15.000 | 0.000 | | | | -3868.2 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 738.420 | 1520.487 | 15.000 | 0.000 | | | | 14356.8 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 763.420 | 1515.085 | 30.000 | 0.000 | | | | -2973.2 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 772.800 | 1513.000 | 30.000 | 0.000 | | | | 50.6 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 785.300 | 1513.000 | 30.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |
| Rectangular | 788.420 | 1513.000 | 30.000 | 0.000 | | | | 0.0 | 0.00328 | 0 | 0.0208 | 0 | 2 |

# COMPUTED FLOW PROFILE - HYDRAULIC PROPERTIES

Compute Flow Profile & Cavitation Properties

**Lake Petit Spillway**

| *Q* | *Y<sub>o</sub>* | Rugosity | Manning's *n* | EGL at Crest | Basin $D_2$ | Basin $Fr_1$ | Approximate Stilling Basin Lengths: Type I | Type II | Type III | Low $Fr$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ft³/s | ft | ft | - | ft | ft | - | ft | ft | ft | ft |
| 530.80 | 2.580 | 0.0032808 | 0.0134 | 1637.97 | 6.00 | 8.84 | 37 | 26 | 16 | 5 |

| Station | Invert Elev. | Slope | Depth | Velocity | Water Surface Elev. | Piezo. Head | Energy Grade Line | Specific Energy | Profile | Normal Depth | Critical Depth | Fr | $Fr_{r,\theta,\alpha}$ | Roll Wave Check | Friction Factor, *f* | *Uplift, ΔH* | *Joint flow, q* | Depth-Solver Error |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft | ft | ft/ft | ft | ft/s | ft | ft | ft | ft | - | ft | ft | - | - | - | - | ft | ft³/s/ft | ft |
| 90.360 | 1632.69 | 0.472 | 2.580 | 13.72 | 1635.54 | 2.333 | 1637.94 | 5.25 | S2 | 0.652 | 3.503 | 1.50 | 1.58 | No | 0.0170 | 0.4002 | 0.0000 | 0.0000 |
| 97.860 | 1629.70 | 0.314 | 1.798 | 19.68 | 1631.58 | 2.124 | 1637.84 | 8.14 | S2 | 0.730 | 3.518 | 2.59 | 2.69 | No | 0.0181 | 0.9586 | 0.0000 | 0.0000 |
| 105.360 | 1627.98 | 0.188 | 1.588 | 22.29 | 1629.59 | 1.962 | 1637.67 | 9.69 | S2 | 0.852 | 3.472 | 3.12 | 3.19 | No | 0.0185 | 1.2249 | 0.0000 | 0.0000 |
| 107.490 | 1627.67 | 0.156 | 1.507 | 23.48 | 1629.19 | 1.358 | 1637.60 | 9.93 | S2 | 0.902 | 3.383 | 3.37 | 3.38 | No | 0.0187 | 1.3614 | 0.0000 | 0.0000 |
| 113.420 | 1626.68 | 0.190 | 1.433 | 24.70 | 1628.14 | 1.219 | 1637.40 | 10.72 | S2 | 0.848 | 3.383 | 3.64 | 3.66 | No | 0.0189 | 1.5266 | 0.0000 | 0.0000 |
| 119.990 | 1625.27 | 0.249 | 1.349 | 26.23 | 1626.66 | 1.119 | 1637.14 | 11.86 | S2 | 0.781 | 3.399 | 3.98 | 4.03 | No | 0.0191 | 1.7525 | 0.0000 | 0.0000 |
| 132.490 | 1621.71 | 0.308 | 1.197 | 29.58 | 1622.96 | 1.005 | 1636.47 | 14.75 | S2 | 0.734 | 3.428 | 4.76 | 4.89 | No | 0.0196 | 2.3243 | 0.0000 | 0.0000 |
| 138.420 | 1619.75 | 0.331 | 1.139 | 31.06 | 1620.95 | 1.082 | 1636.06 | 16.31 | S2 | 0.719 | 3.461 | 5.13 | 5.31 | No | 0.0198 | 2.5644 | 0.0000 | 0.0000 |
| 149.500 | 1616.08 | 0.325 | 1.053 | 33.61 | 1617.19 | 1.031 | 1635.15 | 19.07 | S2 | 0.722 | 3.468 | 5.77 | 6.01 | No | 0.0201 | 3.0858 | 0.0000 | 0.0000 |
| 163.420 | 1611.63 | 0.308 | 0.982 | 36.05 | 1612.66 | 0.999 | 1633.75 | 22.12 | S2 | 0.734 | 3.478 | 6.41 | 6.71 | No | 0.0204 | 3.6109 | 0.0000 | 0.0000 |
| 174.500 | 1608.34 | 0.286 | 0.951 | 37.20 | 1609.33 | 0.979 | 1632.17 | 23.83 | S2 | 0.750 | 3.492 | 6.72 | 7.08 | No | 0.0205 | 3.8536 | 0.0000 | 0.0000 |
| 188.420 | 1604.50 | 0.265 | 0.928 | 38.14 | 1605.46 | 0.967 | 1630.01 | 25.50 | S2 | 0.767 | 3.504 | 6.98 | 7.40 | No | 0.0206 | 4.0842 | 0.0000 | 0.0000 |
| 199.500 | 1601.69 | 0.249 | 0.911 | 38.82 | 1602.63 | 0.916 | 1628.35 | 26.66 | S2 | 0.780 | 3.521 | 7.17 | 7.63 | No | 0.0206 | 4.2546 | 0.0000 | 0.0000 |
| 213.420 | 1598.30 | 0.244 | 0.890 | 39.75 | 1599.21 | 0.865 | 1626.14 | 27.85 | S2 | 0.785 | 3.531 | 7.42 | 7.90 | No | 0.0207 | 4.4971 | 0.0000 | 0.0000 |
| 227.150 | 1594.95 | 0.239 | 0.874 | 40.48 | 1595.85 | 0.887 | 1623.83 | 28.88 | S2 | 0.789 | 3.533 | 7.63 | 8.12 | No | 0.0207 | 4.6907 | 0.0000 | 0.0000 |
| 238.420 | 1592.32 | 0.222 | 0.865 | 40.92 | 1593.20 | 0.929 | 1621.84 | 29.53 | S2 | 0.807 | 3.533 | 7.75 | 8.24 | No | 0.0208 | 4.8046 | 0.0000 | 0.0000 |
| 252.150 | 1589.43 | 0.198 | 0.859 | 41.21 | 1590.31 | 0.928 | 1619.37 | 29.94 | S2 | 0.835 | 3.527 | 7.84 | 8.31 | No | 0.0208 | 4.8808 | 0.0000 | 0.0000 |
| 263.420 | 1587.33 | 0.175 | 0.858 | 41.25 | 1588.20 | 0.933 | 1617.32 | 29.99 | S3 | 0.868 | 3.522 | 7.85 | 8.30 | No | 0.0209 | 4.8840 | 0.0000 | 0.0000 |
| 277.150 | 1585.08 | 0.157 | 0.861 | 41.11 | 1585.95 | 0.899 | 1614.84 | 29.76 | S3 | 0.898 | 3.516 | 7.81 | 8.24 | No | 0.0208 | 4.8394 | 0.0000 | 0.0000 |
| 288.420 | 1583.39 | 0.151 | 0.865 | 40.92 | 1584.26 | 0.855 | 1612.84 | 29.45 | S3 | 0.910 | 3.510 | 7.75 | 8.18 | No | 0.0208 | 4.7865 | 0.0000 | 0.0000 |
| 313.420 | 1579.62 | 0.151 | 0.874 | 40.50 | 1580.51 | 0.864 | 1608.50 | 28.88 | S3 | 0.910 | 3.510 | 7.63 | 8.05 | No | 0.0208 | 4.6698 | 0.0000 | 0.0000 |
| 324.560 | 1577.95 | 0.148 | 0.878 | 40.32 | 1578.83 | 0.888 | 1606.61 | 28.66 | S3 | 0.915 | 3.512 | 7.59 | 8.00 | No | 0.0207 | 4.6318 | 0.0000 | 0.0000 |
| 338.420 | 1575.93 | 0.140 | 0.883 | 40.09 | 1576.83 | 0.911 | 1604.29 | 28.36 | S3 | 0.931 | 3.512 | 7.52 | 7.93 | No | 0.0207 | 4.5688 | 0.0000 | 0.0000 |
| 349.560 | 1574.43 | 0.130 | 0.888 | 39.85 | 1575.32 | 0.917 | 1602.47 | 28.04 | S3 | 0.952 | 3.510 | 7.45 | 7.85 | No | 0.0207 | 4.5066 | 0.0000 | 0.0000 |
| 363.420 | 1572.69 | 0.120 | 0.896 | 39.49 | 1573.59 | 0.926 | 1600.26 | 27.57 | S3 | 0.977 | 3.509 | 7.35 | 7.74 | No | 0.0207 | 4.4108 | 0.0000 | 0.0000 |
| 374.560 | 1571.40 | 0.113 | 0.903 | 39.17 | 1572.31 | 0.914 | 1598.52 | 27.12 | S3 | 0.996 | 3.506 | 7.26 | 7.64 | No | 0.0206 | 4.3288 | 0.0000 | 0.0000 |
| 388.420 | 1569.86 | 0.111 | 0.913 | 38.76 | 1570.78 | 0.907 | 1596.43 | 26.57 | S3 | 1.002 | 3.505 | 7.15 | 7.52 | No | 0.0206 | 4.2236 | 0.0000 | 0.0000 |
| 413.420 | 1567.09 | 0.111 | 0.929 | 38.11 | 1568.02 | 0.923 | 1592.82 | 25.73 | S3 | 1.002 | 3.505 | 6.97 | 7.33 | No | 0.0205 | 4.0592 | 0.0000 | 0.0000 |
| 438.420 | 1564.31 | 0.111 | 0.942 | 37.58 | 1565.25 | 0.936 | 1589.37 | 25.06 | S3 | 1.002 | 3.505 | 6.83 | 7.18 | No | 0.0205 | 3.9352 | 0.0000 | 0.0000 |
| 463.420 | 1561.53 | 0.111 | 0.952 | 37.16 | 1562.49 | 0.947 | 1586.06 | 24.53 | S3 | 1.002 | 3.505 | 6.71 | 7.06 | No | 0.0204 | 3.8362 | 0.0000 | 0.0000 |
| 488.420 | 1558.75 | 0.111 | 0.961 | 36.81 | 1559.72 | 0.955 | 1582.85 | 24.10 | S3 | 1.002 | 3.505 | 6.62 | 6.96 | No | 0.0204 | 3.7569 | 0.0000 | 0.0000 |
| 497.720 | 1557.72 | 0.114 | 0.964 | 36.71 | 1558.69 | 0.940 | 1581.68 | 23.96 | S3 | 0.995 | 3.503 | 6.59 | 6.93 | No | 0.0203 | 3.7392 | 0.0000 | 0.0000 |
| 513.420 | 1555.89 | 0.120 | 0.967 | 36.61 | 1556.87 | 0.931 | 1579.72 | 23.83 | S3 | 0.977 | 3.503 | 6.56 | 6.91 | No | 0.0203 | 3.7163 | 0.0000 | 0.0000 |
| 522.720 | 1554.73 | 0.129 | 0.967 | 36.61 | 1555.71 | 0.930 | 1578.56 | 23.83 | S2 | 0.956 | 3.504 | 6.56 | 6.91 | No | 0.0203 | 3.7198 | 0.0000 | 0.0000 |
| 538.420 | 1552.65 | 0.137 | 0.964 | 36.71 | 1553.62 | 0.926 | 1576.60 | 23.95 | S2 | 0.937 | 3.506 | 6.59 | 6.94 | No | 0.0203 | 3.7465 | 0.0000 | 0.0000 |
| 547.720 | 1551.33 | 0.143 | 0.961 | 36.81 | 1552.30 | 0.942 | 1575.42 | 24.09 | S2 | 0.925 | 3.508 | 6.62 | 6.97 | No | 0.0203 | 3.7711 | 0.0000 | 0.0000 |
| 563.420 | 1549.07 | 0.144 | 0.956 | 37.01 | 1550.04 | 0.946 | 1573.42 | 24.35 | S2 | 0.922 | 3.509 | 6.67 | 7.03 | No | 0.0203 | 3.8207 | 0.0000 | 0.0000 |
| 588.420 | 1545.47 | 0.144 | 0.949 | 37.29 | 1546.42 | 0.939 | 1570.16 | 24.69 | S2 | 0.922 | 3.509 | 6.75 | 7.11 | No | 0.0204 | 3.8880 | 0.0000 | 0.0000 |

# COMPUTED FLOW PROFILE - HYDRAULIC PROPERTIES

Compute Flow Profile & Cavitation Properties

**Lake Petit Spillway**

| Q | $Y_o$ | Rugosity | Manning's n | EGL at Crest | Basin $D_2$ | Basin $Fr_1$ | Approximate Stilling Basin Lengths Type I | Type II | Type III | Low Fr |
|---|---|---|---|---|---|---|---|---|---|---|
| ft³/s | ft | ft | - | ft | ft | - | ft | ft | ft | ft |
| 530.80 | 2.580 | 0.0032808 | 0.0134 | 1637.97 | 6.00 | 8.84 | 37 | 26 | 16 | 5 |

| Station | Invert Elev. | Slope | Depth | Velocity | Water Surface Elev. | Piezo. Head | Energy Grade Line | Specific Energy | Profile | Normal Depth | Critical Depth | Fr | $Fr_{r,\theta,\alpha}$ | Roll Wave Check | Friction Factor, *f* | *Uplift, ΔH* | *Joint flow, q* | Depth-Solver Error |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft | ft | ft/ft | ft | ft/s | ft | ft | ft | ft | - | ft | ft | - | - | - | - | ft | ft³/s/ft | ft |
| 613.420 | 1541.86 | 0.144 | 0.943 | 37.51 | 1542.81 | 0.934 | 1566.83 | 24.97 | S2 | 0.922 | 3.509 | 6.81 | 7.18 | No | 0.0204 | 3.9394 | 0.0000 | 0.0000 |
| 638.420 | 1538.26 | 0.144 | 0.939 | 37.69 | 1539.20 | 0.929 | 1563.45 | 25.19 | S2 | 0.922 | 3.509 | 6.85 | 7.23 | No | 0.0204 | 3.9807 | 0.0000 | 0.0000 |
| 663.420 | 1534.65 | 0.144 | 0.935 | 37.83 | 1535.60 | 0.926 | 1560.02 | 25.37 | S2 | 0.922 | 3.509 | 6.89 | 7.27 | No | 0.0204 | 4.0137 | 0.0000 | 0.0000 |
| 667.890 | 1534.01 | 0.151 | 0.934 | 37.88 | 1534.95 | 0.880 | 1559.40 | 25.39 | S2 | 0.910 | 3.506 | 6.91 | 7.28 | No | 0.0204 | 4.0258 | 0.0000 | 0.0000 |
| 688.420 | 1530.79 | 0.173 | 0.926 | 38.20 | 1531.72 | 0.802 | 1556.52 | 25.73 | S2 | 0.871 | 3.505 | 7.00 | 7.38 | No | 0.0204 | 4.1100 | 0.0000 | 0.0000 |
| 692.890 | 1529.94 | 0.192 | 0.924 | 38.30 | 1530.88 | 0.882 | 1555.88 | 25.93 | S2 | 0.842 | 3.516 | 7.02 | 7.43 | No | 0.0204 | 4.1343 | 0.0000 | 0.0000 |
| 713.420 | 1525.92 | 0.205 | 0.906 | 39.08 | 1526.84 | 0.824 | 1552.83 | 26.91 | S2 | 0.825 | 3.516 | 7.24 | 7.66 | No | 0.0205 | 4.3493 | 0.0000 | 0.0000 |
| 717.890 | 1524.96 | 0.216 | 0.902 | 39.24 | 1525.88 | 0.869 | 1552.13 | 27.18 | S2 | 0.812 | 3.523 | 7.28 | 7.73 | No | 0.0205 | 4.3831 | 0.0000 | 0.0000 |
| 738.420 | 1520.49 | 0.217 | 0.882 | 40.11 | 1521.39 | 0.866 | 1548.83 | 28.34 | S2 | 0.811 | 3.525 | 7.52 | 7.98 | No | 0.0206 | 4.6244 | 0.0000 | 0.0000 |
| 763.420 | 1515.09 | 0.219 | 0.446 | 39.64 | 1515.54 | 0.428 | 1542.35 | 27.27 | S3 | 0.514 | 2.220 | 10.46 | 11.10 | No | 0.0240 | 6.1329 | 0.0000 | 0.0000 |
| 772.800 | 1513.00 | 0.111 | 0.460 | 38.50 | 1513.46 | 0.915 | 1539.23 | 26.23 | S3 | 0.632 | 2.240 | 10.01 | 10.58 | No | 0.0241 | 5.1178 | 0.0000 | 0.0000 |
| 785.300 | 1513.00 | 0.000 | 0.491 | 36.07 | 1513.49 | 0.491 | 1535.71 | 22.71 | H3 | 0.000 | 2.203 | 9.08 | 9.52 | No | 0.0238 | 4.3480 | 0.0000 | 0.0000 |
| 788.420 | 1513.00 | 0.000 | 0.499 | 35.43 | 1513.50 | 0.499 | 1534.94 | 21.94 | H3 | 0.000 | 2.203 | 8.84 | 9.27 | No | 0.0237 | 4.2001 | 0.0000 | 0.0000 |

# AERATED FLOW PROPERTIES

| | Lake Petit Spillway | | | | | |
|---|---|---|---|---|---|---|
| $Q$ | $Y_o$ | Rugosity | Manning's $n$ | Inception Length, $L_i$ | Inception Station | Inception Depth, $Y_i$ |
| ft³/s | ft | ft | - | ft | ft | ft |
| 530.80 | 2.580 | 0.0032808 | 0.0134 | 89.834 | 174.435 | 0.758 |

Compute Flow Profile & Cavitation Properties

| Station | Spillway Chute Invert Elev. | Slope | Depth | Velocity | Boundary Layer Thickness | $X^*/Y_i$ | $X/L_i$ | Entrained air, $C_e$ | Total Air (entrained + Entrapped) $C_{e+E,98}$ | Bulked Depth$_{98}$ | Friction Factor, $f$ | ***USBR Small Dams*** **suggested freeboard** | Training Wall Elev. | Bulked Depth$_{98}$ Elev. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft | ft | ft/ft | ft | ft/s | ft | - | - | - | - | ft | - | ft | ft | ft |
| 90.360 | 1632.69 | 0.472 | 2.580 | 13.72 | 0.029 | | | 0.000 | 0.00 | 2.580 | 0.0170 | 2.470 | 1638.270 | 1635.538 |
| 97.860 | 1629.70 | 0.314 | 1.798 | 19.68 | 0.113 | | | 0.000 | 0.00 | 1.798 | 0.0181 | 2.598 | 1634.308 | 1631.585 |
| 105.360 | 1627.98 | 0.188 | 1.588 | 22.29 | 0.185 | | | 0.000 | 0.00 | 1.588 | 0.0185 | 2.650 | 1632.291 | 1629.594 |
| 107.490 | 1627.67 | 0.156 | 1.507 | 23.48 | 0.204 | | | 0.000 | 0.00 | 1.507 | 0.0187 | 2.673 | 1631.900 | 1629.194 |
| 113.420 | 1626.68 | 0.190 | 1.433 | 24.70 | 0.256 | | | 0.000 | 0.00 | 1.433 | 0.0189 | 2.696 | 1630.881 | 1628.136 |
| 119.990 | 1625.27 | 0.249 | 1.349 | 26.23 | 0.313 | | | 0.000 | 0.00 | 1.349 | 0.0191 | 2.725 | 1629.471 | 1626.663 |
| 132.490 | 1621.71 | 0.308 | 1.197 | 29.58 | 0.420 | | | 0.000 | 0.00 | 1.197 | 0.0196 | 2.785 | 1625.879 | 1622.965 |
| 138.420 | 1619.75 | 0.331 | 1.139 | 31.06 | 0.469 | | | 0.000 | 0.00 | 1.139 | 0.0198 | 2.811 | 1623.910 | 1620.948 |
| 149.500 | 1616.08 | 0.325 | 1.053 | 33.61 | 0.560 | | | 0.000 | 0.00 | 1.053 | 0.0201 | 2.855 | 1620.187 | 1617.185 |
| 163.420 | 1611.63 | 0.308 | 0.982 | 36.05 | 0.671 | | | 0.000 | 0.00 | 0.982 | 0.0204 | 2.896 | 1615.690 | 1612.660 |
| 174.500 | 1608.34 | 0.286 | 0.951 | 37.20 | 0.757 | 0.1 | 1.00 | 0.000 | 0.23 | 1.228 | 0.0205 | 2.915 | 1612.360 | 1609.616 |
| 188.420 | 1604.50 | 0.265 | 0.928 | 38.14 | 0.862 | 19.1 | 1.16 | 0.014 | 0.24 | 1.217 | 0.0206 | 2.930 | 1608.494 | 1605.762 |
| 199.500 | 1601.69 | 0.249 | 0.911 | 38.82 | 0.910 | 34.2 | 1.29 | 0.021 | 0.25 | 1.216 | 0.0206 | 2.941 | 1605.663 | 1602.946 |
| 213.420 | 1598.30 | 0.244 | 0.890 | 39.75 | 0.890 | 53.2 | 1.45 | 0.030 | 0.26 | 1.203 | 0.0207 | 2.956 | 1602.255 | 1599.534 |
| 227.150 | 1594.95 | 0.239 | 0.874 | 40.48 | 0.874 | 71.8 | 1.61 | 0.036 | 0.27 | 1.190 | 0.0207 | 2.968 | 1598.897 | 1596.171 |
| 238.420 | 1592.32 | 0.222 | 0.865 | 40.92 | 0.865 | 87.1 | 1.73 | 0.036 | 0.27 | 1.179 | 0.0208 | 2.975 | 1596.248 | 1593.522 |
| 252.150 | 1589.43 | 0.198 | 0.859 | 41.21 | 0.859 | 105.6 | 1.89 | 0.035 | 0.27 | 1.168 | 0.0208 | 2.979 | 1593.344 | 1590.622 |
| 263.420 | 1587.33 | 0.175 | 0.858 | 41.25 | 0.858 | 120.7 | 2.02 | 0.032 | 0.26 | 1.162 | 0.0209 | 2.980 | 1591.222 | 1588.506 |
| 277.150 | 1585.08 | 0.157 | 0.861 | 41.11 | 0.861 | 139.1 | 2.17 | 0.030 | 0.26 | 1.163 | 0.0208 | 2.978 | 1588.968 | 1586.260 |
| 288.420 | 1583.39 | 0.151 | 0.865 | 40.92 | 0.865 | 154.1 | 2.30 | 0.030 | 0.26 | 1.168 | 0.0208 | 2.975 | 1587.269 | 1584.567 |
| 313.420 | 1579.62 | 0.151 | 0.874 | 40.50 | 0.874 | 187.5 | 2.58 | 0.032 | 0.26 | 1.184 | 0.0208 | 2.968 | 1583.507 | 1580.819 |
| 324.560 | 1577.95 | 0.148 | 0.878 | 40.32 | 0.878 | 202.4 | 2.71 | 0.032 | 0.26 | 1.189 | 0.0207 | 2.965 | 1581.829 | 1579.147 |
| 338.420 | 1575.93 | 0.140 | 0.883 | 40.09 | 0.883 | 220.9 | 2.86 | 0.031 | 0.26 | 1.194 | 0.0207 | 2.961 | 1579.816 | 1577.140 |
| 349.560 | 1574.43 | 0.130 | 0.888 | 39.85 | 0.888 | 235.7 | 2.99 | 0.029 | 0.26 | 1.198 | 0.0207 | 2.958 | 1578.306 | 1575.636 |
| 363.420 | 1572.69 | 0.120 | 0.896 | 39.49 | 0.896 | 254.2 | 3.14 | 0.027 | 0.26 | 1.206 | 0.0207 | 2.952 | 1576.566 | 1573.905 |
| 374.560 | 1571.40 | 0.113 | 0.903 | 39.17 | 0.903 | 269.0 | 3.27 | 0.026 | 0.26 | 1.213 | 0.0206 | 2.947 | 1575.278 | 1572.624 |
| 388.420 | 1569.86 | 0.111 | 0.913 | 38.76 | 0.913 | 287.4 | 3.42 | 0.025 | 0.26 | 1.226 | 0.0206 | 2.940 | 1573.740 | 1571.096 |
| 413.420 | 1567.09 | 0.111 | 0.929 | 38.11 | 0.929 | 320.6 | 3.70 | 0.026 | 0.26 | 1.248 | 0.0205 | 2.929 | 1570.967 | 1568.340 |
| 438.420 | 1564.31 | 0.111 | 0.942 | 37.58 | 0.942 | 353.8 | 3.98 | 0.026 | 0.26 | 1.266 | 0.0205 | 2.921 | 1568.193 | 1565.580 |
| 463.420 | 1561.53 | 0.111 | 0.952 | 37.16 | 0.952 | 387.0 | 4.26 | 0.026 | 0.26 | 1.281 | 0.0204 | 2.914 | 1565.419 | 1562.817 |
| 488.420 | 1558.75 | 0.111 | 0.961 | 36.81 | 0.961 | 420.2 | 4.54 | 0.026 | 0.26 | 1.293 | 0.0204 | 2.908 | 1562.644 | 1560.052 |
| 497.720 | 1557.72 | 0.114 | 0.964 | 36.71 | 0.964 | 432.5 | 4.65 | 0.027 | 0.26 | 1.297 | 0.0203 | 2.907 | 1561.613 | 1559.023 |
| 513.420 | 1555.89 | 0.120 | 0.967 | 36.61 | 0.967 | 453.4 | 4.82 | 0.029 | 0.26 | 1.304 | 0.0203 | 2.905 | 1559.791 | 1557.206 |
| 522.720 | 1554.73 | 0.129 | 0.967 | 36.61 | 0.967 | 465.8 | 4.93 | 0.031 | 0.26 | 1.308 | 0.0203 | 2.905 | 1558.636 | 1556.052 |
| 538.420 | 1552.65 | 0.137 | 0.964 | 36.71 | 0.964 | 486.7 | 5.10 | 0.034 | 0.26 | 1.309 | 0.0203 | 2.907 | 1556.554 | 1553.968 |
| 547.720 | 1551.33 | 0.143 | 0.961 | 36.81 | 0.961 | 499.1 | 5.21 | 0.035 | 0.27 | 1.308 | 0.0203 | 2.908 | 1555.243 | 1552.656 |
| 563.420 | 1549.07 | 0.144 | 0.956 | 37.01 | 0.956 | 520.0 | 5.39 | 0.036 | 0.27 | 1.302 | 0.0203 | 2.912 | 1552.979 | 1550.387 |
| 588.420 | 1545.47 | 0.144 | 0.949 | 37.29 | 0.949 | 553.3 | 5.67 | 0.036 | 0.27 | 1.293 | 0.0204 | 2.916 | 1549.371 | 1546.772 |
| 613.420 | 1541.86 | 0.144 | 0.943 | 37.51 | 0.943 | 586.7 | 5.95 | 0.036 | 0.27 | 1.285 | 0.0204 | 2.920 | 1545.764 | 1543.159 |

# AERATED FLOW PROPERTIES

**Lake Petit Spillway**

Compute Flow Profile & Cavitation Properties

| $Q$ | $Y_o$ | Rugosity | Manning's $n$ | Inception Length, $L_i$ | Inception Station | Inception Depth, $Y_i$ |
|---|---|---|---|---|---|---|
| ft³/s | ft | ft | - | ft | ft | ft |
| 530.80 | 2.580 | 0.0032808 | 0.0134 | 89.834 | 174.435 | 0.758 |

| Station | Spillway Chute Invert Elev. | Slope | Depth | Velocity | Boundary Layer Thickness | $X^*/Y_i$ | $X/L_i$ | Entrained air, $C_e$ | Total Air (entrained + Entrapped) $C_{e+E,98}$ | Bulked $Depth_{98}$ | Friction Factor, $f$ | *USBR Small Dams* suggested freeboard | Training Wall Elev. | Bulked $Depth_{98}$ Elev. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft | ft | ft/ft | ft | ft/s | ft | - | - | - | - | ft | - | ft | ft | ft |
| 638.420 | 1538.26 | 0.144 | 0.939 | 37.69 | 0.939 | 620.0 | 6.23 | 0.036 | 0.27 | 1.279 | 0.0204 | 2.923 | 1542.157 | 1539.548 |
| 663.420 | 1534.65 | 0.144 | 0.935 | 37.83 | 0.935 | 653.4 | 6.51 | 0.036 | 0.27 | 1.274 | 0.0204 | 2.925 | 1538.551 | 1535.939 |
| 667.890 | 1534.01 | 0.151 | 0.934 | 37.88 | 0.934 | 659.3 | 6.56 | 0.038 | 0.27 | 1.276 | 0.0204 | 2.926 | 1537.909 | 1535.296 |
| 688.420 | 1530.79 | 0.173 | 0.926 | 38.20 | 0.926 | 686.8 | 6.79 | 0.045 | 0.27 | 1.277 | 0.0204 | 2.931 | 1534.699 | 1532.081 |
| 692.890 | 1529.94 | 0.192 | 0.924 | 38.30 | 0.924 | 692.8 | 6.84 | 0.052 | 0.28 | 1.286 | 0.0204 | 2.933 | 1533.869 | 1531.252 |
| 713.420 | 1525.92 | 0.205 | 0.906 | 39.08 | 0.906 | 720.4 | 7.08 | 0.056 | 0.29 | 1.269 | 0.0205 | 2.945 | 1529.847 | 1527.211 |
| 717.890 | 1524.96 | 0.216 | 0.902 | 39.24 | 0.902 | 726.4 | 7.13 | 0.060 | 0.29 | 1.271 | 0.0205 | 2.948 | 1528.896 | 1526.258 |
| 738.420 | 1520.49 | 0.217 | 0.882 | 40.11 | 0.882 | 754.1 | 7.36 | 0.061 | 0.29 | 1.244 | 0.0206 | 2.962 | 1524.420 | 1521.760 |
| 763.420 | 1515.09 | 0.219 | 0.446 | 39.64 | 0.446 | 787.9 | 7.64 | 0.062 | 0.29 | 0.630 | 0.0240 | 2.757 | 1518.365 | 1515.730 |
| 772.800 | 1513.00 | 0.111 | 0.460 | 38.50 | 0.459 | 800.6 | 7.75 | 0.027 | 0.26 | 0.618 | 0.0241 | 2.743 | 1516.222 | 1513.622 |
| 785.300 | 1513.00 | 0.000 | 0.491 | 36.07 | 0.490 | 817.1 | 7.89 | 0.003 | 0.23 | 0.639 | 0.0238 | 2.711 | 1516.202 | 1513.639 |
| 788.420 | 1513.00 | 0.000 | 0.499 | 35.43 | 0.499 | 821.2 | 7.93 | 0.003 | 0.23 | 0.651 | 0.0237 | 2.703 | 1516.202 | 1513.651 |

# COMPUTED FLOW PROFILE - CAVITATION PROPERTIES

**Lake Petit Spillway**

Compute Flow Profile & Cavitat

| Q | $Y_o$ | Rugosity | Manning's *n* |
|---|---|---|---|
| ft³/s | ft | ft | - |
| 530.8 | 2.58 | 0.0032808 | 0.013443462 |

**DAMAGE POTENTIAL**

| Station | Flow Sigma, σ | Sigma of Uniform Roughness | Required Chamfer to Stop Cavitation | Circular Arc 1/4-in (5-mm) | Circular Arc 1/2-in (12.5-mm) | Circular Arc 1-in (25-mm) | 90° Offset 1/4-in (5-mm) | 90° Offset 1/2-in (12.5-mm) | 90° Offset 1-in (25-mm) | Turbulence Intensity | Stream Power | Bottom Air, $C_b$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft | - | - | n : 1 | - | - | - | - | - | - | - | kW/m2 | - |
| 90.360 | 11.601 | 0.068 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.062 | 0.21 | 0.000 |
| 97.860 | 5.601 | 0.072 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.048 | 0.61 | 0.000 |
| 105.360 | 4.345 | 0.074 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.044 | 0.88 | 0.000 |
| 107.490 | 3.845 | 0.075 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.044 | 1.04 | 0.000 |
| 113.420 | 3.459 | 0.076 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.042 | 1.21 | 0.000 |
| 119.990 | 3.058 | 0.076 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.041 | 1.45 | 0.000 |
| 132.490 | 2.397 | 0.078 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.039 | 2.09 | 0.000 |
| 138.420 | 2.179 | 0.079 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.039 | 2.43 | 0.000 |
| 149.500 | 1.857 | 0.080 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.038 | 3.11 | 0.000 |
| 163.420 | 1.614 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.037 | 3.86 | 0.000 |
| 174.500 | 1.514 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.24 | 0.000 |
| 188.420 | 1.440 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.57 | 0.000 |
| 199.500 | 1.387 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.82 | 0.001 |
| 213.420 | 1.322 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.18 | 0.001 |
| 227.150 | 1.275 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.48 | 0.002 |
| 238.420 | 1.250 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.66 | 0.002 |
| 252.150 | 1.232 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.79 | 0.002 |
| 263.420 | 1.230 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.81 | 0.002 |
| 277.15 | 1.237 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.75 | 0.001 |
| 288.42 | 1.247 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.67 | 0.001 |
| 313.42 | 1.273 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.49 | 0.002 |
| 324.56 | 1.285 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.42 | 0.002 |
| 338.42 | 1.301 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.32 | 0.001 |
| 349.56 | 1.317 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.22 | 0.001 |
| 363.42 | 1.341 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.08 | 0.001 |
| 374.56 | 1.363 | 0.083 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.95 | 0.001 |

# COMPUTED FLOW PROFILE - CAVITATION PROPERTIES

**Lake Petit Spillway**

Compute Flow Profile & Cavitat

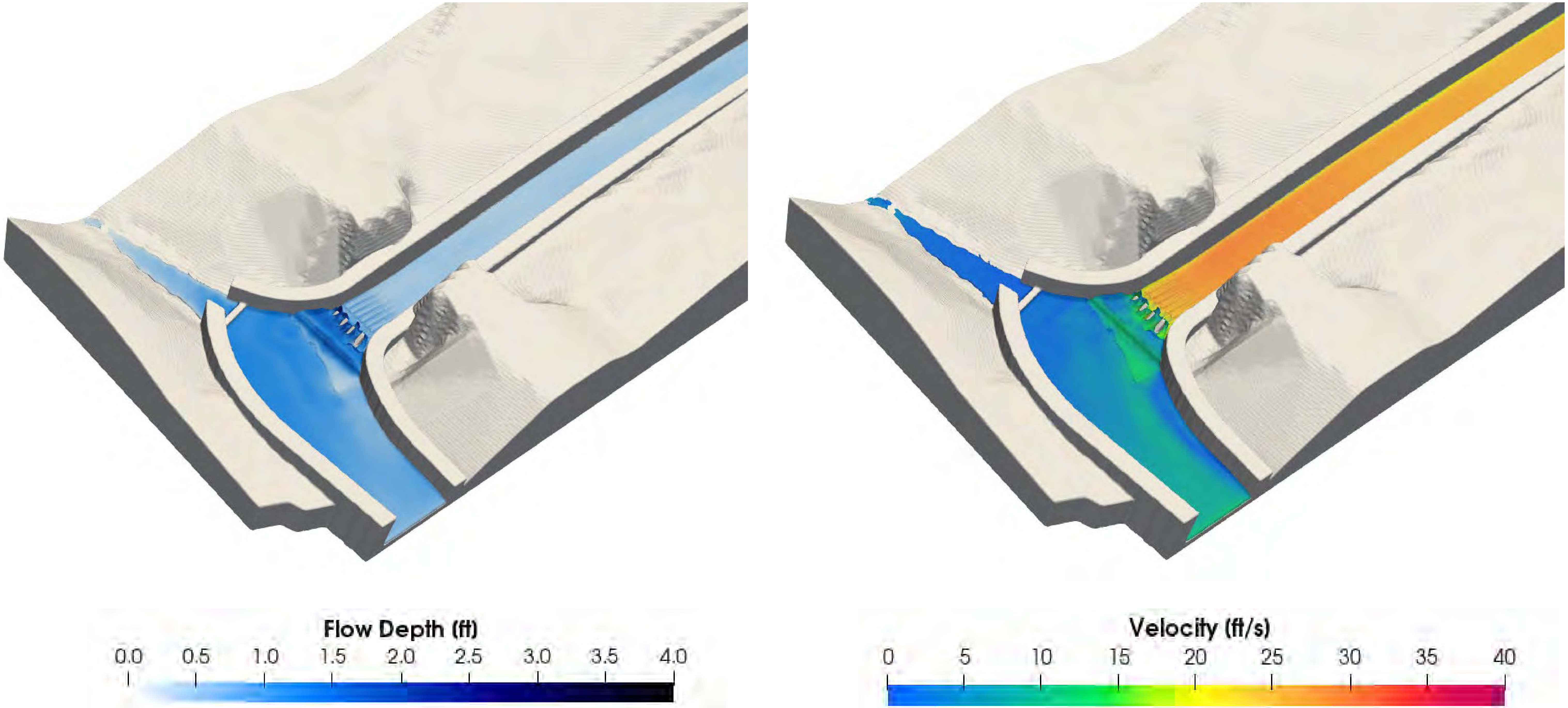
| ***Q*** | ***Y*** $_o$ | **Rugosity** | **Manning's *n*** |
|---|---|---|---|
| ft³/s | ft | ft | - |
| 530.8 | 2.58 | 0.0032808 | 0.013443462 |

**DAMAGE POTENTIAL**

| Station | Flow Sigma, σ | Sigma of Uniform Roughness | Required Chamfer to Stop Cavitation | Circular Arc 1/4-in (5-mm) | Circular Arc 1/2-in (12.5-mm) | Circular Arc 1-in (25-mm) | 90° Offset 1/4-in (5-mm) | 90° Offset 1/2-in (12.5-mm) | 90° Offset 1-in (25-mm) | Turbulence Intensity | Stream Power | Bottom Air, $C_b$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ft | - | - | n : 1 | - | - | - | - | - | - | - | kW/m2 | - |
| 388.42 | 1.392 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.80 | 0.001 |
| 413.42 | 1.440 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.55 | 0.001 |
| 438.42 | 1.481 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.36 | 0.001 |
| 463.42 | 1.516 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.20 | 0.001 |
| 488.42 | 1.545 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.08 | 0.001 |
| 497.72 | 1.553 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.05 | 0.001 |
| 513.42 | 1.561 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.01 | 0.001 |
| 522.72 | 1.561 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.0 | 0.001 |
| 538.42 | 1.552 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.0 | 0.002 |
| 547.72 | 1.544 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.1 | 0.002 |
| 563.42 | 1.528 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.1 | 0.002 |
| 588.42 | 1.505 | 0.081 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.2 | 0.002 |
| 613.42 | 1.487 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.3 | 0.002 |
| 638.42 | 1.473 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.4 | 0.002 |
| 663.42 | 1.462 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.4 | 0.002 |
| 667.89 | 1.455 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.5 | 0.002 |
| 688.42 | 1.428 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.6 | 0.003 |
| 692.89 | 1.424 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.035 | 4.6 | 0.004 |
| 713.42 | 1.365 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.9 | 0.005 |
| 717.89 | 1.356 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 4.9 | 0.006 |
| 738.42 | 1.298 | 0.082 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.036 | 5.3 | 0.006 |
| 763.42 | 1.311 | 0.096 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.039 | 5.5 | 0.006 |
| 772.80 | 1.411 | 0.096 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.039 | 5.0 | 0.001 |
| 785.30 | 1.586 | 0.095 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.038 | 4.1 | 0.000 |
| 788.42 | 1.644 | 0.095 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.038 | 3.9 | 0.000 |

**ATTACHMENT 3**

**Flow-3D – Lake Petit Dam Proposed Spillway Chute and Stilling Basin**



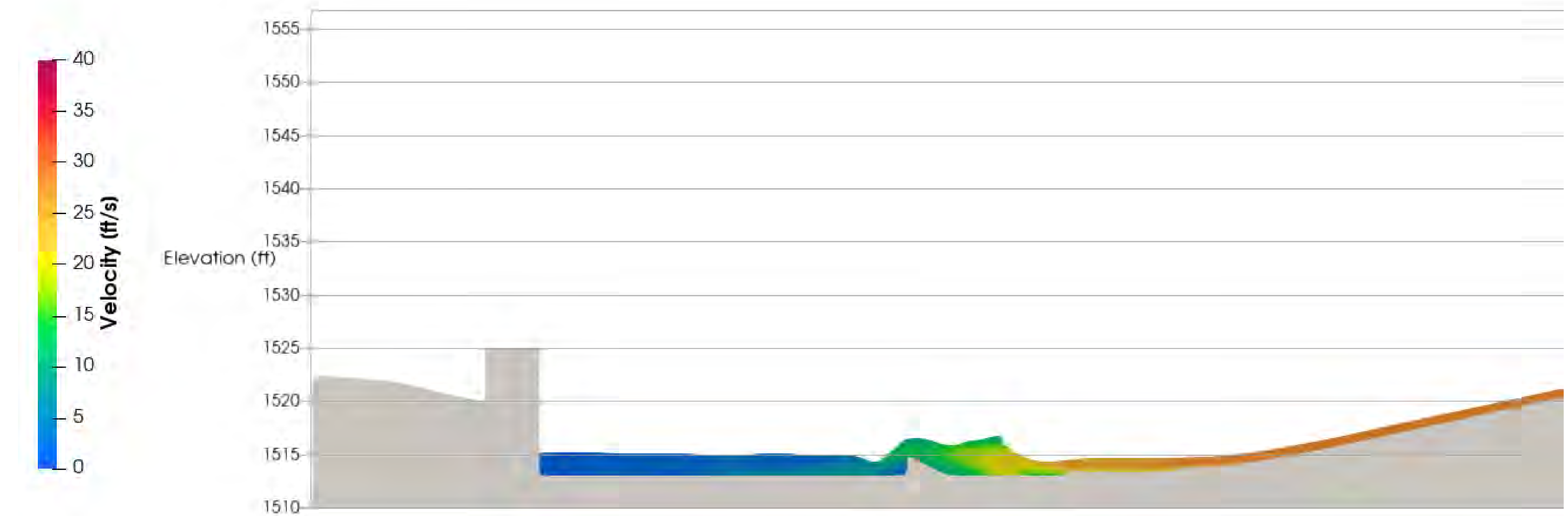

**Stilling Basin Flow Depth and Velocity (250 cfs)**

Lake Petit Dam
Big Canoe

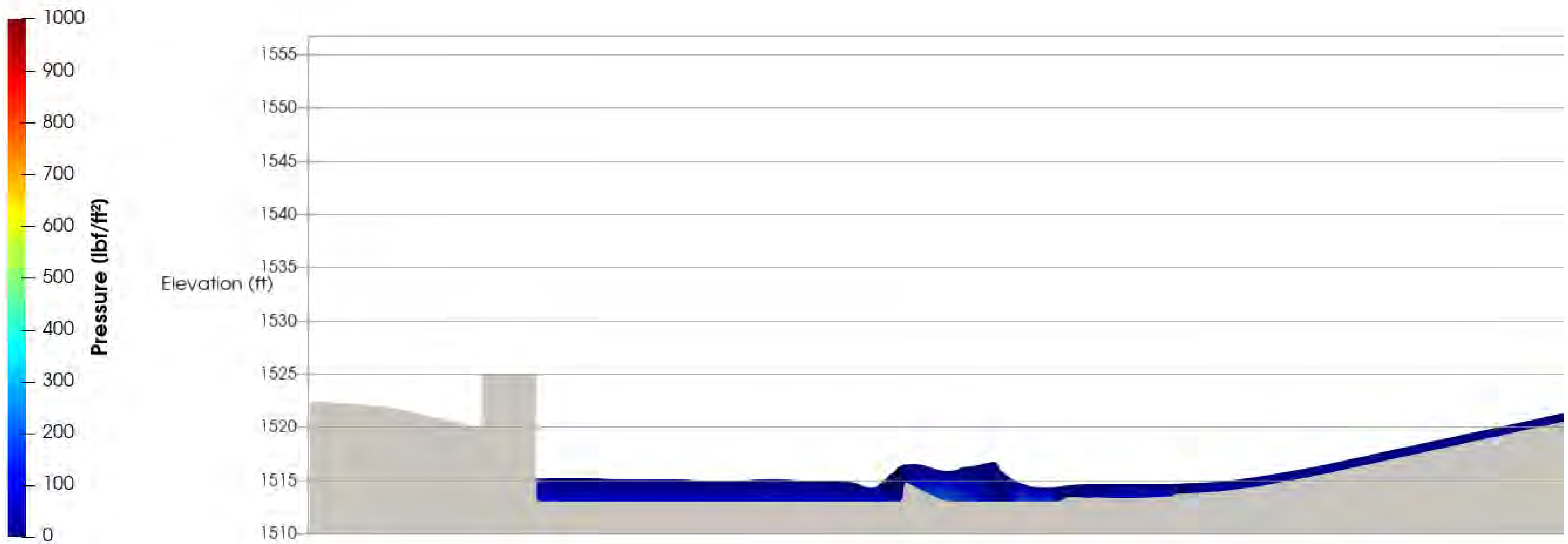
Geosyntec consultants

Project No.: TJD10771 | October 2024

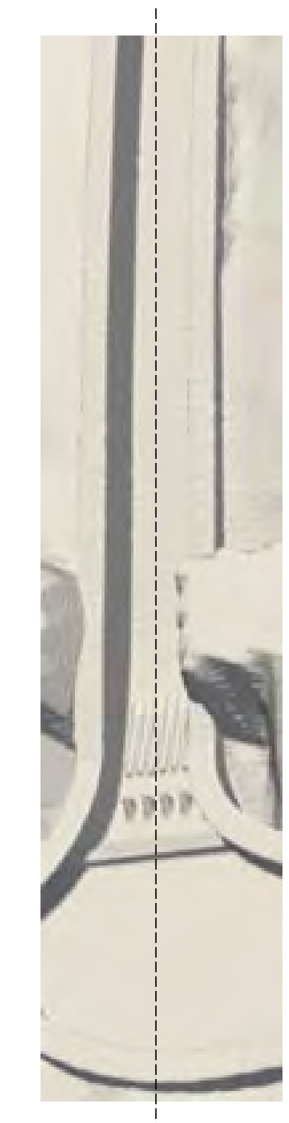
**Figure** 1




(a) Velocity




(b) Pressure



Profile 1
Centerline between force blocks

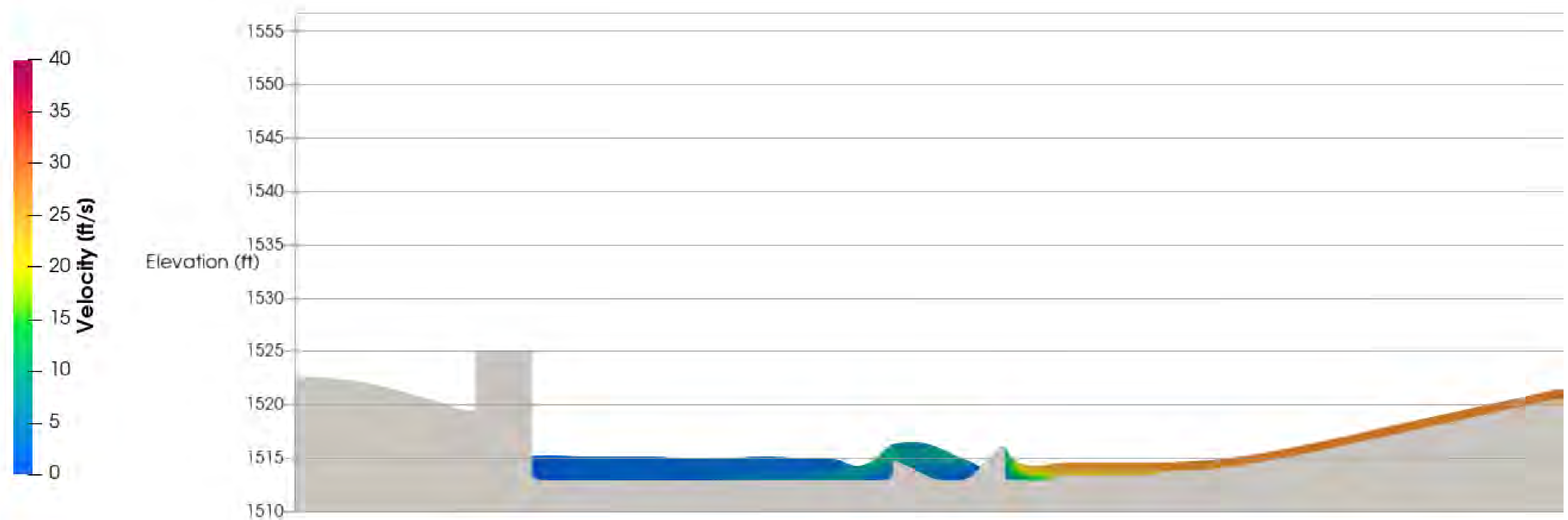
**Stilling Basin Results along Profile 1 (250 cfs)**

Lake Petit Dam
Big Canoe

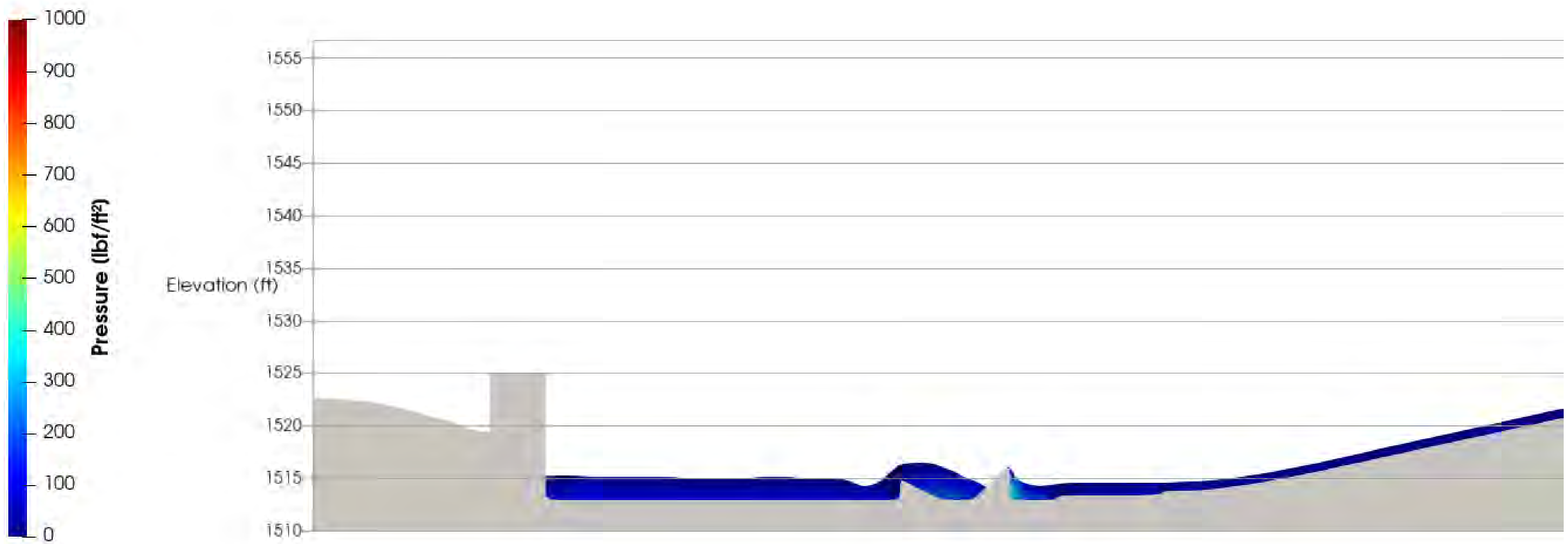
Geosyntec consultants

Project No.: TJD10771 | October 2024

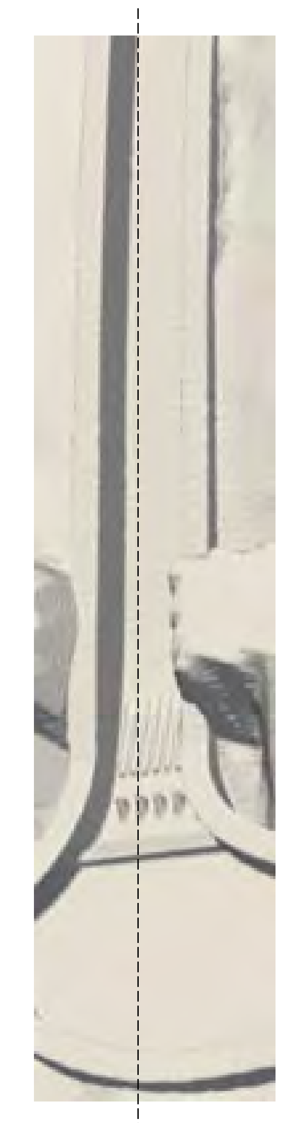
**Figure**
2




(a) Velocity

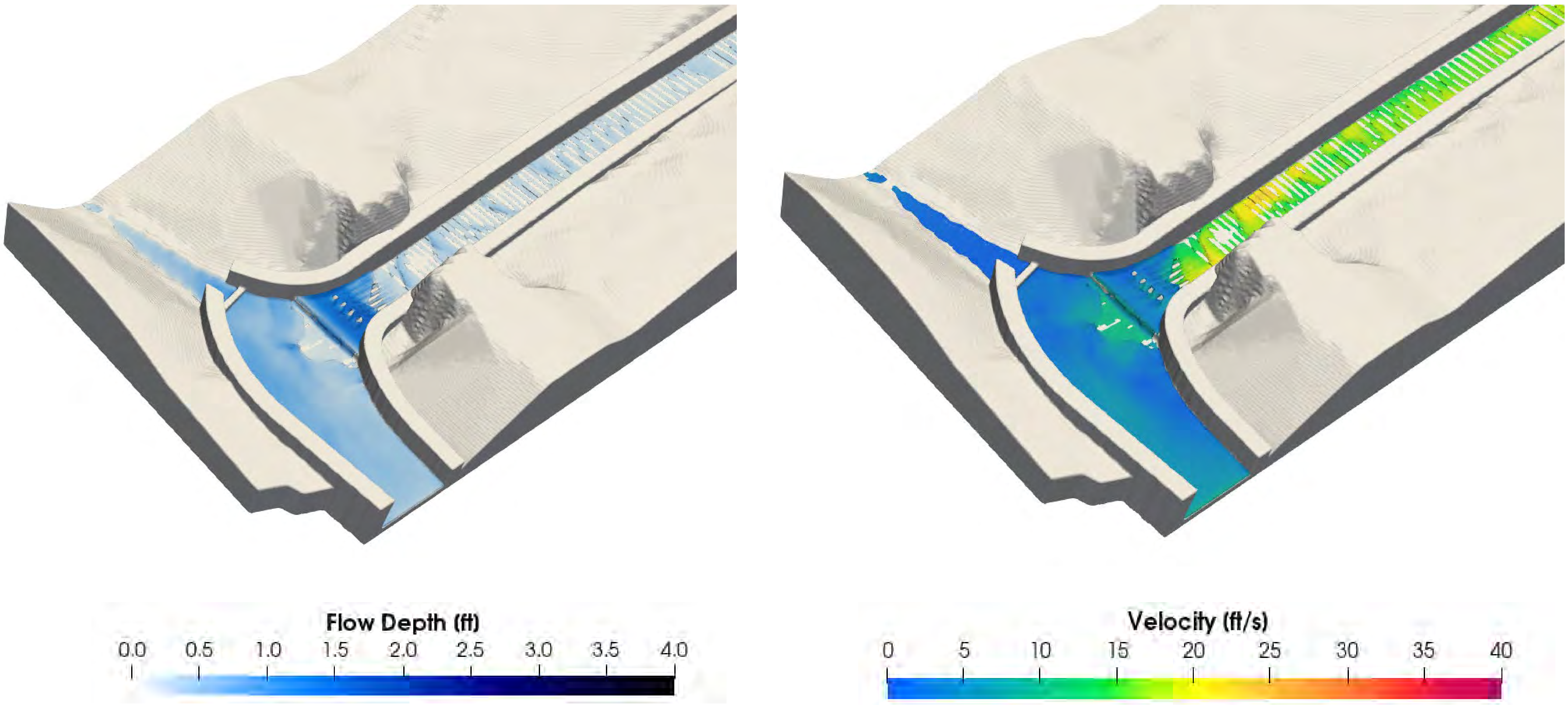



(b) Pressure



Profile 2
Through center-right force block

| | |
|---|---|
| **Stilling Basin Results along Profile 2 (250 cfs)** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure** 3 |
| Project No.: TJD10771 | October 2024 |




| | | |
|---|---|---|
| **Stilling Basin Flow Depth and Velocity (100 cfs)** | | |
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | **Figure**<br>4 |
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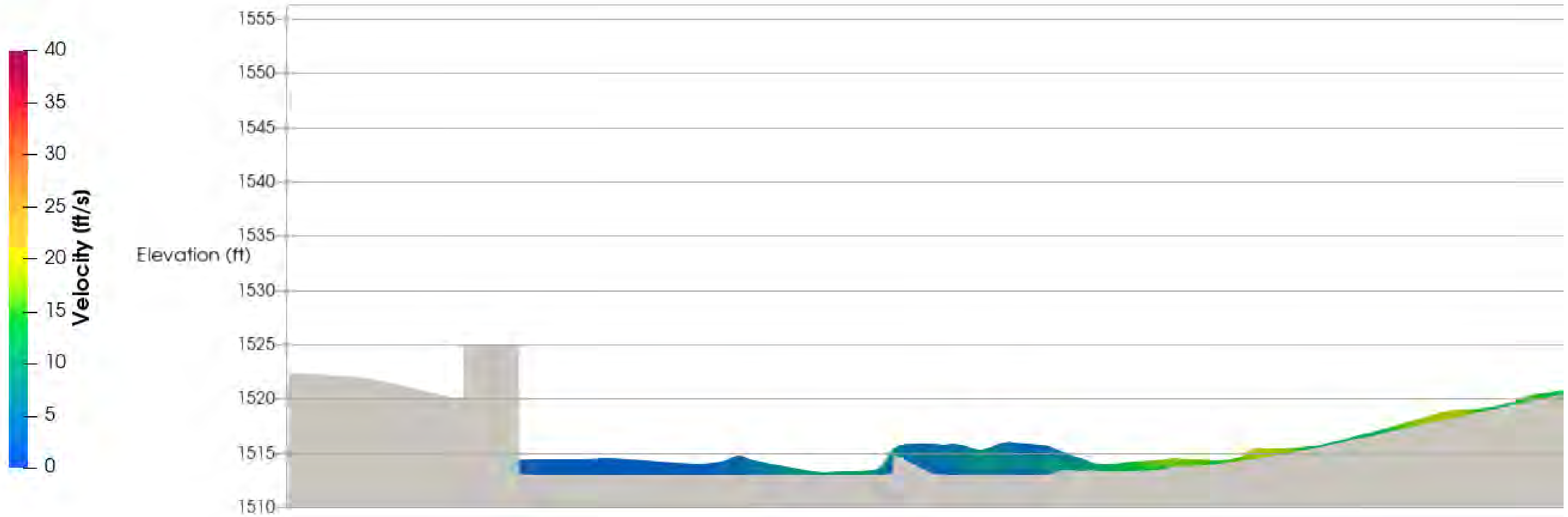
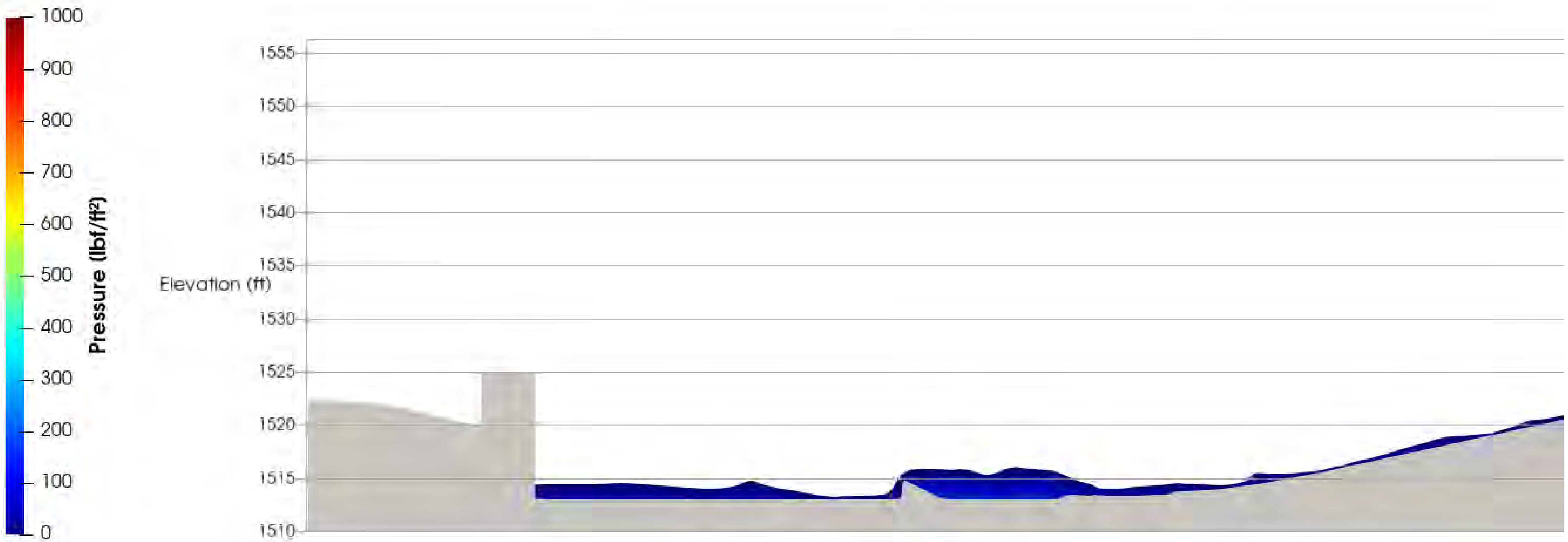
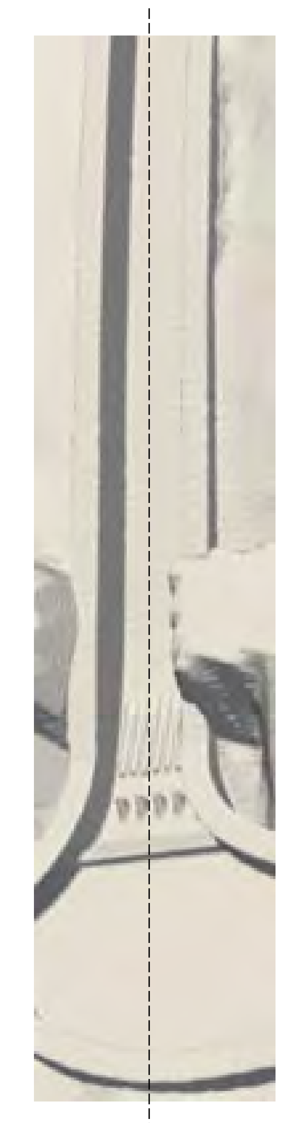



(a) Velocity




(b) Pressure



Profile 1
Centerline between force blocks

| Stilling Basin Results along Profile 1 (100 cfs) | | |
|---|---|---|
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | Figure 5 |
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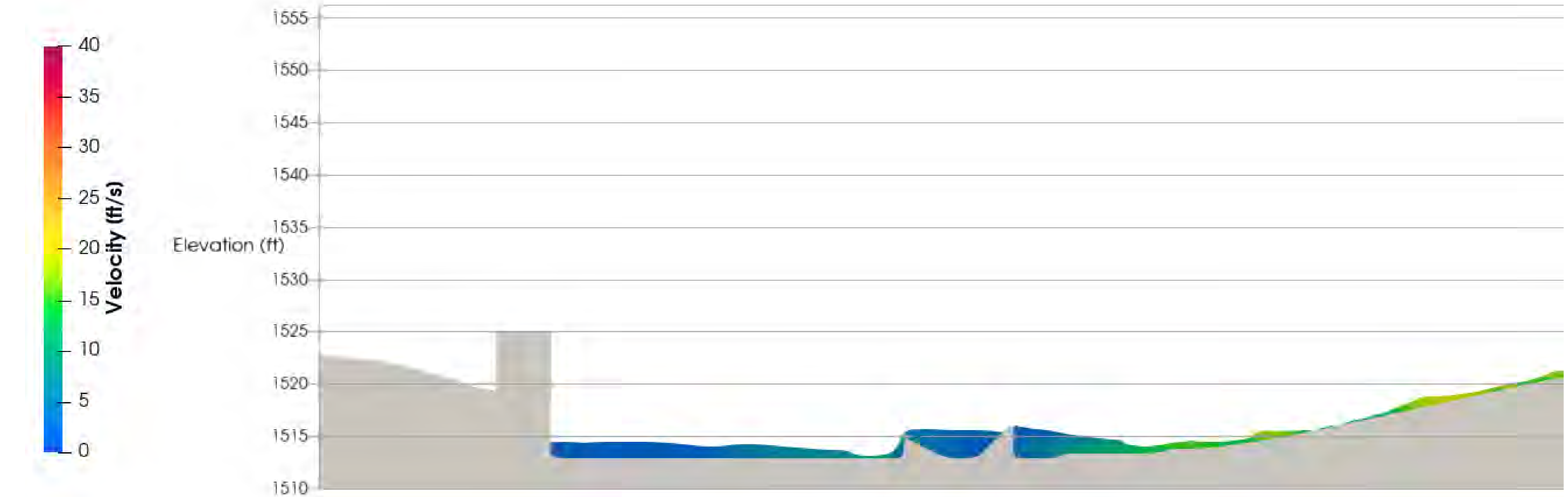


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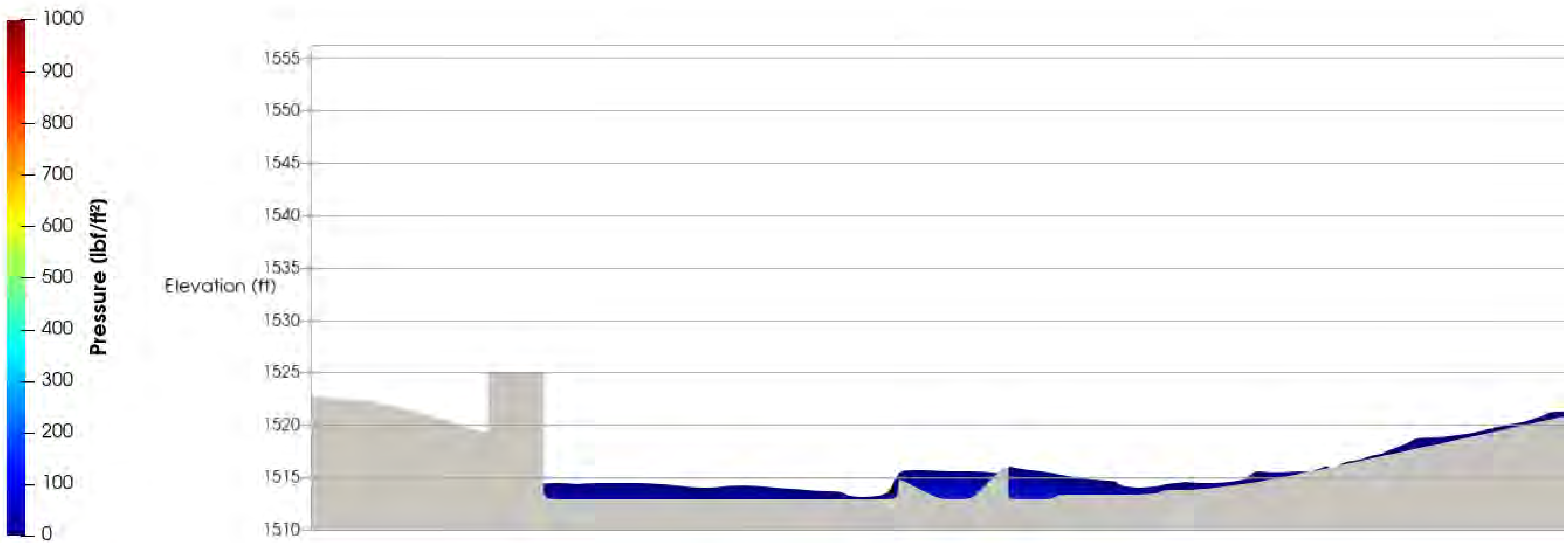
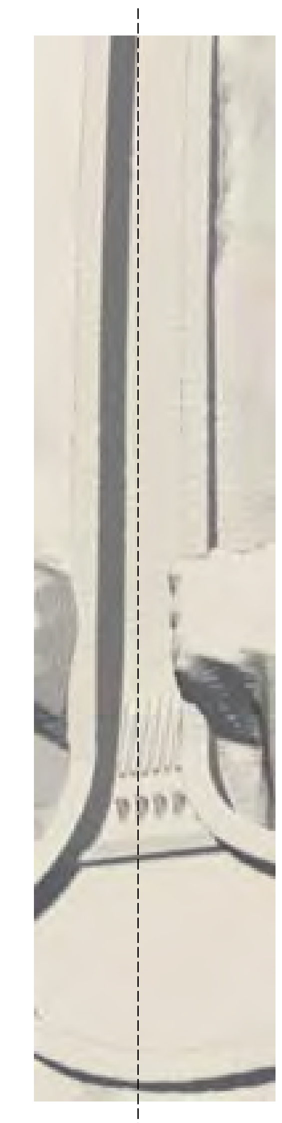



(b) Pressure



Profile 2
Through center-right force block

| Stilling Basin Results along Profile 2 (100 cfs) | |
|---|---|
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | Figure<br>6 |
| Project No.: TJD10771 | October 2024 |

# LAKE PETIT DAM

## Pickens County, Georgia

## State ID No. 112-009-00462

## NID No. GA00685

## Structural Design of Spillway for Lake Petit Dam
## Calculation Package
## Revision 0

*Prepared for:*

**Big Canoe® Property Owners Association, Inc.**
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*Prepared by:*

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Johnson City, TN 37604

Project No: TJD10771

Document No: GA240353

February 2025

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Geosyntec consultants

# CALCULATION PACKAGE COVER SHEET

**Client:** Big Canoe Property Owners Association **Project:** Spillway Design of Lake Petit Dam

**Project No.:** TJD10771 **Task #:** 04/01

**TITLE OF COMPUTATION** Structural Design of Spillway for Lake Petit Dam

**COMPUTATIONS BY:**
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12/27/2024
DATE

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(PM or Designate)

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05/22/2024
DATE

Printed Name and Title: John W. Barrett, P.E. (GA)
Principal Engineer

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### LIST OF FIGURES



### LIST OF ATTACHMENTS

# RECORD OF REVISIONS

| Revision Number & Date | Description of Revision |
|---|---|
| Rev. 0 – 10 February 2025 | Initial Submittal |

# CALCULATION PACKAGE

## 1 PURPOSE AND SCOPE

This Calculation Package (Package) was prepared by Geosyntec Consultants, Inc. (Geosyntec) for the structural design of the chute and stilling basin for the Lake Petit Dam (Dam) that will be installed as part of the maintenance and repair project. The existing stepped spillway will be replaced by a rectangular concrete channel (i.e., 'U'-type) chute. To dissipate the energy of the water at the end of the chute, a Type III U.S. Bureau of Reclamation (USBR, 1984) stilling basin will be constructed which consists of training walls, baffles, and a concrete slab.

The spillway replacement will occur from downstream of the existing control structure to the end of the current spillway under the bridge located at toe of the Dam. No modification of the existing control structure and bridges will occur. A plan view of the proposed chute and stilling basin replacement areas is shown in **Figure 1**.

The specific goals of this Package are to determine minimum dimensions and required reinforcement of the structures (i.e., chute and stilling basin components) required to ensure overall stability and to resist expected loading at the site. The remainder of this Package is organized to present the (i) basis of design, (ii) main assumptions and constraints, (ii) methodology for the analyses performed, (iii) uplift, joint spacing, and structural design considerations, and (iv) analysis of results.

## 2 BASIS OF DESIGN

The proposed chute and stilling basin components were designed in accordance with the American Concrete Institute (ACI) codes, the USBR general outlet works design considerations DS-14 (USBR, 2022), and the U.S. Army Corps of Engineers (USACE) guidelines for hydraulic concrete structures Engineering Manual (EM) 1110-2-2104 (USACE, 2016). The primary purpose of the chute and stilling basin is to convey liquids and retain soil and liquid loads; therefore, structural design was completed based on the minimum standards from ACI 350-06 (2006). The USBR and USACE guidelines were utilized to include more conservative or stricter design standards, when applicable.

The chute and stilling basin components were designed to have strength at all sections at least equal to the required strengths calculated for the factored loads, forces, and moments based on the critical loading conditions. The analyses were carried out considering the following design criteria:

- Shear Strength: the design shear strength provided by the concrete cross-section of the structural elements is sufficient to avoid shear reinforcement and to resist the forces due to the loading conditions (e.g., soil, water, and surcharge).

- Flexural Strength: the structural elements and reinforcement steel provide sufficient bending resistance due to the forces and moments induced by the soil, water, and surcharge.

- Temperature and Shrinkage Reinforcement: the structural elements will have reinforcement for temperature and shrinkage movement that will be sufficient to prevent excessive cracking of the concrete due to temperature changes.

The additional requirements below were evaluated and included in the design:

- Waterstops are incorporated at all joints.

- Concrete strength will not be less than 4,000 pound per square inches (psi).

- Clear cover will not be less than 4 inches (in.).

- Primary flexural reinforcement and temperature and shrinkage reinforcement will not be spaced farther than 12 in.

- Wall thickness will not be less than 12 in.

- A serviceability factor of 1.3 was considered in addition to the load factors as recommended by USBR (2022).

## 3 MAIN ASSUMPTIONS AND CONSTRAINTS

The following main assumptions and constraints were considered in the design:

- The dimensions of the chute were based on a like-to-like replacement. The width of the chute is 15 feet (ft). The height of the chute walls is between 5 and 7 ft. The design was performed for the tallest portion of the chute.
- The dimensions of the Type III stilling basin shown in **Figure 2** were determined using USBR guidelines as presented in the hydrology and hydraulics calculation package for the project (Geosyntec, 2025). Flows depths and velocities in the chute and stilling basin were used from the results of hydraulic modeling (Geosyntec, 2025).

- Structures were designed by conservatively assuming no relief of water pressure (i.e., uplift) provided by the drainage to be installed under and/or adjacent to each structure.
- Earth pressures were calculated assuming that the backfill material around walls will be the same material as the native soil. Native soil was taken to be silty sand based on soil borings completed by Geosyntec (2021) and was assumed to be cohesionless for earth pressure calculations.
- Training walls at the stilling basin were designed similar to a cantilever retaining wall, including the slabs. Similarly, the walls of the chute were designed as a cantilever retaining wall. The slab of the chute was designed as a double fixed-end beam.
- The ground water table (gwt) was conservatively selected to be at the final ground surface to design for maximum uplift.
- The pressure distribution of the upper surface of the concrete slabs due to flowing water is equivalent to the hydrostatic pressure due to the depth of flow (USBR, 2007).
- The hydraulic jump in the stilling basin is expected to occur downstream of the energy dissipators. As such, the baffle blocks were assumed not to be submerged, and the hydrodynamic force from incoming flow was calculated using the expected flow conditions immediately exiting the spillway chute. The end sill and chute blocks of the stilling basin were not designed, and the reinforcement layout was based on best current practice standards.
- Impact, wind, and silt loading were considered negligible within the chute and stilling basin when considering load combinations.
- Overturning and sliding were not evaluated as these conditions are not expected due to the geometry of the chute and stilling basin. Bearing capacity was not evaluated as the structures are compensated due to the removal of the existing structures.
- Epoxy-coated reinforcement was not considered for the structures based on the recommendations from USBR (2022).

# 4 METHODOLOGY

The chute consists of a wall acting similar to a cantilever retaining wall. However, the slab was considered as a double fixed-end beam due to the presence of the walls. Due to the geometric and loading conditions symmetry of the chute, the analyses were performed for only one side wall and the slab. The stilling basin consists of a training wall connected to the floor slab that acts similar to a cantilever retaining wall. To force a hydraulic jump, the slab will have baffles structurally connected to the floor slab.

The loading conditions for each structure are presented in **Figures 3** to **5**. The free-body diagrams show the expected loads that will be applied during the spillway operations. The forces and moments acting on the structure were factored based on the loading conditions as per ACI 350, USBR, and USACE. Load factors for each loading condition were selected based on load type (e.g., dead load, live load, etc.) and anticipated qualitative frequency of the loading event (e.g., usual, unusual, or extreme event), where applicable. The loads were determined with the input parameters summarized in **Table 1**. The structural design of the structures was performed for only the critical loading combination. The critical loading combination for each structure was determined by (i) calculating anticipated unfactored loads; (ii) determining potential loading combinations during normal operating, empty channel, and maximum tailwater conditions; (iii) calculating the resultant factored load for each loading combination; and (iv) selecting the critical loading combination based on the highest resultant factored load.

Based on USBR guidelines, earthquake loads applied to the structures were estimated using the Mononobe-Okabe (M-O) method (1929) using a horizontal seismic coefficient conservatively taken as 0.5 times the Peak Ground Acceleration (PGA) for the 2,500-yr return period at the Dam. When the estimated earthquake loads were applied to the structure, it was determined to not be the critical loading combination and was not used for the design.

Design of the wall sections (i.e., chute and training walls) was performed using the critical load combination as implemented in the Cantilever Wall GEO5 computer software (Geo5), version 2024 (Fine, 2024). This software allows the user to input design characteristics such as cross section geometries of the structure, soil and water profiles, reinforcement size and locations, load factors and combinations, and the applications of additional forces (e.g., construction surcharges, earthquake loads, and active or passive earth pressures) to determine if the selected inputs meet the design criteria. GEO5 is not able to fully model a ‘U’-type channels; however, the chute walls are expected to have similar loading conditions at each side.

To determine the flexural reinforcement in the slabs, a separate set of calculations were performed assuming the slab behave as a cantilever heel in the Stilling Basin and as a double fixed-end beam in the Chute. For simplicity, the upward pressure from the foundation soils is neglected.

The baffle blocks in the stilling basin were designed based on the ACI 318-19 guidelines for corbels and brackets, due to the similar geometry and loading pattern to the trapezoidal baffle blocks.

# 5 UPLIFT CALCULATION

The chute and stilling basin components were checked against uplift. The calculations assumed the worst-case conditions for uplift, where the gwt provides a total head under the structures that could move them upwards (i.e., flotation) when the channel is empty. The uplift calculations were performed to check whether the selected dimensions and geometry of the structures provide enough weight to prevent flotation. For this calculation, the uplift relief benefit contribution from the underdrain systems was not included. Groundwater for the spillway chute and training walls was conservatively assumed to be at the ground surface.

The structures provide sufficient weight with a Factor of Safety larger than 1.1 to prevent flotation of the structures as presented in **Appendix 1**.

# 6 STRUCTURAL DESIGN

The following subsections describe the pertinent geometry and reinforcement details of the final design for each structure. Software outputs and structural calculations for the walls, slabs, and baffles can be found in **Appendix 2**, **Appendix 3**, and **Appendix 4**, respectively.

As per ACI 350 Section 4.2.2, the recommended 28-day compressive strength requirements of the concrete to be used for the structures should be minimum 4,000 psi due to the exposure. Grade 60 steel reinforcement is used for the design. The strength reduction factors per ACI 350 Section 9.3 were selected as 0.90 for flexural and 0.75 for shear calculations. The minimum reinforcement ratio for the flexural elements used in the design is 0.0034 to comply with ACI 350 Section 10.5.1. Based on ACI 350 Table 7.12.2.1, the minimum shrinkage and temperature reinforcement ratio is 0.003 for joints spacing no further than 30 ft.

Additional provisions, such as criteria for concrete mix design, welds, steel tie anchorage, and other similar details will conform to ACI 318-19 and USACE EM 1110-2-2104 where applicable or will be detailed in construction drawings and specifications as needed. The results presented in this Package are valid for the assumptions stated and the loading conditions anticipated based on these assumptions. If assumptions or expected loading conditions change, the structural analyses should be reviewed and revised if necessary to ensure structural members are adequately sized and reinforced to resist loading.

## 6.1 WALL SECTIONS

The output and calculations of forces and moments in the walls and the reinforcement required to resist critical loading are presented in **Appendix 2**.

### 6.1.1 SPILLWAY CHUTE WALLS

Moments were calculated using the tallest portion of the wall at 7 ft. Based on the calculations, walls were designed to be 1.5 ft thick with No. 8 bars at 10-in. spacing at the outer face (i.e., the face in contact with soil). Longitudinal reinforcement and reinforcement in the inner face (i.e., the face in contact with flowing water) for the use of temperature and shrinkage control was designed with No. 5 bars at 10-in. spacing. Reinforcement layouts within the spillway chute cross section can be found in **Figure 6**.

### 6.1.2 STILLING BASIN WALLS

The design was performed for a height of 9 ft. Walls were designed to be 2 ft thick with No. 8 bars at 8-in. spacing at the outer face. Longitudinal reinforcement and reinforcement in the inner face was designed with No. 5 bars at 10-in. spacing. Reinforcement layouts within the stilling basin wall sections can be found in **Figure 7**.

### 6.1.3 TRAINING WALLS

The design for the training wall was performed for a height of 8 ft. Walls were designed to be 1.5 ft thick with outer face reinforcing of No. 8 bars at 8-in. spacing and longitudinal and inner face reinforcement was designed with No. 5 bars at 12-in. spacing. Reinforcement layouts within the training wall sections can be found in **Figure 8**.

## 6.2 SLAB SECTIONS

The output and calculations of forces and moments in the slabs and the reinforcement required to resist critical loading are presented in **Attachment 3**.

### 6.2.1 SPILLWAY CHUTE SLAB

The thickness of the slabs was selected to be 2 ft based on the best practice recommendations from ACI 350-06. The slab was designed with No. 7 bars at 8-in. spacing in the transverse and longitudinal directions for the top and bottom of the slab. Reinforcement layouts within the spillway chute cross section can also be found in **Figure 6**.

#### 6.2.2 STILLING BASIN SLAB

Similarly, the slab at the stilling basin was selected to have a thickness of 2 ft. The slab was determined to meet criteria at 2 ft thick with No. 9 bars at 8-in. spacing in the transverse and longitudinal directions for the top of the slab and No. 10 bars at 9-in. spacing in the transverse and longitudinal directions for the bottom of the slab. Reinforcement layouts within the stilling basin slab can be found in **Figure 9**.

### 6.3 BAFFLE BLOCKS

Calculations to determine the forces and moments in the baffles and the reinforcement required to resist critical loading are presented in **Attachment 4**. The baffles were generally designed to have No. 5 longitudinal framing bars, ties, and closed stirrups in line with the configuration presented for corbel design in ACI 318-19. The reinforcement for the baffles extends into the stilling basin slab and is expected to resist loading in a manner does not require additional slab reinforcement beyond what is specified in the previous section. Reinforcement layouts within the baffle blocks can also be found in **Figure 9**.

### 6.4 JOINTS

In addition, joint spacing was determined for the structures (i.e., slabs and walls) based on the recommendations from ACI 350-06. As per ACI 350 Section 6.4.7, all construction joints shall have an integral waterstop. All construction joints should be internally vibrated at frequent intervals to properly consolidate and densify the concrete at the joint and around the reinforcement.

Slab joints should be 15 to 25 ft apart. According to guidance from ACI 350-06 and general recommendations provided by USACE EM 1110-2-2104 state that joint spacing should be no more than 3 times the structure's wall height. Based on these guidelines, a joint spacing of 20 ft was selected for all structures.

## 7 REINFORCEMENT DETAILS

ACI 350 provides guidance on the minimum development length for deformed bars in tension, development of standard hooks, and splices. **Table 2** presents the reinforcement minimum recommended lengths based on thickness of the structures, a concrete compressive strength of 4,000 psi, a minimum clear cover of 4 in., and a streel yield strength of 60 ksi. These values were obtained from the calculation summarized in **Attachment 5**.

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# TABLES

**Table 1 – Summary of Input Parameters**

| | Input Parameter | Value |
|---|---|---|
| Concrete | Compressive Strength, psi | 4,000 |
| | Unit Weight, pcf | 150 |
| Reinforcing Bar | Yield Strength, psi | 60,000 |
| Soil: Silty Sand | Unit Weight, pcf | 115 |
| | Saturated Unit Weight, pcf | 115 |
| | Friction Angle, deg | 29 |
| | Cohesion[1], psf | 0 |
| Water | Unit Weight, pcf | 62.4 |
| Earthquake | Peak Ground Acceleration, 2,500-year return period | 0.18 |
| Hydraulics | Velocity of Flow Exiting the Chute[2], ft/s | 40 |
| | Minimum Depth of Flow at Chute / Stilling Basin[2], ft | 1 / 1 |
| | Maximum Depth of Flow at Chute / Stilling Basin[2], ft | 4 / 6 |

**Notes:**

1. Assumed to be cohesionless for earth pressure calculations.
2. Determined based on hydraulic analyses (Geosyntec, 2025).

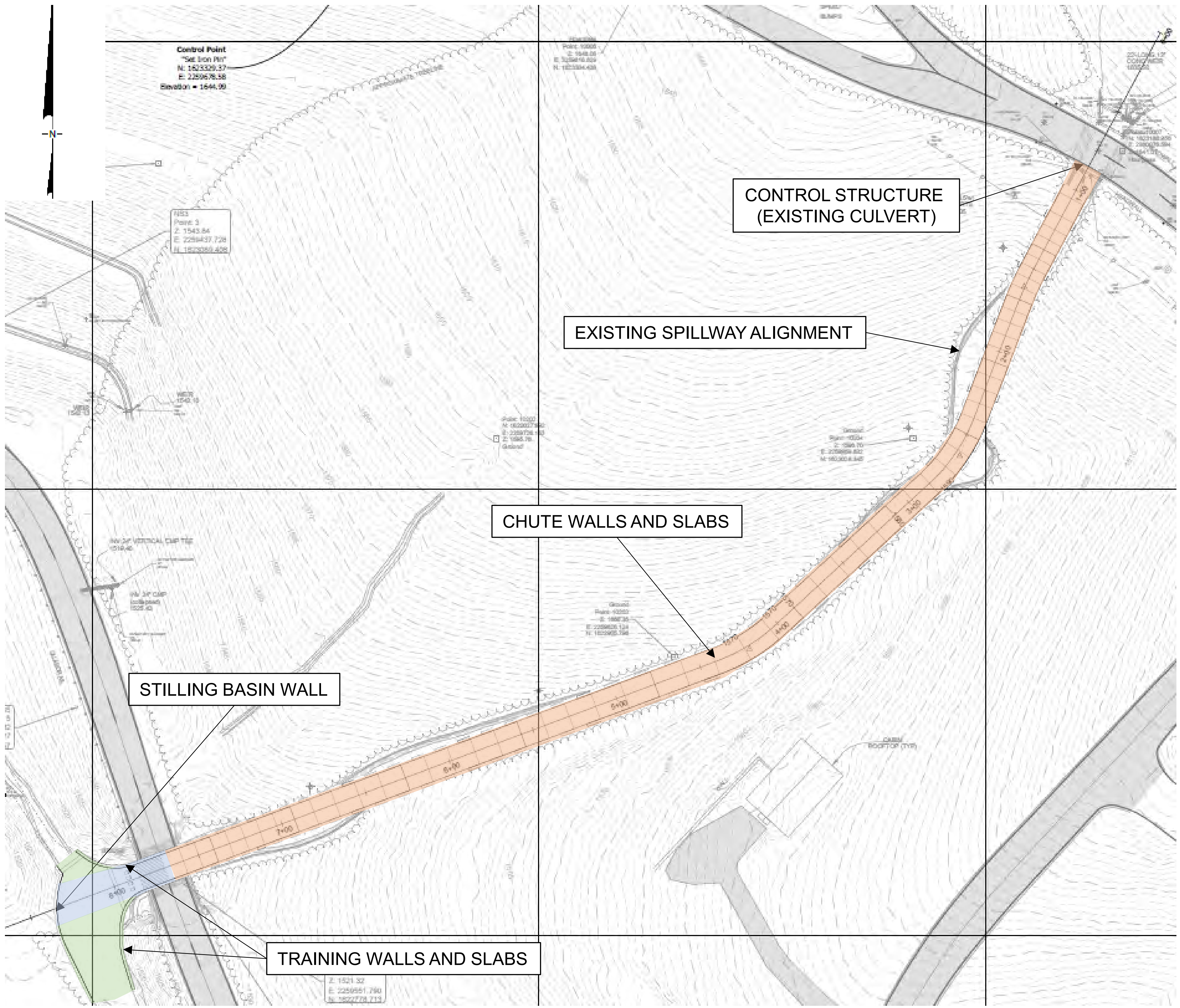
**Table 2 – Reinforcement Development and Splicing Details**

| Bar Size | Hook Length (in.) | Lap Splice Length[1] (in.) | Embedment Length[1] (in.) |
|---|---|---|---|
| #3 | 6 | 19 (25) | 15 (19) |
| #4 | 6 | 25 (33) | 19 (25) |
| #5 | 8 | 31 (41) | 24 (31) |
| #6 | 10 | 37 (49) | 29 (37) |
| #7 | 13 | 44 (57) | 34 (44) |
| #8 | 15 | 50 (65) | 38 (50) |
| #9 | 18 | 56 (73) | 43 (56) |
| #10 | 21 | 62 (81) | 48 (62) |
| #11 | 25 | 68 (89) | 53 (68) |

**Notes:**

1. Use length in parentheses for wall horizontal rebars and slab bars with 12 in. or more of fresh concrete underneath.

**FIGURES**




**Site Plan View**

Lake Petit Dam
Big Canoe

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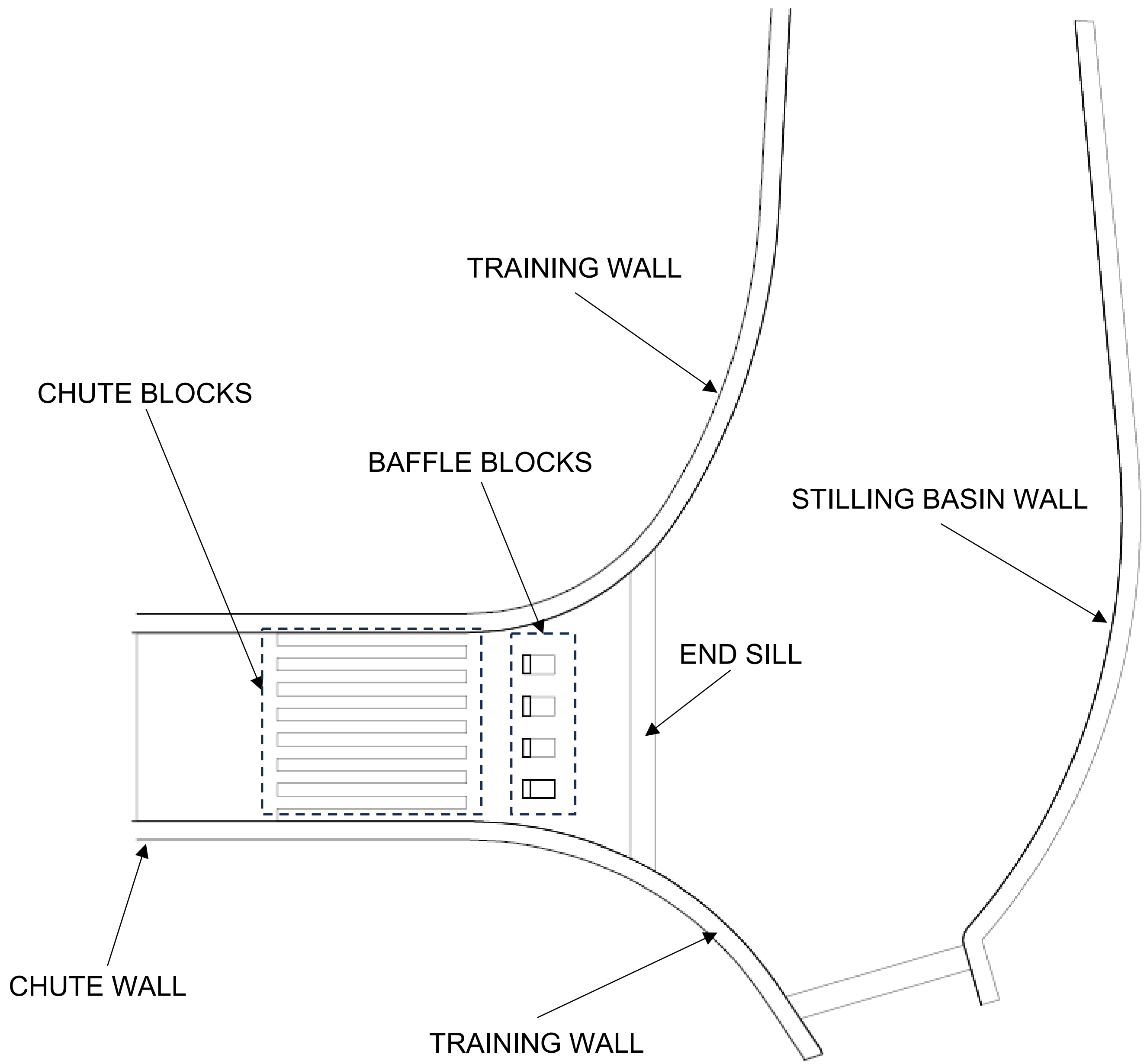
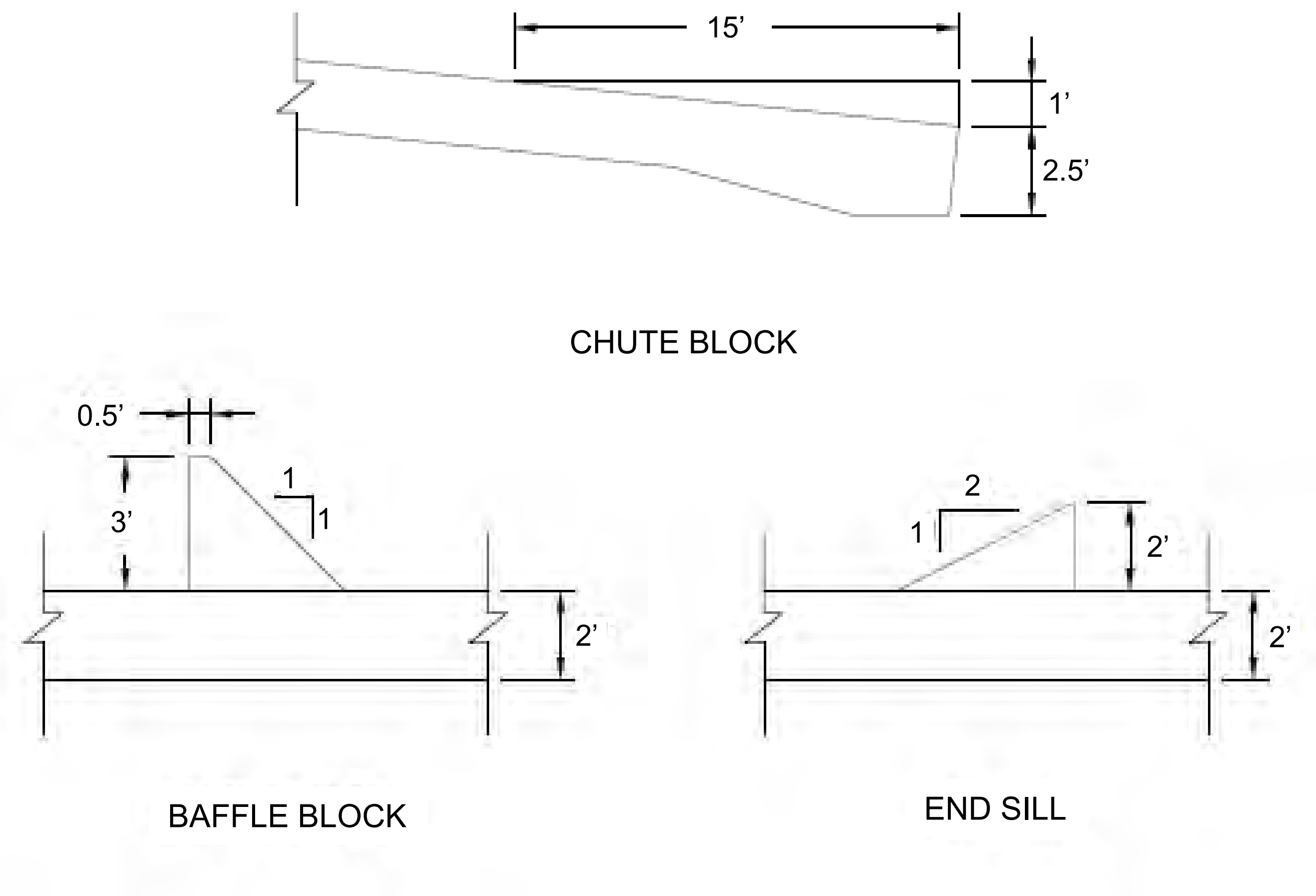
**Figure** 1

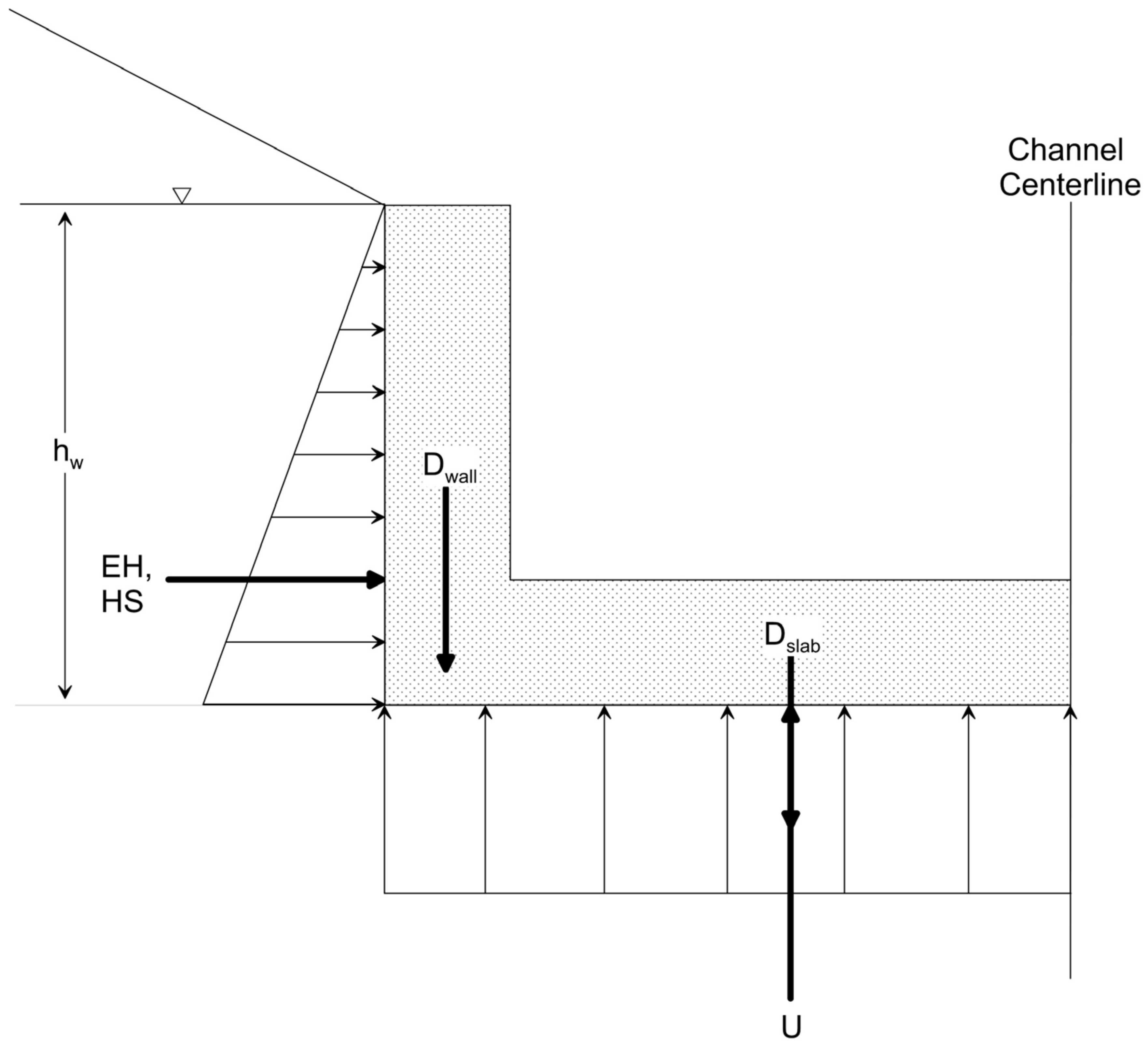



## Stilling Basin – Plan View




## Stilling Basin – Details

| | |
|---|---|
| **Stilling Basin Geometry** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>2 |
| Project No.: TJD10771   February 2025 | |




Note:

- D = dead load; HS = hydrostatic load; U = uplift load; EH = lateral earth pressure load
- Shown for the critical case of an empty channel
- Reinforcement not shown

| | |
|---|---|
| **Wall and Slab Free-Body Diagram** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>3 |
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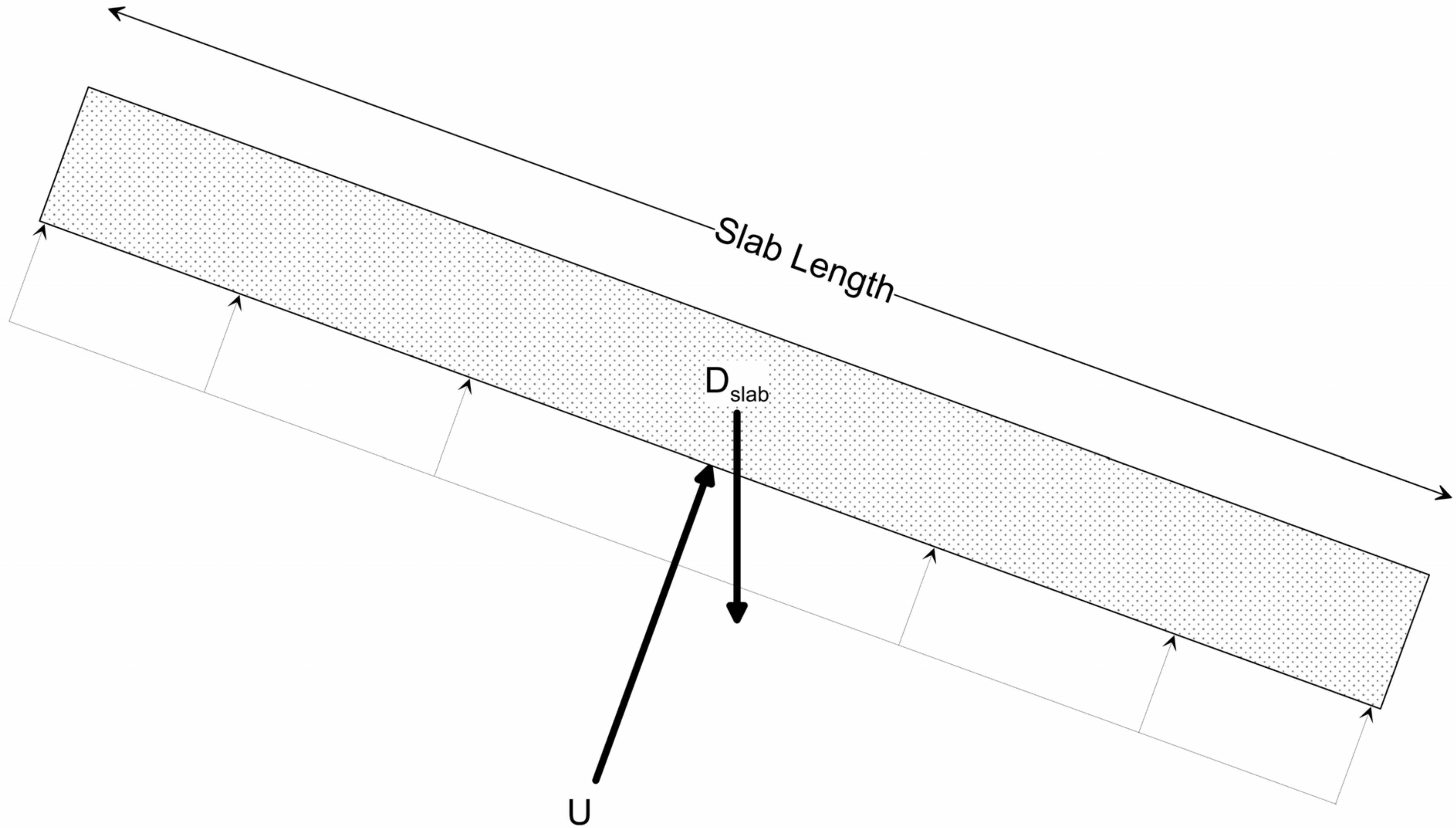
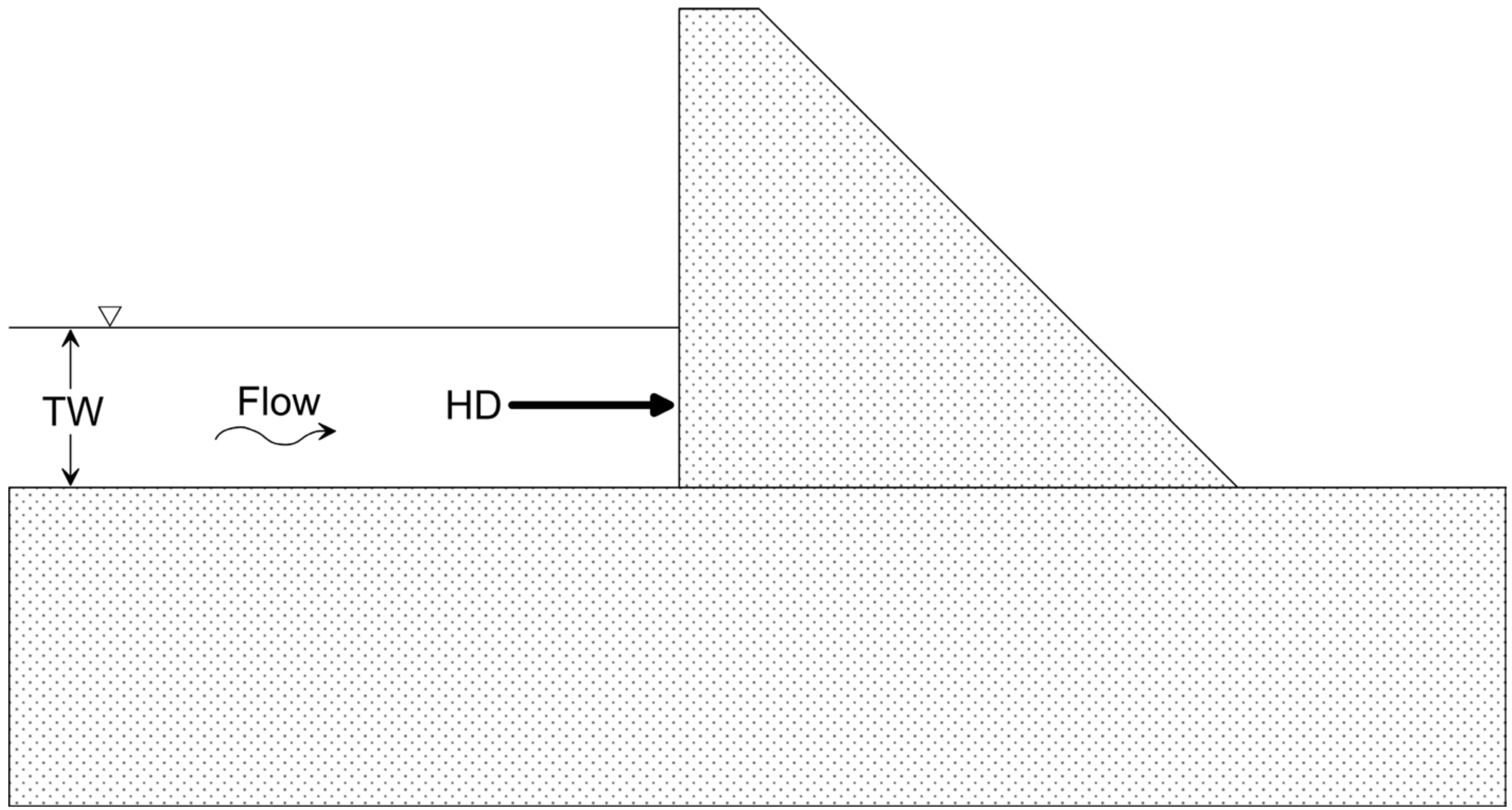



Note:
- D = dead load; U = uplift load
- Shown for the critical case of an empty channel
- Reinforcement not shown

| Spillway Chute Free-Body Diagram | |
|---|---|
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | Figure<br>4 |
| Project No.: TJD10771 February 2025 | |




Note:
- HD = hydrodynamic load
- TW = tailwater/height of water contained within structure

**Baffle Block Free-Body Diagram**

Lake Petit Dam
Big Canoe

Geosyntec consultants

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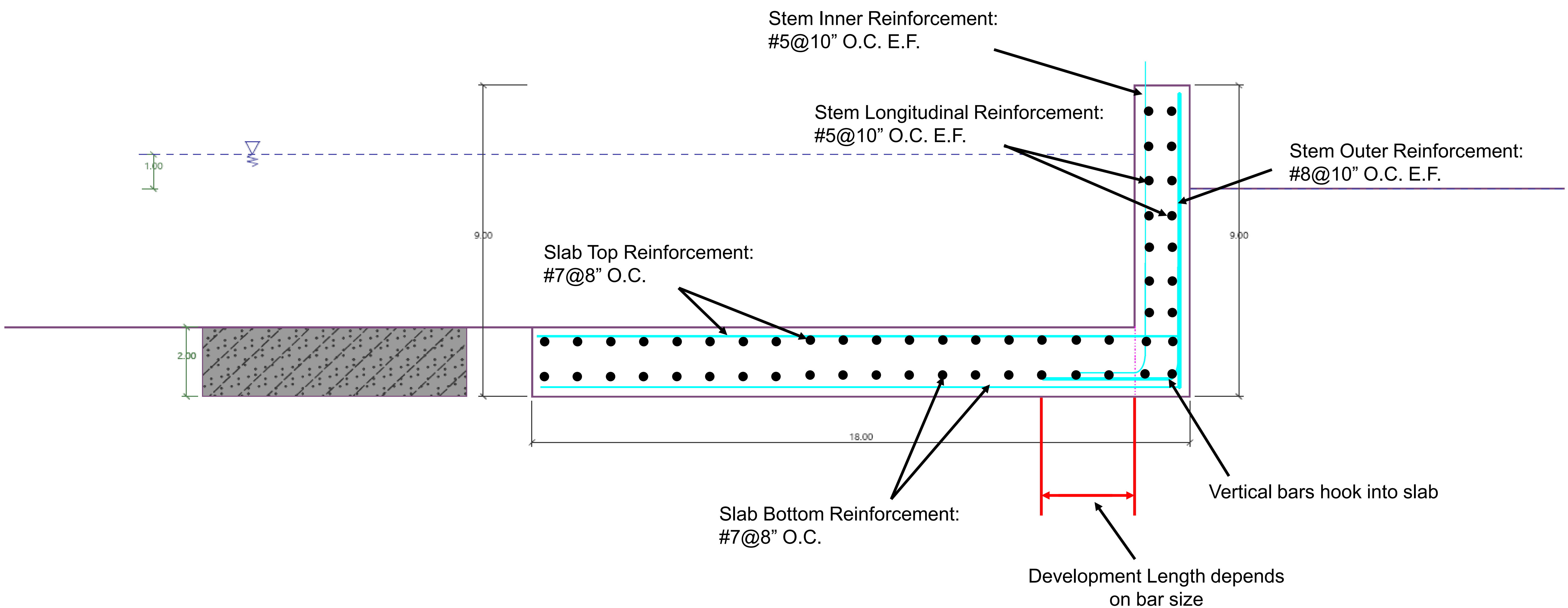
**Figure** 5




Note:

- Reinforcement applies to any spillway wall height up to 7 ft.
- Final dimensions and drawings include symmetrical wall on left side of the structure.
- All lengths with units not labeled are measured in feet.

| | |
|---|---|
| **Spillway Chute Reinforcement** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>6 |
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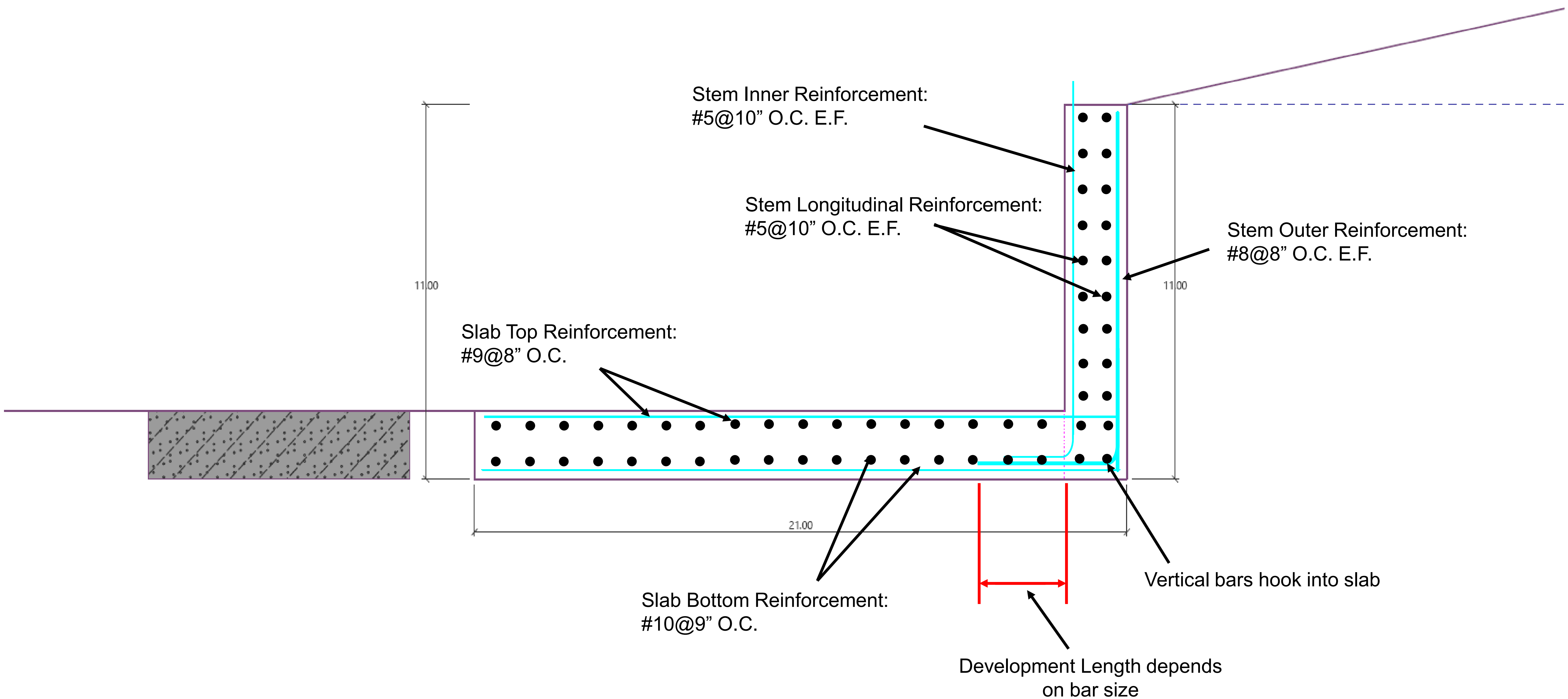
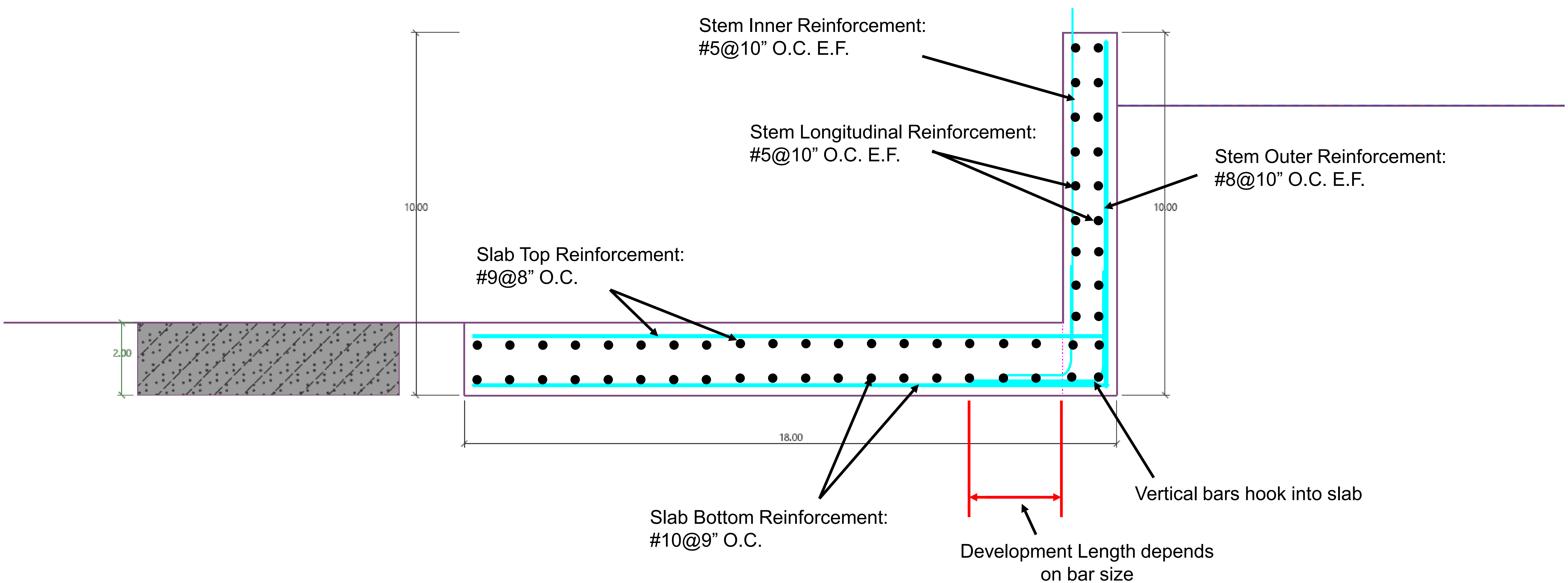



Note:

- Final dimensions and drawings include symmetrical wall on left side of the structure.
- All lengths with units not labeled are measured in feet.

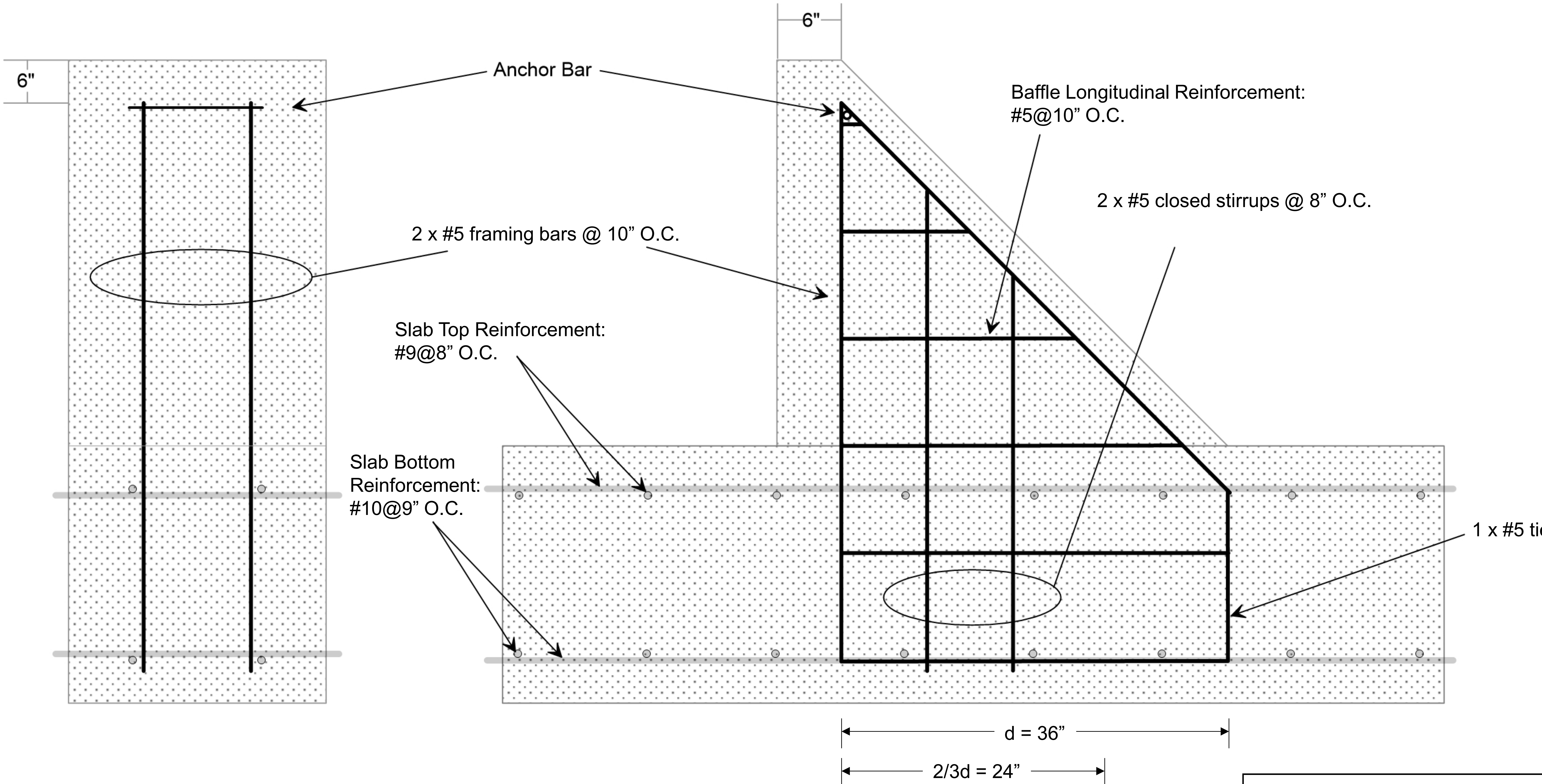
| | |
|---|---|
| **Stilling Basin Wall Reinforcement** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>7 |
| Project No.: TJD10771 February 2025 | |




Note:

- Final dimensions and drawings include symmetrical wall on left side of the structure.
- All lengths with units not labeled are measured in feet.

| **Training Wall Reinforcement** | | |
|---|---|---|
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | **Figure**<br>8 |
| Project No.: TJD10771 | February 2025 | |




Note:

- #5 tie at downstream end of baffle block not necessary if framing bars are closed

| | |
|---|---|
| **Slab and Baffle Block Reinforcement** | |
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>9 |
| Project No.: TJD10771 | February 2025 |

**ATTACHMENT 1**
**Uplift Calculations**

# Uplift Calculations

REFERENCES:

- Stability Analysis of Concrete Structures, Engineer Manual 1110-2-2100 (US Army Corps of Engineers, 2005)

This calculation evaluates the uplift on the chute, training, and stilling basin sections and evaluates factors of safety (FS) against flotation to check whether the selected dimensions and geometry of the structures provide enough weight to prevent flotation. Uplift relief provided by the underdrain system below and adjacent to the slab is conservatively not considered. Only the critical loading case where the channel is empty was analyzed.

## <u>Factor of Safety Against Flotation</u>

The factor of safety against flotation (USACE EM 1110-2-2100) is

$$FS_f = \frac{W_s + W_c + S}{U - W_G}$$

where $W_s$ = weight of structure

$W_c$ = weight of water contained within structure

$S$ = surcharge above structure

$U$ = uplift force

$W_G$ = weight of water above structure

Assume $S = 0$, $W_c = 0$, and $W_G = 0$ for an empty channel with maximum uplift.

## Spillway Chute Section

The factor of safety against flotation of the spillway chute was calculated as follows.

### Input Parameters

| | |
|---|---|
| $W_b = 15\ ft$ | Width of slab |
| $t_s = 2\ ft$ | Thickness of slab |
| $t_w = 1.5\ ft$ | Thickness of wall |
| $h = 5\ ft$ | Wall height (not including slab) |
| $h_w = 6\ ft$ | Groundwater head above bottom of slab |
| $\gamma_c = 150\ pcf$ | Unit weight of concrete |
| $\gamma_w = 62.4\ pcf$ | Unit weight of water |

**Weight of Structure: $W_s = W_{slab} + W_{walls}$**

$$W_{slab} = \gamma_c(W_b + 2\ t_w)t_s = 150(15 + 2 * 1.5)(2) = 5.4\ kips/ft$$

$$W_{walls} = 2\gamma_c(t_w)h = 150(2 * 1.5)(5) = 2.3\ kips/ft$$

$$W_s = 5.4 + 2.3 = 7.7\ kips/ft$$

**Uplift: $U$**

$$U = (\gamma_w h_w)(W_b + 2t_w) = (62.4 * 6)(15 + 2 * 1.5) = 6.7\ kips/ft$$

## Spillway Chute Calculated Factors of Safety

$$FS_f = \frac{W_s + W_c + S}{U - W_G} = \frac{7.7 + 0 + 0}{6.7 - 0} = 1.1$$

The minimum required factor of safety against flotation is 1.1 (USACE EM 1110-2-2100), so the structures are satisfactory.

**Stilling Basin and Training Wall Section**

This section is through the stilling basin where one wall is a stilling basin wall and the other is a training wall. The factor of safety against flotation of the stilling basin-training wall section was calculated as follows.

**Input Parameters**

| | |
|---|---|
| $W_b = 30\ ft$ | Width of slab |
| $t_s = 2\ ft$ | Thickness of slab |
| $t_{sb} = 2\ ft$ | Thickness of stilling basin wall |
| $h_{sb} = 9\ ft$ | Stilling basin wall height (not including slab) |
| $h_{w,sb} = 2\ ft$ | Groundwater head behind stilling basin walls above bottom of slab |
| $t_t = 1.5\ ft$ | Thickness of training wall |
| $h_t = 8\ ft$ | Training wall height (not including slab) |
| $h_{w,t} = 9\ ft$ | Groundwater head behind training walls above bottom of slab |
| $\gamma_c = 150\ pcf$ | Unit weight of concrete |
| $\gamma_w = 62.4\ pcf$ | Unit weight of water |

**Weight of Structure: $\boldsymbol{W_s = W_{slab} + W_{walls}}$**

$W_{slab} = \gamma_c(W_b + t_{sb} + t_t)t_s = 150(30 + 2 + 1.5)(2) = 10.1\ kips/ft$

$W_{walls} = \gamma_c(t_{sb}h_{sb} + t_t h_t) = 150(2 * 9 + 1.5 * 8) = 4.5\ kips/ft$

$W_s = 10.1 + 4.5 = 14.6\ kips/ft$

**Uplift: $\boldsymbol{U}$**

Trapezoidal distribution:

$U = \frac{1}{2}(\gamma_w h_{w,\text{sb}} + \gamma_w h_{w,\text{t}})(W_b + t_{sb} + t_t)$

$= \frac{1}{2}(62.4 * 2 + 62.4 * 9)(30 + 2 + 1.5) = 11.5\ kips/ft$

**Stilling Basin-Training Wall Section Calculated Factor of Safety**

$$FS_f = \frac{W_S+W_C+S}{U-W_G} = \frac{14.6+0+0}{11.5-0} = 1.3$$

The minimum required factor of safety against flotation is 1.1 (USACE EM 1110-2-2100), so the structures are satisfactory.

# ATTACHMENT 2
# Wall GEO5 Outputs and Structural Calculations

# Cantilever wall analysis

## Input data (Geometry)

| | |
|---|---|
| Project : | Lake Petit |
| Part : | Chute Spillway |
| Description : | Chute Spillway |
| Customer : | Big Canoe POA |
| Author : | Joshua Schaefer |
| Date : | 18-Feb-25 |
| Project ID : | TJD10771 |
| Project number : | TJD10771 |

### Settings

(input for current task)

### Materials and standards

Concrete structures : ACI 318-19

### Wall analysis

| | |
|---|---|
| Verification methodology : | Safety factors (ASD) |
| Active earth pressure calculation : | Mazindrani (Rankine) |
| Passive earth pressure calculation : | Mazindrani (Rankine) |
| Earthquake analysis : | Mononobe-Okabe |
| Shape of earth wedge : | Calculate as skew |
| Base key : | The base key is considered as inclined footing bottom |
| Allowable eccentricity : | 0.333 |

### Material of structure

Unit weight γ = 150.00 pcf
Analysis of concrete structures carried out according to the standard ACI 318-19.

**Concrete: Concrete ACI**

| | | |
|---|---|---|
| Compressive strength | $f_c'$ | = 4000.0 psi |
| Elasticity modulus | $E_{cm}$ | = 3605.0 ksi |

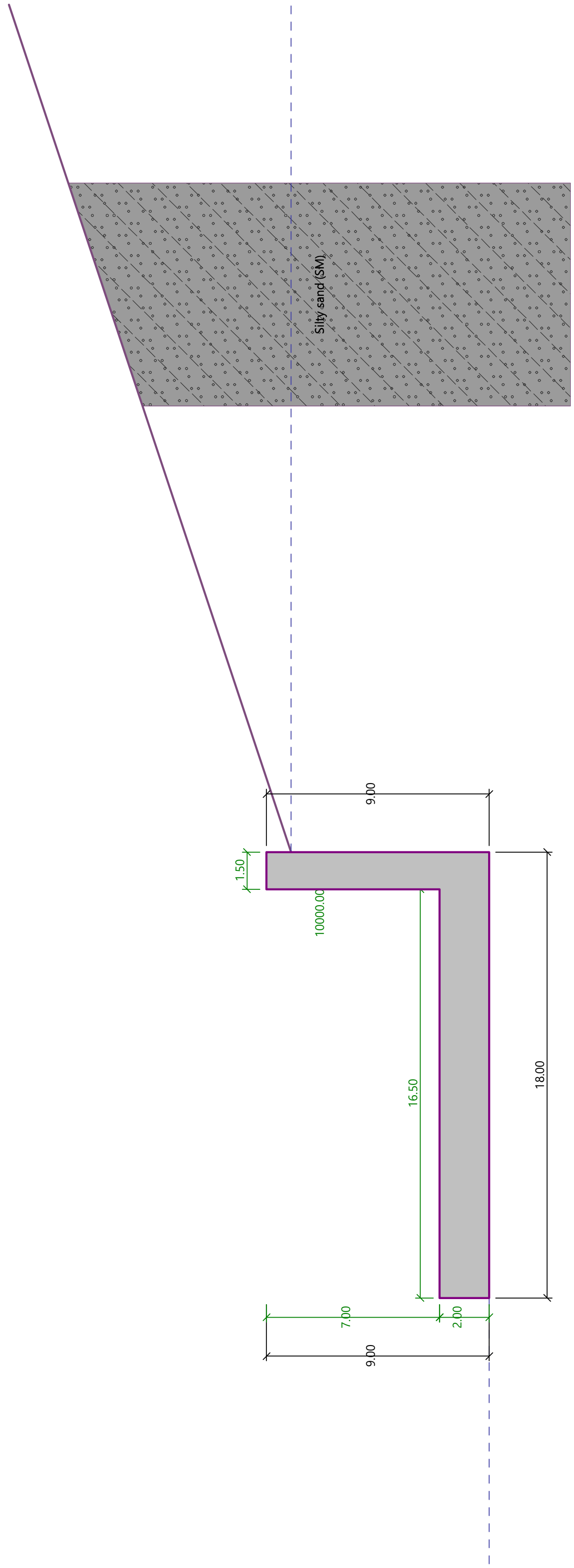
**Longitudinal reinforcement: A615/60**

| | | |
|---|---|---|
| Tensile strength | $f_y$ | = 60000.0 psi |

### Geometry of structure

| No. | Coordinate X [ft] | Depth Z [ft] |
|---|---|---|
| 1 | 0.00 | -1.00 |
| 2 | 0.00 | 6.00 |
| 3 | 0.00 | 8.00 |
| 4 | -18.00 | 8.00 |
| 5 | -18.00 | 6.00 |
| 6 | -1.50 | 6.00 |
| 7 | -1.50 | -1.00 |

The origin [0,0] is located at the most upper right point of the wall.
Wall section area = 46.50 $ft^2$.


Silty sand (SM)
9.00
1.50
10000.00
16.50
18.00
7.00
2.00
9.00

## Basic soil parameters

| No. | Name | Pattern | $\varphi_{ef}$ [°] | $c_{ef}$ [psf] | $\gamma$ [pcf] | $\gamma_{su}$ [pcf] | $\delta$ [°] |
|---|---|---|---|---|---|---|---|
| 1 | Silty sand (SM) | | 29.00 | 0.0 | 115.00 | 52.50 | 17.00 |

All soils are considered as cohesionless for at rest pressure analysis.

## Soil parameters

**Silty sand (SM)**

Unit weight : $\gamma$ = 115.0 pcf
Stress-state : effective
Angle of internal friction : $\varphi_{ef}$ = 29.00 °
Cohesion of soil : $c_{ef}$ = 0.0 psf
Angle of friction struc.-soil : $\delta$ = 17.00 °
Soil : cohesionless
Saturated unit weight : $\gamma_{sat}$ = 115.0 pcf

## Terrain profile

Terrain behind construction has the slope 1: 3.00 (slope angle is 18.43 °).
Depth of terrain below the top of wall h = 1.00 ft.

## Water influence

GWT behind the structure lies at a depth of 0.00 ft
GWT in front of the structure lies at a depth of 8.00 ft
Subgrade at the heel is not permeable.
Uplift in foot. bottom due to different pressures is considered as linear.

## Settings of the stage of construction

Design situation : transient
The wall is prevented from motion. Earth pressure at rest is therefore assumed.
Reduction of soil/soil friction angle : do not reduce

# Verification No. 1 (Geometry)

## Pressure at rest distribution behind the structure (without surcharge)

| Layer No. | Start [ft] End [ft] | $\sigma_z$ [psf] | $\sigma_w$ [psf] | Pressure [psf] | Hor. comp. [psf] | Vert. comp. [psf] |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 6.00 | 315.0 | 375.0 | 193.9 | 193.9 | 0.0 |
| 2 | 6.00 | 315.0 | 375.0 | 193.9 | 193.9 | 0.0 |
| | 8.00 | 420.0 | 500.0 | 258.6 | 258.6 | 0.0 |

## Water pressure distribution

| Point No. | Depth [ft] | Hor. comp. [psf] | Vert. comp. [psf] |
|---|---|---|---|
| 1 | 0.00 | 0.0 | 0.0 |
| 2 | 6.00 | 375.0 | 0.0 |
| 3 | 8.00 | 500.0 | 0.0 |

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -2.02 | 6975.6 | 10.86 | 1.000 |
| Pressure at rest | 1034.4 | -2.67 | 0.0 | 18.00 | 0.000 |
| Water pressure | 2000.0 | -2.67 | 0.0 | 18.00 | 1.000 |
| Uplift pressure | 0.0 | 0.00 | -4500.2 | 12.00 | 1.000 |

## Dimensioning No. 1 (Geometry)

### Wall stem check - back reinf.

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -3.50 | 1575.1 | 0.75 | 2.080 |
| Pressure at rest | 581.6 | -2.00 | 0.0 | 1.50 | 2.080 |
| Water pressure | 1124.5 | -2.00 | 0.0 | 1.50 | 2.080 |
| Uplift pressure | 0.0 | -6.00 | 0.0 | 1.50 | 2.080 |

### Wall stem check - back reinf.

Wall check at the construction joint 7.00 ft from the wall crest
Reinforcement and dimensions of the cross-section
1.20 prof. No. 8, cover 4.00 in
Inputted reinforcement area = 0.942 $in^2$
Required reinforcement area = 0.347 $in^2$
Cross-section width = 1.00 ft
Cross-section height = 1.50 ft

Reinforcement ratio $\rho$ = 0.58 % > 0.33 % = $\rho_{min}$
Position of neutral axis c = 0.14 ft < 0.42 ft = $c_{max}$
Ultimate shear force $\phi V_n$ = 15378.23 lbf > 3548.76 lbf = $V_u$
Ultimate moment $\phi M_n$ = 54352.0 lbfft > 15655.9 lbfft = $M_u$

**Cross-section is SATISFACTORY.**

### Wall jump check

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -2.02 | 6975.6 | 10.86 | 2.080 |
| Pressure at rest | 1034.4 | -2.67 | 0.0 | 18.00 | 2.080 |
| Water pressure | 2000.0 | -2.67 | 0.0 | 18.00 | 2.080 |
| Uplift pressure | 0.0 | 0.00 | -4500.2 | 12.00 | 2.080 |

### Wall jump check

Reinforcement and dimensions of the cross-section
1.50 prof. No. 7, cover 4.00 in
Inputted reinforcement area = 0.902 $in^2$
Required reinforcement area = 0.238 $in^2$
Cross-section width = 1.00 ft
Cross-section height = 2.00 ft

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reinforcement ratio | $\rho$ | = | 0.38 | % | > | 0.33 | % | = $\rho_{min}$ |
| Position of neutral axis | c | = | 0.13 | ft | < | 0.61 | ft | = $c_{max}$ |
| Ultimate shear force | $\phi V_n$ | = | 22270.34 | lbf | > | 198.71 | lbf | = $V_u$ |
| Ultimate moment | $\phi M_n$ | = | 76710.5 | lbfft | > | 15655.9 | lbfft | = $M_u$ |

**Cross-section is SATISFACTORY.**

# Cantilever wall analysis

## Input data (Geometry)

Project : Lake Petit
Part : Chute Spillway
Description : Stilling Basin Wall
Customer : Big Canoe POA
Author : Joshua Schaefer
Date : 18-Feb-25
Project ID : TJD10771
Project number : TJD10771

### Settings

(input for current task)

### Materials and standards

Concrete structures : ACI 318-19

### Wall analysis

Verification methodology : Safety factors (ASD)
Active earth pressure calculation : Mazindrani (Rankine)
Passive earth pressure calculation : Mazindrani (Rankine)
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Base key : The base key is considered as inclined footing bottom
Allowable eccentricity : 0.333

### Material of structure

Unit weight γ = 150.00 pcf
Analysis of concrete structures carried out according to the standard ACI 318-19.

**Concrete: Concrete ACI**

Compressive strength $f_c'$ = 4000.0 psi
Elasticity modulus $E_{cm}$ = 3605.0 ksi

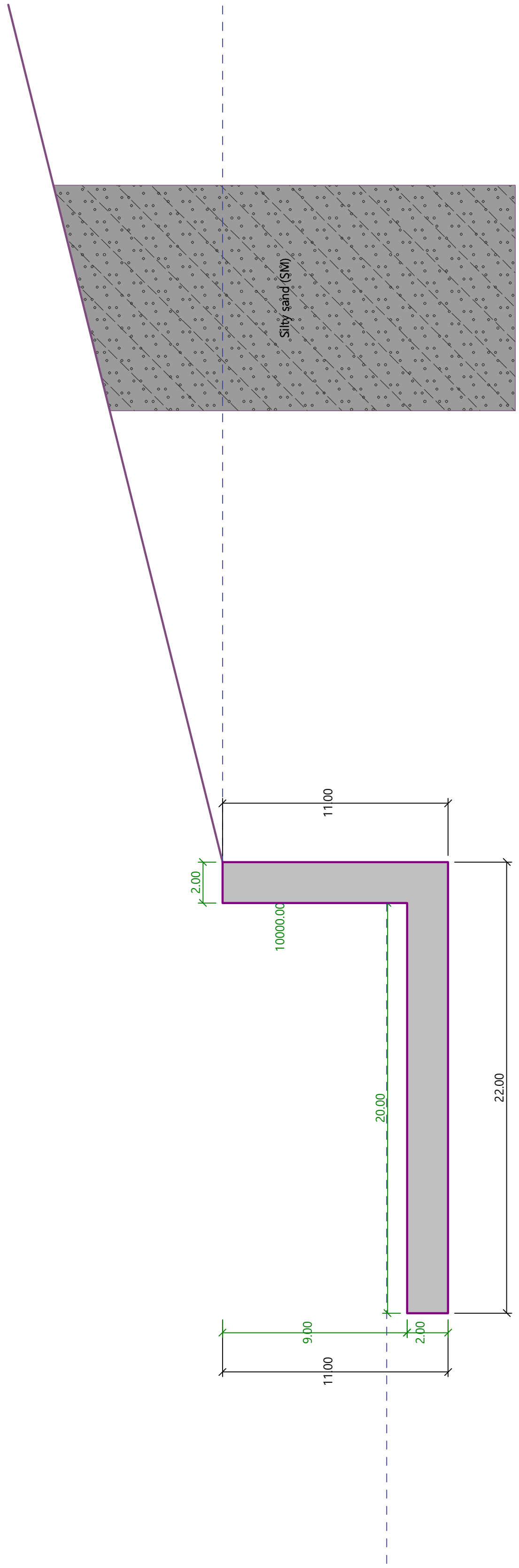
**Longitudinal reinforcement: A615/60**

Tensile strength $f_y$ = 60000.0 psi

### Geometry of structure

| No. | Coordinate X [ft] | Depth Z [ft] |
|---|---|---|
| 1 | 0.00 | 0.00 |
| 2 | 0.00 | 9.00 |
| 3 | 0.00 | 11.00 |
| 4 | -22.00 | 11.00 |
| 5 | -22.00 | 9.00 |
| 6 | -2.00 | 9.00 |
| 7 | -2.00 | 0.00 |

The origin [0,0] is located at the most upper right point of the wall.
Wall section area = 62.01 $ft^2$.


Silty sand (SM)
11.00
2.00
10000.00
20.00
22.00
9.00
2.00
11.00

### Basic soil parameters

| No. | Name | Pattern | $\varphi_{ef}$ [°] | $c_{ef}$ [psf] | $\gamma$ [pcf] | $\gamma_{su}$ [pcf] | $\delta$ [°] |
|---|---|---|---|---|---|---|---|
| 1 | Silty sand (SM) | | 29.00 | 0.0 | 115.00 | 52.50 | 17.00 |

All soils are considered as cohesionless for at rest pressure analysis.

### Soil parameters

**Silty sand (SM)**

Unit weight : $\gamma$ = 115.0 pcf
Stress-state : effective
Angle of internal friction : $\varphi_{ef}$ = 29.00 °
Cohesion of soil : $c_{ef}$ = 0.0 psf
Angle of friction struc.-soil : $\delta$ = 17.00 °
Soil : cohesionless
Saturated unit weight : $\gamma_{sat}$ = 115.0 pcf

### Water influence

GWT behind the structure lies at a depth of 0.00 ft
GWT in front of the structure lies at a depth of 8.00 ft
Subgrade at the heel is not permeable.
Uplift in foot. bottom due to different pressures is considered as linear.

### Settings of the stage of construction

Design situation : transient
The wall is prevented from motion. Earth pressure at rest is therefore assumed.
Reduction of soil/soil friction angle : do not reduce

## Verification No. 1 (Geometry)

### Pressure at rest distribution behind the structure (without surcharge)

| Layer No. | Start [ft] End [ft] | $\sigma_Z$ [psf] | $\sigma_W$ [psf] | Pressure [psf] | Hor. comp. [psf] | Vert. comp. [psf] |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 8.00 | 420.0 | 500.0 | 238.9 | 238.9 | 0.0 |
| 2 | 8.00 | 420.0 | 500.0 | 238.9 | 238.9 | 0.0 |
| | 9.00 | 472.5 | 500.0 | 268.8 | 268.8 | 0.0 |
| 3 | 9.00 | 472.5 | 500.0 | 268.8 | 268.8 | 0.0 |
| | 11.00 | 577.5 | 500.0 | 328.5 | 328.5 | 0.0 |

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -3.28 | 6425.7 | 15.01 | 1.000 |
| Pressure at rest | 1806.8 | -3.67 | 0.0 | 22.00 | 0.000 |
| Water pressure | 3500.0 | -3.88 | 0.0 | 22.00 | 1.000 |
| Uplift pressure | 0.0 | 0.00 | -5500.2 | 14.67 | 1.000 |

# Dimensioning No. 1 (Geometry)

## Wall stem check - back reinf.

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -4.69 | 2575.3 | 1.00 | 2.080 |
| Pressure at rest | 1209.2 | -3.00 | 0.0 | 2.00 | 2.080 |
| Water pressure | 2499.4 | -3.03 | 0.0 | 2.00 | 2.080 |
| Uplift pressure | 0.0 | -9.00 | 0.0 | 2.00 | 2.080 |

### Wall stem check - back reinf.

Wall check at the construction joint 9.00 ft from the wall crest
Reinforcement and dimensions of the cross-section
1.50 prof. No. 8, cover 4.00 in
Inputted reinforcement area = 1.178 $in^2$
Required reinforcement area = 0.617 $in^2$
Cross-section width = 1.00 ft
Cross-section height = 2.00 ft

Reinforcement ratio $\rho$ = 0.50 % > 0.33 % = $\rho_{min}$
Position of neutral axis c = 0.17 ft < 0.61 ft = $c_{max}$
Ultimate shear force $\phi V_n$ = 22211.48 lbf > 7713.86 lbf = $V_u$
Ultimate moment $\phi M_n$ = 98842.9 lbfft > 40000.0 lbfft = $M_u$

**Cross-section is SATISFACTORY.**

## Wall jump check

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -3.28 | 6425.7 | 15.01 | 2.080 |
| Pressure at rest | 1806.8 | -3.67 | 0.0 | 22.00 | 2.080 |
| Water pressure | 3500.0 | -3.88 | 0.0 | 22.00 | 2.080 |
| Uplift pressure | 0.0 | 0.00 | -5500.2 | 14.67 | 2.080 |

### Wall jump check

Reinforcement and dimensions of the cross-section
1.33 prof. No. 10, cover 4.00 in
Inputted reinforcement area = 1.685 $in^2$
Required reinforcement area = 0.622 $in^2$
Cross-section width = 1.00 ft
Cross-section height = 2.00 ft

Reinforcement ratio $\rho$ = 0.73 % > 0.33 % = $\rho_{min}$
Position of neutral axis c = 0.24 ft < 0.61 ft = $c_{max}$
Ultimate shear force $\phi V_n$ = 22045.50 lbf > 6000.00 lbf = $V_u$
Ultimate moment $\phi M_n$ = 137425.6 lbfft > 40000.0 lbfft = $M_u$

**Cross-section is SATISFACTORY.**

# Cantilever wall analysis

## Input data (Geometry)

Project : Lake Petit
Part : Chute Spillway
Description : Training Walls
Customer : Big Canoe POA
Author : Joshua Schaefer
Date : 18-Feb-25
Project ID : TJD10771
Project number : TJD10771

### Settings

(input for current task)

### Materials and standards

Concrete structures : ACI 318-19

### Wall analysis

Verification methodology : Safety factors (ASD)
Active earth pressure calculation : Mazindrani (Rankine)
Passive earth pressure calculation : Mazindrani (Rankine)
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Base key : The base key is considered as inclined footing bottom
Allowable eccentricity : 0.333

### Material of structure

Unit weight γ = 150.00 pcf
Analysis of concrete structures carried out according to the standard ACI 318-19.

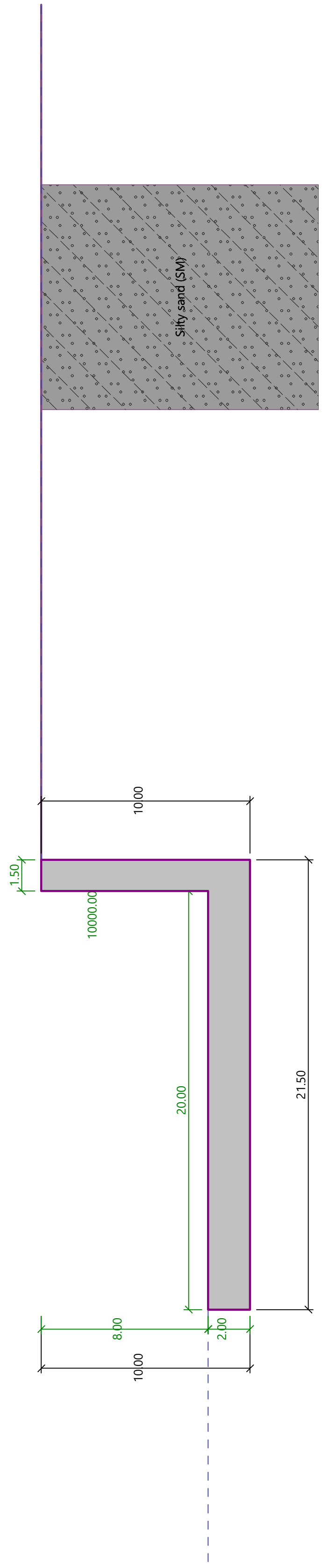
**Concrete: Concrete ACI**
Compressive strength $f_c'$ = 4000.0 psi
Elasticity modulus $E_{cm}$ = 3605.0 ksi

**Longitudinal reinforcement: A615/60**
Tensile strength $f_y$ = 60000.0 psi

### Geometry of structure

| No. | Coordinate X [ft] | Depth Z [ft] |
|---|---|---|
| 1 | 0.00 | 0.00 |
| 2 | 0.00 | 8.00 |
| 3 | 0.00 | 10.00 |
| 4 | -21.50 | 10.00 |
| 5 | -21.50 | 8.00 |
| 6 | -1.50 | 8.00 |
| 7 | -1.50 | 0.00 |

The origin [0,0] is located at the most upper right point of the wall.
Wall section area = 55.00 $ft^2$.


Silty sand (SM)
10.00
1.50
10000.00
20.00
21.50
8.00
2.00
10.00

## Basic soil parameters

| No. | Name | Pattern | $\varphi_{ef}$ [°] | $c_{ef}$ [psf] | $\gamma$ [pcf] | $\gamma_{su}$ [pcf] | $\delta$ [°] |
|---|---|---|---|---|---|---|---|
| 1 | Silty sand (SM) | | 29.00 | 0.0 | 115.00 | 52.50 | 17.00 |

All soils are considered as cohesionless for at rest pressure analysis.

## Soil parameters

**Silty sand (SM)**

| | |
|---|---|
| Unit weight : | $\gamma$ = 115.0 pcf |
| Stress-state : | effective |
| Angle of internal friction : | $\varphi_{ef}$ = 29.00 ° |
| Cohesion of soil : | $c_{ef}$ = 0.0 psf |
| Angle of friction struc.-soil : | $\delta$ = 17.00 ° |
| Soil : | cohesionless |
| Saturated unit weight : | $\gamma_{sat}$ = 115.0 pcf |

## Water influence

GWT behind the structure lies at a depth of 0.00 ft
GWT in front of the structure lies at a depth of 8.00 ft
Subgrade at the heel is not permeable.
Uplift in foot. bottom due to different pressures is considered as linear.

## Settings of the stage of construction

Design situation : transient
The wall is prevented from motion. Earth pressure at rest is therefore assumed.
Reduction of soil/soil friction angle : do not reduce

# Verification No. 1 (Geometry)

## Pressure at rest distribution behind the structure (without surcharge)

| Layer No. | Start [ft] End [ft] | $\sigma_z$ [psf] | $\sigma_w$ [psf] | Pressure [psf] | Hor. comp. [psf] | Vert. comp. [psf] |
|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 8.00 | 420.0 | 500.0 | 216.4 | 216.4 | 0.0 |
| 2 | 8.00 | 420.0 | 500.0 | 216.4 | 216.4 | 0.0 |
| | 10.00 | 525.0 | 500.0 | 270.5 | 270.5 | 0.0 |

## Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -2.62 | 5563.1 | 13.99 | 1.000 |
| Pressure at rest | 1352.4 | -3.33 | 0.0 | 21.50 | 0.000 |
| Water pressure | 3000.0 | -3.44 | 0.0 | 21.50 | 1.000 |
| Uplift pressure | 0.0 | 0.00 | -5375.2 | 14.33 | 1.000 |

# Dimensioning No. 1 (Geometry)

## Wall stem check - back reinf.

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -4.00 | 1800.2 | 0.75 | 2.080 |
| Pressure at rest | 865.3 | -2.67 | 0.0 | 1.50 | 2.080 |
| Water pressure | 1999.4 | -2.67 | 0.0 | 1.50 | 2.080 |
| Uplift pressure | 0.0 | -8.00 | 0.0 | 1.50 | 1.000 |

### Wall stem check - back reinf.

Wall check at the construction joint 8.00 ft from the wall crest
Reinforcement and dimensions of the cross-section
1.20 prof. No. 8, cover 4.00 in
Inputted reinforcement area = 0.942 $in^2$
Required reinforcement area = 0.353 $in^2$
Cross-section width = 1.00 ft
Cross-section height = 1.50 ft

Reinforcement ratio $\rho$ = 0.58 % > 0.33 % = $\rho_{min}$
Position of neutral axis c = 0.14 ft < 0.42 ft = $c_{max}$
Ultimate shear force $\phi V_n$ = 15379.60 lbf > 5958.45 lbf = $V_u$
Ultimate moment $\phi M_n$ = 54357.1 lbfft > 15886.0 lbfft = $M_u$

**Cross-section is SATISFACTORY.**

## Wall jump check

### Forces acting on construction

| Name | $F_{hor}$ [lbf/ft] | App.Pt. z [ft] | $F_{vert}$ [lbf/ft] | App.Pt. x [ft] | Design coefficient |
|---|---|---|---|---|---|
| Weight - wall | 0.0 | -2.62 | 5563.1 | 13.99 | 2.080 |
| Pressure at rest | 1352.4 | -3.33 | 0.0 | 21.50 | 2.080 |
| Water pressure | 3000.0 | -3.44 | 0.0 | 21.50 | 2.080 |
| Uplift pressure | 0.0 | 0.00 | -5375.2 | 14.33 | 1.000 |

### Wall jump check

Reinforcement and dimensions of the cross-section
1.33 prof. No. 10, cover 4.00 in
Inputted reinforcement area = 1.685 $in^2$
Required reinforcement area = 0.244 $in^2$
Cross-section width = 1.00 ft
Cross-section height = 2.00 ft

Reinforcement ratio $\rho$ = 0.73 % > 0.33 % = $\rho_{min}$
Position of neutral axis c = 0.24 ft < 0.61 ft = $c_{max}$
Ultimate shear force $\phi V_n$ = 22045.50 lbf > 6.64 lbf = $V_u$
Ultimate moment $\phi M_n$ = 137425.6 lbfft > 15886.0 lbfft = $M_u$

**Cross-section is SATISFACTORY.**

# ATTACHMENT 3
## Slab Structural Calculations

# Slab Structural Calculations

REFERENCES:

- American Concrete Institute (ACI) 318 Structural Concrete Building Code
- Flood Walls and Other Hydraulic Retaining Walls, Engineer Manual 1110-2-2502 (US Army Corps of Engineers, 2022)

This calculation evaluates the forces on the chute and stilling basin slabs, determines the critical load combination, and provides the minimum required area of reinforcement to resist critical loading in addition to providing reinforcement for crack and temperature and shrinkage control.

**<u>Spillway Chute Slabs</u>**

### Input Parameters

| | |
|---|---|
| $W_b = 20\ ft$ | Width of slab |
| $t_s = 2\ ft$ | Thickness of slab |
| $h_w = 6\ ft$ | Groundwater head behind walls (above bottom of slab) |
| $d_w = 5\ ft$ | Depth of water in chute |
| $\gamma_c = 150\ pcf$ | Unit weight of concrete |
| $\gamma_w = 62.4\ pcf$ | Unit weight of water |
| $f'c = 4{,}000\ psi$ | Concrete compressive strength |
| $f_y = 60\ ksi$ | Steel yield strength |
| $d = 20\ in.$ | Distance from tension reinforcement to maximum compression fiber |

### Unfactored Loads

Unfactored loads were calculated assuming the chute slab is a double fixed-end beam of length and width $W_b$. Impact, wind, and silt loading were considered negligible within the chute. For slabs behaving as double fixed-end beams, reinforcement shall be placed at the opposite face of load application (i.e., the bottom reinforcement shall be designed using loading on the top face of the slab and the top reinforcement shall be designed using loading on the bottom face of the slab). Applicable loads are:

Dead load per square foot from the weight of the slab is calculated as:

$$D = \gamma_c(t_s) = 150(2) = 300\ psf$$

Uplift on the bottom face per square foot due to groundwater head behind the structure walls is calculated as:

$$U = \gamma_w h_w = 62.4 * 6 = 374\ psf$$

Hydrostatic load per square foot due to weight of water in the chute is calculated as:

$$HS = \gamma_w d_w = 62.4 * 5 = 312\ psf$$

**Spillway Chute Slab Bottom**

**Critical Factored Loads**

Using load factors from USBR, the critical load at the bottom of the slab from forces acting on the top face is:

$$w = 1.6 * 1.3HS = 2.08(312) = 649\ psf$$

The resultant/ultimate shear force on slab width $W_b$ is:

$$V_u = W_b \text{ w} = 18(649) = 11{,}681\ lb/ft$$

The resultant/ultimate moment for a double fixed-end beam is:

$$M_u = \frac{w * W_b^2}{8} = \frac{649 * 18^2}{8} = 26.3\ kip - ft/ft$$

**Reinforcement Selection**

Determine minimum reinforcement ratio per ft of slab width (section width $b = 12\ in.$). Minimum reinforcement for temperature and shrinkage control is 0.003 times the gross cross-sectional area, half in each face, or no less than No. 4 bars at 12-in. spacing (USACE EM 1110-2-2104 2.9.1).

$$\rho_{min,1} = 3\sqrt{(f_c')}/f_y = 3\sqrt{(4000)}/60000 = 0.0032$$

$$\rho_{min,2} = 200/f_y = 200/60{,}000 = 0.0033$$

$$\begin{aligned}\rho_{min,flexure} &= \frac{0.85 f_c'}{f_y}\left(1 - \sqrt{1 - \frac{M_u}{0.383 b d^2 f_c'}}\right) \\ &= \frac{0.85 * 4{,}000}{60{,}000}\left(1 - \sqrt{1 - \frac{26.3(12{,}000)}{0.383(12)(20)^2(4{,}000)}}\right) \\ &= 0.00123\end{aligned}$$

The controlling minimum reinforcement ratio is $\rho_{min} = 0.0033$ for the bottom of the spillway chute slab. The minimum required area of steel per 12 in. is then:

$$A_{s,min} = \rho_{min} b d = 0.0033(12)(20) = 0.792\ in^2$$

Rebar area for a No. 7 bar is $A_{s,bar} = 0.60\ in^2$. To meet the minimum required area of steel, the slab would require:

$$A_{s,min}/A_{s,bar} = 0.792/0.60 \ = \ 1.32 \text{ No. 7 bars per 12 in.}$$

Or No. 7 bars with spacing less than 12/1.32 = 9.1 in.

Select No. 7 bars @ 8-in. spacing for the bottom of the spillway chute slab.

## Spillway Chute Slab Top

### Critical Factored Loads

For the top of the slab, the weight of the concrete counteracts some of the uplift pressure acting on the bottom face, and the critical load is:

$$w \ = 1.6 * 1.3U - 1.2D = 2.08(374) - 1.2(300) = 419\ psf$$

The resultant/ultimate shear force on slab width $W_b$ is:

$$V_u = W_b \text{ w} = 18(419) = 7{,}542\ lb/ft$$

The resultant/ultimate moment for a double fixed-end beam is:

$$M_u = \frac{w*W_b^2}{8} = \frac{419*18^2}{8} = 17.0\ kip - ft/ft$$

### Reinforcement Selection

Determine minimum reinforcement ratio per ft of slab width (section width $b\ =\ 12\ in.$). Minimum reinforcement for temperature and shrinkage control is 0.003 times the gross cross-sectional area, half in each face, or no less than No. 4 bars at 12-in. spacing (USACE EM 1110-2-2104 2.9.1).

$$\rho_{min,1} = 3\sqrt{(f_c')}/f_y = 3\sqrt{(4000)}/60000 = 0.0032$$

$$\rho_{min,2} = 200/f_y = 200/60{,}000 = 0.0033$$

$$\rho_{min,flexure} = \frac{0.85 f_c'}{f_y}\left(1 - \sqrt{1 - \frac{M_u}{0.383 b d^2 f_c'}}\right)$$

$$= \frac{0.85*4{,}000}{60{,}000}\left(1 - \sqrt{1 - \frac{17.0(12{,}000)}{0.383(12)(20)^2(4{,}000)}}\right)$$

$$= 0.000792$$

The controlling minimum reinforcement ratio is $\rho_{min} = 0.0033$ for the top of the spillway chute slab. The minimum required area of steel per 12 in. is then:

$$A_{s,min} = \rho_{min} bd = 0.0033(12)(20) = 0.792\ in^2$$

Rebar area for a No. 7 bar is $A_{s,bar} = 0.60\ in^2$. To meet the minimum required area of steel, the slab would require:

$A_{s,min}/A_{s,bar} = 0.792/0.60\ =\ 1.32$ No. 7 bars per 12 in.

Or No. 7 bars with spacing less than 12/1.32 = 9.1 in.

Select No. 7 bars @ 8-in. spacing for the top of the spillway chute slab.

**Shear Strength**

Check if $\phi V_c \geq V_u$ per ft of slab width.

$$V_c = 2\sqrt{f'_c}bd = 2\sqrt{4{,}000}(12)(20)/1000 = 30\ kips/ft$$

$$\phi V_c = 0.75(30) = 23\ kips/ft$$

Since $\phi V_c \geq V_u$ in the top and bottom of the spillway chute slab, additional shear reinforcement is not required, and the shear strength criteria is satisfied.

**Result**

- Provide at least No. 7 reinforcing bars spaced at 8 in. in both the longitudinal and transverse directions and in each face of the slab.

## Stilling Basin Section

### Input Parameters

| | |
|---|---|
| $W_b = 20\ ft$ | Width of slab |
| $t_s = 2\ ft$ | Thickness of slab |
| $h_w = 8\ ft$ | Groundwater head behind walls (above bottom of slab) |
| $d_w = 6\ ft$ | Depth of water in stilling basin |
| $\gamma_c = 150\ pcf$ | Unit weight of concrete |
| $\gamma_w = 62.4\ pcf$ | Unit weight of water |
| $f'c = 4{,}000\ psi$ | Concrete compressive strength |
| $f_y = 60\ ksi$ | Steel yield strength |
| $d = 20\ in.$ | Distance from tension reinforcement to maximum compression fiber |

### Unfactored Loads

Unfactored loads were calculated assuming the slab to be a cantilever beam of length and width $W_b$. Impact, wind, and silt loading were considered negligible within the stilling basin. For slabs behaving as cantilever beams, reinforcement shall be placed at the same face as the load application (i.e., the bottom reinforcement shall be designed using loading on the bottom face of the slab and the top reinforcement shall be designed using loading on the top face of the slab). Applicable loads are:

Dead load per square foot from the weight of the slab is calculated as:

$$D = \gamma_c(t_s) = 150(2) = 300\ psf$$

Uplift on the bottom face per square foot due to groundwater head behind the structure walls is calculated as:

$$U = \gamma_w h_w = 62.4 * 8 = 499\ psf$$

Hydrostatic load per square foot due to weight of water in the chute is calculated as:

$$HS = \gamma_w d_w = 62.4 * 6 = 374\ psf$$

**<u>Stilling Basin Slab Bottom</u>**

**Critical Factored Loads**

For the top of the slab, the weight of the concrete counteracts some of the uplift pressure acting on the bottom face. Using load factors from USBR, the critical load at the bottom of the slab from forces acting on the bottom face is:

$$w = 1.6 * 1.3U - 1.2D = 2.08(499) - 1.2(300) = 678\, psf$$

The resultant/ultimate shear force on slab width $W_b$ is:

$$V_u = W_b \text{ w} = 20(678) = 13{,}560\, lb/ft$$

The resultant/ultimate moment for a cantilever beam is:

$$M_u = \frac{w*W_b^2}{2} = \frac{678*20^2}{2} = 135.6\, kip - ft/ft$$

**Reinforcement Selection**

Determine minimum reinforcement ratio per ft of slab width (section width $b = 12\, in.$). Minimum reinforcement for temperature and shrinkage control is 0.003 times the gross cross-sectional area, half in each face, or no less than No. 4 bars at 12-in. spacing (USACE EM 1110-2-2104 2.9.1).

$$\rho_{min,1} = 3\sqrt{(f_c')}/f_y = 3\sqrt{(4000)}/60000 = 0.0032$$

$$\rho_{min,2} = 200/f_y = 200/60{,}000 = 0.0033$$

$$\rho_{min,flexure} = \frac{0.85 f_c'}{f_y}\left(1 - \sqrt{1 - \frac{M_u}{0.383 b d^2 f_c'}}\right)$$

$$= \frac{0.85*4{,}000}{60{,}000}\left(1 - \sqrt{1 - \frac{135.7(12{,}000)}{0.383(12)(20)^2(4{,}000)}}\right)$$

$$= 0.00669$$

The controlling minimum reinforcement ratio is $\rho_{min,flexure} = 0.00669$ for the bottom of the stilling basin slab. The minimum required area of steel per 12 in. is then:

$$A_{s,min} = \rho_{min} bd = 0.00669(12)(20) = 1.61\, in^2$$

Rebar area for a No. 10 bar is $A_{s,bar} = 1.27\ in^2$. To meet the minimum required area of steel, the slab would require:

$A_{s,min}/A_{s,bar} = 1.61/1.27\ =\ 1.25$ No. 10 bars per 12 in.

Or No. 10 bars with spacing less than 12/1.26 = 9.5 in.

Select No. 10 bars @ 9-in. spacing for the bottom of the stilling basin slab.

## Stilling Basin Slab Top

### Critical Factored Loads

Using load factors from USBR, the critical load at the top of the slab from forces acting on the top face is:

$$w = 1.2 * 1.3HS = 1.56(374) = 584\ psf$$

The resultant/ultimate shear force on slab width $W_b$ is:

$$V_u = W_b\ \text{w} = 20(584) = 11{,}669\ lb/ft$$

The resultant/ultimate moment for a cantilever beam is:

$$M_u = \frac{w * W_b^2}{2} = \frac{584 * 20^2}{2} = 116.7\ kip - ft/ft$$

### Reinforcement Selection

Determine minimum reinforcement ratio per ft of slab width (section width $b = 12\ in.$). Minimum reinforcement for temperature and shrinkage control is 0.003 times the gross cross-sectional area, half in each face, or no less than No. 4 bars at 12-in. spacing (USACE EM 1110-2-2104 2.9.1).

$$\rho_{min,1} = 3\sqrt{(f_c')}/f_y = 3\sqrt{(4000)}/60000 = 0.0032$$

$$\rho_{min,2} = 200/f_y = 200/60{,}000 = 0.0033$$

$$\rho_{min,flexure} = \frac{0.85f_c'}{f_y}\left(1 - \sqrt{1 - \frac{M_u}{0.383bd^2f_c'}}\right)$$
$$= \frac{0.85 * 4{,}000}{60{,}000}\left(1 - \sqrt{1 - \frac{116.7(12{,}000)}{0.383(12)(20)^2(4{,}000)}}\right)$$
$$= 0.00571$$

The controlling minimum reinforcement ratio is $\rho_{min,flexure} = 0.00571$ for the top of the stilling basin slab. The minimum required area of steel per 12 in. is then

$$A_{s,min} = \rho_{min}bd = 0.00571(12)(20) = 1.37\ in^2$$

Rebar area for a No. 9 bar is $A_{s,bar} = 1.00\ in^2$. To meet the minimum required area of steel, the slab would require:

$A_{s,min}/A_{s,bar} = 1.37/1.00\ =\ 1.37$ No. 9 bars per 12 in.

Or No. 9 bars with spacing less than 12/1.37 = 8.8 in.

Select No. 9 bars @ 8-in. spacing for the top of the stilling basin slab.

**Shear Strength**

Check if $\phi V_c \geq V_u$ per ft of slab width.

$$V_c = 2\sqrt{f'_c}bd = 2\sqrt{4{,}000}(12)(20)/1000 = 30\ kips/ft$$

$$\phi V_c = 0.75(30) = 23\ kips/ft$$

Since $\phi V_c \geq V_u$ in the top and bottom of the stilling basin slab, additional shear reinforcement is not required, and the shear strength criteria is satisfied.

**Result**

- Provide at least No. 10 reinforcing bars spaced at 9 in. in both the longitudinal and transverse directions in the bottom of the stilling basin slab.
- Provide at least No. 9 reinforcing bars spaced at 8 in. in both the longitudinal and transverse directions in the top of the stilling basin slab.

# ATTACHMENT 4
# Baffle Block Structural Calculations

# Baffle Block Structural Calculations

REFERENCES:

- American Concrete Institute (ACI) 318-19 Structural Concrete Building Code
- Strength Design for Reinforced Concrete Hydraulic Structures, Engineer Manual 1110-2-2104 (US Army Corps of Engineers, 2016)

The spillway stilling basin will be a Type III impact-style stilling basin as defined by the USBR. This calculation evaluates the forces on the baffles in the expected critical load combination scenario and provides the minimum required area of reinforcement to resist the loading. The baffle was designed based on the ACI guidance for corbel design (ACI 318-19 16.5).

## Input Parameters

| | |
|---|---|
| $h_b = 3\ ft$ | Height of baffle |
| $w_b = 2\ ft$ | Width of baffle |
| $L_b = 3.5\ ft$ | Length of baffle |
| $t_b = 0.5\ ft$ | Thickness of baffle face |
| $d = L_b - t_b = 3ft$ | Effective depth of baffle |
| $t_s = 2\ ft$ | Thickness of slab |
| $d_1 = 1\ ft$ | Depth of water entering the stilling basin |
| $v_1 = 40\ ft/s$ | Velocity of water entering the stilling basin from the chute |
| $\gamma_w = 62.4\ pcf$ | Unit weight of water |
| $\rho_w = \frac{\gamma_w}{g=32.2ft/s^2} = 1.94\ slug/ft^3$ | Density of water |
| $f'c = 4{,}000\ psi$ | Concrete compressive strength |
| $f_y = 60\ ksi$ | Steel yield strength |
| $\phi = 0.75$ | Reduction factor for corbel design (ACI 318 16.5.4.2) |
| $\mu = 1.0$ | Coefficient of friction for concrete placed against hardened concrete with surface intentionally roughened to amplitude approximately ¼ inch (ACI 318 11.6) |
| Baffle upstream face: $c_c = 6\ in.$<br>Slab: $c_c = 4\ in.$ | Clear cover, distance from edge of structure to edge of reinforcement |

## Unfactored Loads

The hydraulic jump in the stilling basin is expected to occur downstream of the energy dissipators. As such, the baffle blocks were assumed not to be submerged, and the hydrodynamic force from incoming flow was calculated using the expected flow conditions immediately exiting the spillway chute.

The only load considered for calculation of the critical load combination is the hydrodynamic force from incoming flow. From conservation of momentum,

$$HD = \rho_w Q \Delta v$$

where

$Q = W_b d_1 v_1$ = flow rate in cubic ft per second (cfs)

$\Delta v = v_2 - v_1$ = change in velocity

Assume horizontal velocity upon hitting the baffle $v_2 = 0$ and rewrite:

$$HD = \rho_w W_b d_1 v_1^2 = 1.94(2)(1)(40^2)/1000 = 6.2\ kips$$

## Critical Load

The critical load occurs when a hydrodynamic force is present on the face of the baffle block. Using a load factor from USACE EM 1110-2-2104, the critical load is:

$$2.2HD = 2.2(6.2) = \mathbf{13.7\ kips}$$

Resultant/ultimate horizontal load:

$$V_u = 13.7\ kips$$

Shear span, distance from slab face to acting point of $V_u$ :

$$a = \frac{1}{2} d_1 = \frac{1}{2}(1) = 0.5\ ft$$

Resultant ultimate moment:

$$M_u = V_u \times a = 13.7(0.5) = 6.9\ kip - ft$$

Assumed vertical load based on ACI 318 16.2.2:

$$N_{uc} = 0.2V_u = 2.7\ kips$$

**Strut-and-Tie Model**

A strut-and-tie model was used to determine forces within the baffle and slab beneath the baffle (ACI 318 23). A free-body diagram showing the location of the applied hydrodynamic force and the idealization of the internal forces is shown in **Figure 4-1**.

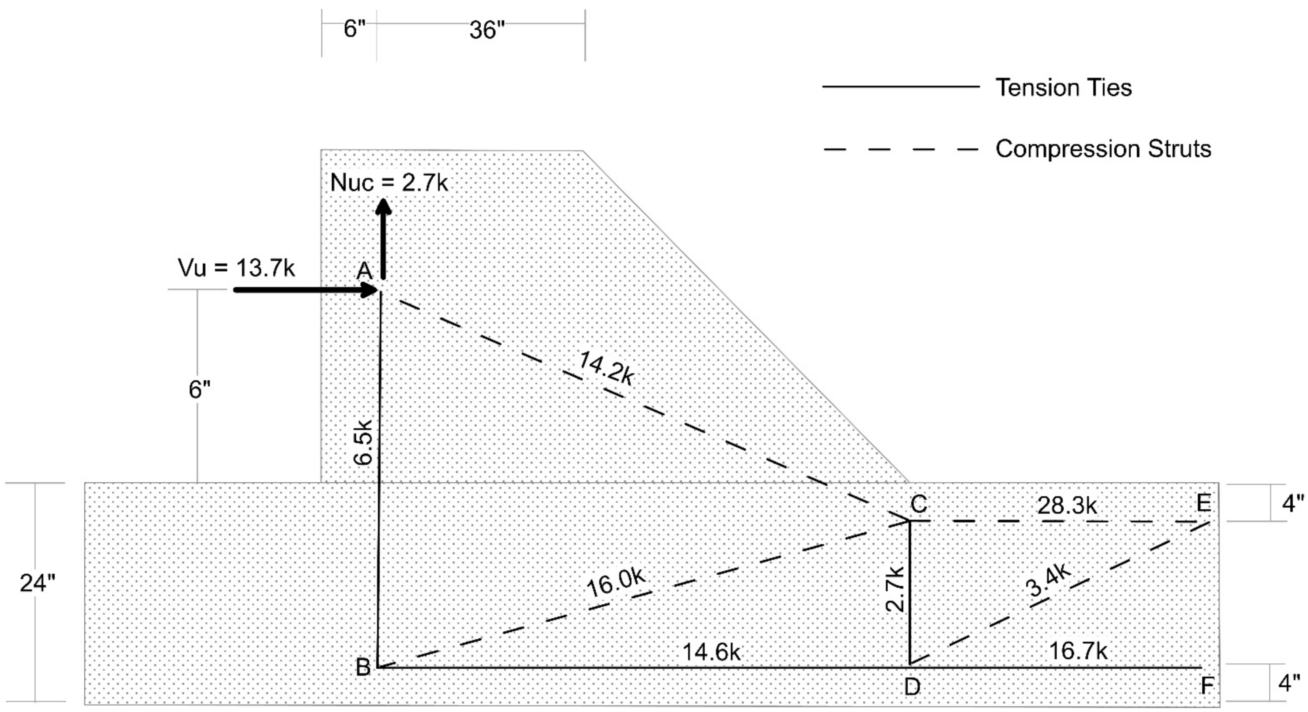



**Figure 4-1. Strut-and-Tie Model for Baffle Block (Not to Scale)**

**Primary Tension Reinforcement**

Area of steel required for primary tension reinforcement: $A_s = \frac{F}{\phi f_y}$

Tie AB: $A_s = \frac{F_{AB}}{0.75*60} = \frac{6.5}{0.75*60} = 0.15\ in^2$

Tie CD: $A_s = \frac{F_{CD}}{0.75*60} = \frac{2.7}{0.75*60} = 0.07\ in^2$

Ties BD and DF (DF controls since $F_{DF} > F_{BD}$): $A_s = \frac{F_{DF}}{0.75*60} = \frac{16.7}{0.75*60} = 0.37\ in^2$

Provide at least 2 No. 5 framing bars to satisfy steel demand for Ties AB, BD, and DF. Since Tie DF has the highest required $A_s$, check:

2 No. 5 framing bars: $A_s = 2 \times 0.31 = 0.62\ in^2 > 0.37\ in^2$

If framing bars are not closed, provide at least 1 No. 5 tie to satisfy the steel demand for Tie CD:

1 No. 5 tie: $A_s = 1 \times 0.31 = 0.31\ in^2 > 0.07\ in^2$

**Strut Widths**

Width of strut (check that clear cover is sufficient to contain width): $w_s = \frac{F}{w_b \phi (0.75)(0.85) f_c'}$

Strut AC: $$w_s = \frac{F_{AC}}{(24)(0.75)(0.75)(0.85)(4.0)} = \frac{14.2}{45.9} = 0.31\ in.$$

Strut BC: $$w_s = \frac{F_{BC}}{(24)(0.75)(0.75)(0.85)(4.0)} = \frac{16.0}{45.9} = 0.35\ in.$$

Strut CE: $$w_s = \frac{F_{CE}}{(24)(0.75)(0.75)(0.85)(4.0)} = \frac{28.3}{45.9} = 0.62\ in.$$

Strut DE: $$w_s = \frac{F_{DE}}{(24)(0.75)(0.75)(0.85)(4.0)} = \frac{3.4}{45.9} = 0.07\ in.$$

All struts lie within baffle cross section, clear covers are adequate.

**<u>Secondary Reinforcement</u>**

Must provide closed stirrups or ties uniformly spaced within 2/3d (24 in.) from the primary tension reinforcement satisfying

$$A_{h,min} = 0.5(A_{sc} - A_n)$$

where

$$A_{sc} = A_s = 0.62 + 0.31 = 0.93\ in^2$$

$$A_n = \frac{N_u}{\phi f_y} = \frac{2.7}{0.75*60} = 0.06\ in^2$$

$$A_{h,min} = 0.5(0.93 - 0.06) = 0.44\ in^2$$

Only one No. 5 closed stirrup would be needed to satisfy $A_{h,min}$; however, to maintain a spacing less than 12 in. within 2/3d = 24 in., provide at least two No. 5 closed stirrups at 8-in. spacing.

$$A_h = 4A_{s,bar} = 4 \times 0.31 = 1.24\ in^2 > A_{h,min}\ \text{OK}$$

**Nominal Design Moment**

Check that the primary tension reinforcement also satisfies the flexural demand and that $\phi M_n \geq M_u$.

$$M_n = A_s f_y c_{c,baffle} = 0.80(60)(6) = 288\ kip - in = 24\ kip - ft$$
$$\phi M_n = 0.75(24) = 18\ kip - ft$$

Since $\phi M_n \geq M_u$ , the flexural demand is satisfied by the primary tension reinforcement.

**Shear Strength**

Area of steel required at baffle-slab interface (ACI 318 18.12.9):

$$A_{vf} = \frac{V_u}{\phi f_y \mu} = \frac{13.7}{0.75*60*1.0} = 0.30\ in^2$$

Shear reinforcement is provided by the stirrups and Ties AB and AC. From the secondary reinforcement alone, two No. 5 closed stirrups provide:

$$A_s = 4 \times 0.31 = 1.24\ in^2 > 0.30\ in^2$$

No additional shear reinforcement is required, and the shear strength requirement is satisfied.

**Minimum Reinforcement for Temperature and Shrinkage Control**

Minimum reinforcement for temperature and shrinkage control is 0.003 times the gross cross-sectional area, half in each face, or no less than No. 4 bars at 12-in. spacing (USACE EM 1110-2-2104 2.9.1). This condition is satisfied by the framing bars and by the secondary reinforcement for the struts.

**Result**

- Provide at least 2 No. 5 framing bars at 10-in. spacing for Ties AB, BD, and DF
- If framing bars are not closed, provide at least 1 No. 5 tie for Tie CD
- Provide 2 No. 5 closed stirrups at 8-in. spacing parallel to Tie AB and with 24 in. of Tie AB

# ATTACHMENT 5
## Reinforcement Development and Splicing Structural Calculations

# Reinforcement Development and Splicing Structural Calculations

REFERENCES:

- American Concrete Institute (ACI) 318-19 Structural Concrete Building Code

This calculation evaluates the hook length, lap splice length, and embedment length required per standard reinforcing bar number for development of steel members in tension.

**Input Parameters**

| | |
|---|---|
| $f'c = 4{,}000\ psi$ | Concrete compressive strength |
| $f_y = 60\ ksi$ | Steel yield strength |

**Embedment**

Embedment or development length for normalweight concrete with uncoated reinforcement is calculated as

No. 6 and smaller bars: $$l_d = \frac{f_y}{25\sqrt{f_c'}} d_b = \frac{60{,}000}{25\sqrt{4{,}000}} d_b = 37.95 d_b$$

No. 7 and larger bars: $$l_d = \frac{f_y}{20\sqrt{f_c'}} d_b = \frac{60{,}000}{20\sqrt{4{,}000}} d_b = 47.43 d_b$$

where $d_b$ is bar diameter. The value of $l_d$ shall not be taken as smaller than 12 in.

**Hook Length**

The development length of a standard hook for normalweight concrete with uncoated reinforcement, spacing larger than $6d_b$, and cover of 2.5 in. or greater is calculated as

$$l_{dh} = \frac{f_y \psi_c}{55\sqrt{f_c'}} d_b^{1.5}$$

Where $\psi_c = f_c'/15{,}000 + 0.6$ for $f_c' < 6{,}000\ psi$. The value of $l_{dh}$ shall not be taken as smaller than 6 in. or $8d_b$.

$$\psi_c = 4{,}000/15{,}000 + 0.6 = 0.87$$

$$l_{dh} = \frac{0.87 f_y}{55\sqrt{f_c'}} d_b^{1.5} = \frac{0.87(60{,}000)}{55\sqrt{4{,}000}} d_b^{1.5} = 14.95 d_b^{1.5}$$

**Lap Splice Length**

The lap splice length for bars in sections where provided area of steel is less than 2.0 times the required area of steel is calculated as

$$l_{st} = 1.3 l_d$$

**Results**

The resulting embedment, hook, and lap splice lengths are shown in **Table 2**. When 12 in. or more of fresh concrete is placed below horizontal reinforcement, the lap and embedment lengths are to be multiplied by a factor of 1.3.

# LAKE PETIT DAM

## Pickens County, Georgia

## State ID No. 112-009-00462

## NID No. GA00685

## Scour Protection for Spillway Design of Lake Petit Dam

## Calculation Package

## Revision 0

*Prepared for:*

**Big Canoe® Property Owners Association, Inc.**
10586 Big Canoe
Jasper, GA 30143

*Prepared by:*

**Geosyntec Consultants, Inc.**
200 E. Main St., Suite 6
Johnson City, TN 37604

Project No: TJD10771

Document No: GA250026

February 2025

Geosyntec
consultants

# CALCULATION PACKAGE COVER SHEET

**Client:** Big Canoe Property Owners Association **Project:** Spillway Design of Lake Petit Dam

**Project No.:** TJD10771 **Task #:** 04/02

**TITLE OF COMPUTATION** Scour Protection for Spillway Design of Lake Petit Dam

**COMPUTATIONS BY:** Signature ____________ 12/20/2024 DATE

Printed Name Kelsey Boldiszar
and Title Senior Staff Engineer

**ASSUMPTIONS AND PROCEDURES**

**CHECKED BY:** Signature ____________ 12/27/2024 DATE
(Peer Reviewer)

Printed Name Maria Limas, P.E.
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**COMPUTATIONS CHECKED BY:** Signature ____________ 12/27/2024 DATE

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**COMPUTATIONS BACKCHECKED BY:** Signature ____________ 01/22/2025 DATE
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**APPROVED BY:** Signature ____________ 02/10/2025 DATE
(PM or Designate)

Printed Name John W. Barrett, P.E. (GA)
and Title Principal Engineer

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### LIST OF ATTACHMENTS

# RECORD OF REVISIONS

| Revision Number & Date | Description of Revision |
|---|---|
| Rev. 0 – 10 February 2025 | Initial Submittal |

# CALCULATION PACKAGE

## 1 PURPOSE AND SCOPE

This Calculation Package (Package) was prepared by Geosyntec Consultants, Inc. (Geosyntec) for the design of scour protection at the outlet of the spillway stilling basin for the Lake Petit Dam (Dam). This Package documents the methods used to predict scour depth and extents and to evaluate the scour protection required to resist scour at the outlet of the spillway stilling basin.

## 2 MAIN ASSUMPTIONS/CONSTRAINTS

For the analyses, the following main assumptions were considered:

- The proposed width of the stilling basin outlet is 25 feet (ft).
- Scour protection is assumed to be achieved by a standard riprap apron.
- The apron is assumed to be the same width as the stilling basin outlet (i.e., 25 ft) as recommended by the Georgia Department of Transportation (GDOT) for aprons constructed parallel to an existing channel (GDOT, 2025).
- Based on the hydrology and hydraulics calculation package for the project (Geosyntec, 2025), flow depth exiting the stilling basin was assumed to be 4 ft, and average flow velocity exiting the stilling basin was assumed to be 20 ft per second (ft/s).
- The material at the stilling basin outlet is assumed to be fine-grained with a median particle size, $D_{50}$, of 0.075 millimeters (mm) based on laboratory data from exploratory drilling by Geosyntec (2021).

## 3 METHODOLOGY

To evaluate the maximum expected scour depth, procedure 24-20(2) by the National Cooperative Highway Research Program (NCHRP, 2015) for predicting abutment scour was used and was then compared to the recommendations by the Federal Highway Administration (FHWA, 2006) and GDOT (2025) for design of riprap aprons. The NCHRP 24-20(2) method assumes that abutment scour is a function of contraction scour at a long contraction multiplied by an amplification factor, which accounts for nonuniform flow and turbulence. The NCHRP 24-20(2) method also includes provisions for scour prediction when flow expands rather than contracts, such as the case where flow from a stilling basin channel becomes unconfined at an outlet. Results of the NCHRP 24-20 procedure were then compared to a Hydraulic Engineering Circular 14 (HEC 14) procedure by the Federal Highway Administration (FHWA, 2006) for design of riprap aprons, which determines apron depth based on the riprap class with the $D_{50}$ necessary to resist scour. The larger apron depth from the two methods was selected as the design depth, provided that it exceeded the GDOT minimum. The required GDOT riprap class was selected from 2025 GDOT standards based on the calculated $D_{50}$ from the FHWA procedure. Finally, FHWA HEC 14 guidance was used to determine the required length of the riprap apron, with a minimum length requirement equal to the width of the outlet (i.e., 25 ft).

The general design sequence for scour protection at the stilling basin outlet was as follows:

1. Calculate scour depth based on NCHRP 24-20(2):

    a. Determine the applicable scour condition. Scour Condition A, where the abutment is set near the main channel, was selected over Scour Condition B, where the abutment is setback from the main channel, since Scour Condition A tends to predict higher scour depths and is more realistic for an uncontrolled flow condition that would erode a channel over time.

    b. Determine the ratio of unit discharge immediately downstream of the outlet ($q_2$) to the unit discharge within the stilling basin channel ($q_1$). For flow expansion, NCHRP 24-20(2) recommends a minimum ratio of 1.1 to avoid underprediction of scour depth.

    c. Determine if live-bed or clear-water scour conditions prevail by comparing average velocity in the channel (V) to critical velocity ($V_c$) for the median particle size ($D_{50}$).

    d. Calculate contraction-scour flow depth ($y_c$) and graphically select the amplification coefficient (α) corresponding to the scour conditions determined in the previous steps.

e. Calculate scour hole depth ($y_s$) which represents the required riprap apron depth by this method.

2. Calculate apron dimensions and riprap class based on FHWA HEC 14 and GDOT guidance, respectively:

   a. Calculate the $D_{50}$ of the riprap required to resist scour at the spillway stilling basin outlet.

   b. Select the appropriate riprap class from GDOT to satisfy the required $D_{50}$.

   c. Calculate the required apron depth and length using the FHWA riprap class satisfying the required $D_{50}$. If design apron length is less than the channel width, increase apron length to be equal to the channel width.

3. Compare and select the larger apron depth from the two methods to be the recommended design depth of the riprap apron. Apron length is as determined by FHWA HEC 14.

## 4 INPUT PARAMETERS

The following input parameters were utilized for the analysis:

**Table 4-1: Scour Protection Calculation Input Parameters**

| Input Parameter: | Value: | Units: |
|---|---|---|
| Average flow depth in stilling basin, $y_1$ | 4 | ft |
| Average flow velocity in stilling basin, $V$ | 20 | ft/s |
| Median particle size, $D_{50}$ | 0.075 | mm |
| Channel Outlet Width, B | 25 | ft |

## 5 ANALYSIS OF RESULTS

The following points summarize the pertinent geometry and riprap details for the design of scour protection at the base of the spillway stilling basin. Calculations can be found in **Attachment 1**, and a sketch of the final recommended riprap apron design can be found in **Figure 1**. A formal detail of the apron is included in the design drawings for the spillway, which includes necessary information for construction not shown in **Figure 1**, such as separation geotextile and tie-in to existing grade.

- NCHRP 24-20(2) resulted in a riprap apron depth of 1.5 ft, and FHWA HEC 14 resulted in a riprap apron depth of 2.0 ft. As such, the design depth of the riprap apron is 2.0 ft.
- The required riprap class for the apron is GDOT Type 3, with a $D_{50}$ of 9 inches.
- The design length of the riprap apron was calculated as 20 ft but was selected as 25 ft based on the FHWA HEC 14 recommendation that the length of the apron be no shorter than the width of the outlet.

The results presented in this Package are valid for the assumptions stated and the hydraulic conditions anticipated based on these assumptions. If assumptions or hydraulic conditions change, the scour protection calculations should be reviewed and revised if necessary to ensure that the riprap apron is adequately sized and the proper class of riprap is provided to resist scour.

## 6 REFERENCES

Federal Highway Administration, 2006. *"Hydraulic Engineering Circular No. 14, Third Edition: Hydraulic Design of Energy Dissipators for Culverts and Channels."* Denver, Colorado.

Georgia Department of Transportation, 2025. "*Construction Standards and Details.*" Detail D-55A.

Geosyntec Consultants, 2021. *"Lake Petit Dam Spillway Improvements Alternatives Analysis – Draft."* Johnson City, Tennessee.

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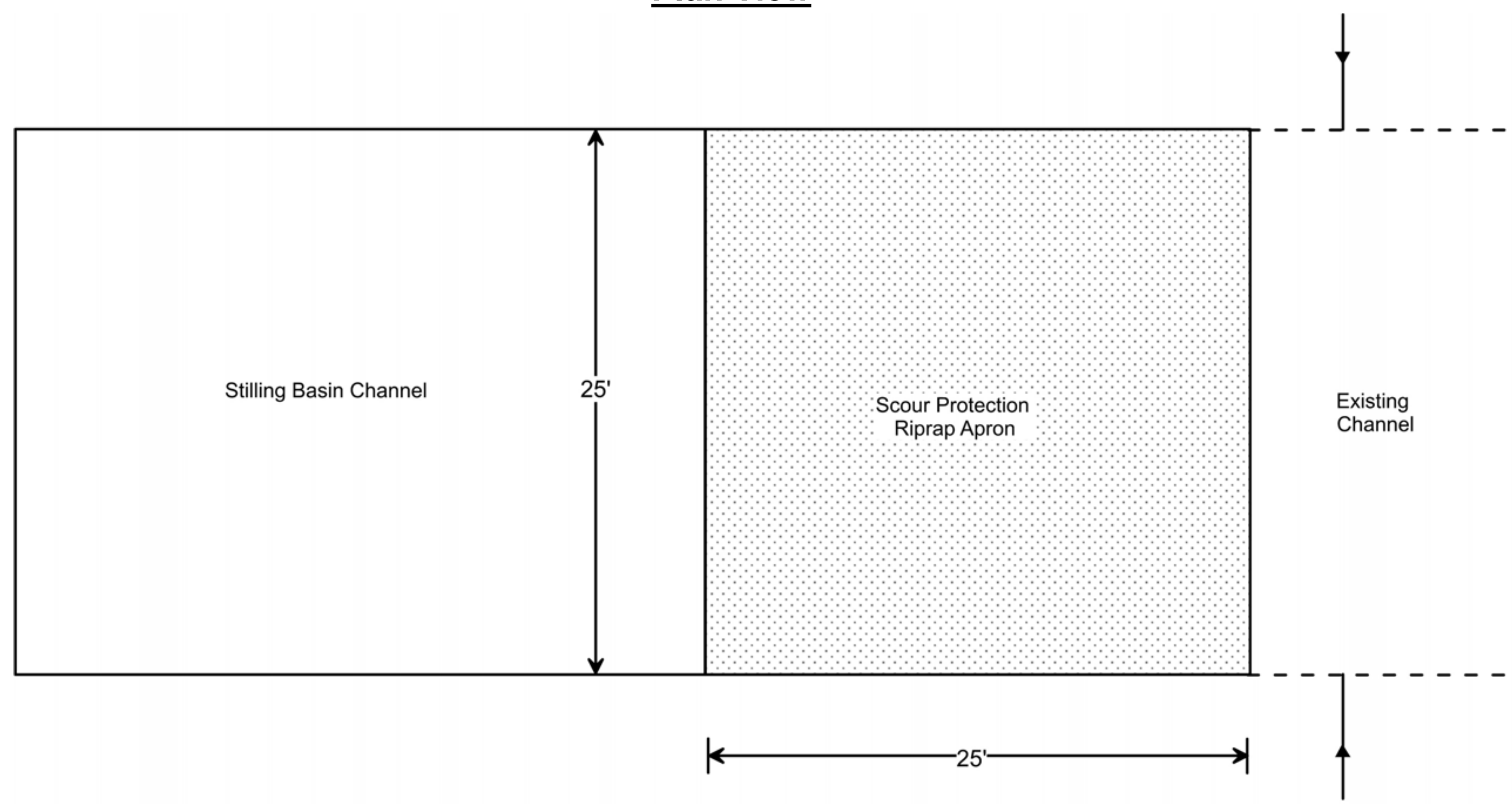
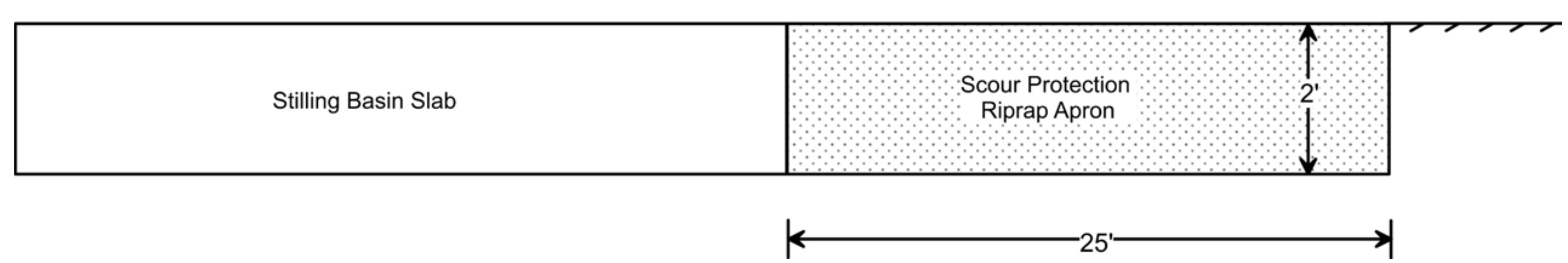
National Cooperative Highway Research Program, 2015. *"NCHRP 24-20(2): Evaluation of Abutment Scour Equations from NCHRP Projects 24-15(2) and 24-20 Using Laboratory and Field Data."* Washington, District of Columbia.

**FIGURES**

## Plan View




## Profile View




Note:

- Intended to show simplified geometry only and does not include details such as geotextile requirements or tie-in to existing grades.

**Simplified Scour Protection Geometry**

Lake Petit Dam
Big Canoe

Geosyntec consultants

Project No.: TJD10771 | February 2025

**Figure** 1

**ATTACHMENT 1**
**Scour Protection Calculations**

# NCHRP 24-20(2) Scour Depth Procedure

**INPUTS**

| | | |
|---|---|---|
| Avg flow depth, y1 | 4 | ft |
| Avg channel velocity, V | 20 | ft/s |
| Soil median particle size, D50 | 0.003 | in |

1. Determine the unit discharge in the bridge cross section

Let discharge per unit width in the channel = q1 and discharge per unit width at the outlet = q2.
Flow is conserved, and since width at outlet > width in channel, q2 < q1 and q2/q1 < 1.
NCHRP 24-20(2) recommends minimum q2/q1 = 1.1 to avoid underprediction of scour depth.

q2/q1 1.1

2. Determine if live-bed or clearwater contraction scour conditions.

If the critical velocity Vc > V, then clear-water contraction scour is assumed.
If the critical velocity Vc < V, then live-bed contraction scour is assumed.

Critical velocity (Laursen, 1963):
Vc = K*y1^(1/6)*D50^(1/3)
Vc= 0.8819 ft/s < V, so live bed assumed

3. Calculate contraction-scour flow depth (Yc)

Contraction-scour flow depth (Laursen, 1960):
Yc = y1*(q2/q1)^(6/7)
Yc = 4.34 ft

4. Determine the amplification coefficient graphically (Figure 2-3)

Solid curve to be used in design; dashed curves represent theoretical conditions (FHWA, 2012)
Width at outlet > width in channel, so q2/q1 < 1
Since q2/q1 < 1, use minimum amplification factor for q2/q1 = 1.0
alpha 1.2

# NCHRP 24-20(2) Scour Depth Procedure

4 (Continued). Determine the amplification coefficient graphically (Figure 2-3)

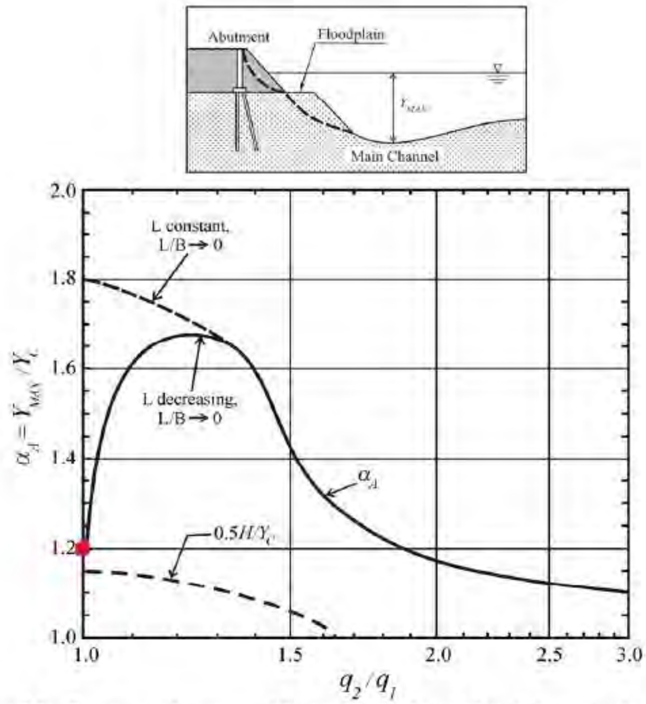



**Figure 2-3.** Design curve for scour-amplification factor, $\alpha$, for spill-through abutments subject to Scour Condition A ($L/B_f \geq 0.75$) (from Ettema et al. 2010).

5. Calculate abutment-scour flow depth (Ymax) and scour-hole depth (ys)

| | | |
|---|---|---|
| Ymax = alpha*Yc | 5.5 | ft |
| Ys = Ymax - y1 | 1.5 | ft |


REFERENCES

Federal Highway Administration (FHWA), 2012. "*Hydraulic Engineering Circular No. 18, Fifth Edition: Evaluating Scour at Bridges* ." Fort Collins, Colorado.

Laursen, E.M., 1960. “*Scour at bridge crossings* .” Journal of the Hydraulics Division, ASCE, 86(2), 39-54.

Laursen, E.M., 1963. “*An analysis of relief bridge scour.* ” Journal of the Hydraulics Division, ASCE, 86(2), 93-118.

National Cooperative Highway Research Program, 2015. *“NCHRP 24-20(2): Evaluation of Abutment Scour Equations from NCHRP Projects 24-15(2) and 24-20 Using Laboratory and Field Data.”*

# FHWA HEC 14 Riprap Apron Dimensions Procedure

**INPUTS**

| | | | |
|---|---|---|---|
| Avg flow depth, y1 | 4 | ft | = culvert rise, D |
| Avg channel velocity, V | 20 | ft/s | |
| Culvert width, B | 25 | | |
| Flow rate, Q | 2000 | cfs | |

1. Determine the median riprap size to resist scour.

For a rectangular culvert (closest to case of channel outlet) from Urban Drainage and Flood Control District (UD&FCD, 2004), as seen in Appendix D of FHWA HEC 14:

$$D_{50} = 0.014D\left(\frac{Q}{\alpha BD^{1.5}}\right)\left(\frac{D}{TW}\right) \qquad \text{(D.1b)}$$

where,

$D_{50}$ = riprap size, m (ft)
Q = design discharge, $m^3/s$ ($ft^3/s$)
D = culvert diameter (circular) or culvert rise (rectangular), m (ft)
B = culvert span (rectangular), m (ft)
TW = tailwater depth, m (ft)
$\alpha$ = unit conversion constant, 1.811 (SI) and 1.0 (CU)

| | | |
|---|---|---|
| $D_{50}$ | 0.56 | ft |
| | 6.72 | in |

2. Determine the required riprap class.

Per the Georgia Department of Transportation (GDOT, 2025), if the required D50 < 0.70 ft, GDOT Type 3 riprap may be used and must have a minimum apron depth of 1.5 ft. Therefore, since 6.72 in. < 0.70 ft, GDOT Type 3 riprap may be used.

3. Determine the required depth and length of the apron from FHWA HEC 14 Table 10.1.

**Table 10.1. Example Riprap Classes and Apron Dimensions**

| Class | $D_{50}$ (mm) | $D_{50}$ (in) | Apron Length[1] | Apron Depth |
|---|---|---|---|---|
| 1 | 125 | 5 | 4D | $3.5D_{50}$ |
| 2 | 150 | 6 | 4D | $3.3D_{50}$ |
| 3 | 250 | 10 | 5D | $2.4D_{50}$ |
| 4 | 350 | 14 | 6D | $2.2D_{50}$ |
| 5 | 500 | 20 | 7D | $2.0D_{50}$ |
| 6 | 550 | 22 | 8D | $2.0D_{50}$ |

[1] D is the culvert rise.

For 6<D50<10, calculate the apron dimensions based on FHWA Class 3 riprap (similar dimensions as GDOT Type 3).

| | | | |
|---|---|---|---|
| Apron Depth = 2.4 D50 = | 2.0 | ft | > GDOT min. 1.5 ft, OK |
| Apron Length = 5D | 20 | ft | |

However, FHWA recommends that apron length be no less than B.
Increase apron length to minimum 25 ft.

# FHWA HEC 14 Riprap Apron Dimensions Procedure

REFERENCES

Federal Highway Administration, 2006. *“Hydraulic Engineering Circular No. 14, Third Edition: Hydraulic Design of Energy Dissipators for Culverts and Channels.”* Denver, Colorado.

Georgia Department of Transportation, 2025. "Construction Standards and Details." Detail D-55A.

Urban Drainage and Flood Control District, 2004. “Drainage Criteria Manual: Major Drainage,” Denver, Colorado.

# LAKE PETIT DAM

## Pickens County, Georgia

## State ID No. 112-009-00462

## NID No. GA00685

## Soil Nail Excavation Reinforcement for Spillway Design of Lake Petit Dam

## Calculation Package

## Revision 0

*Prepared for:*

**Big Canoe® Property Owners Association, Inc.**
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Project No: TJD10771

Document No: GA250025

February 2025

Geosyntec consultants

# CALCULATION PACKAGE COVER SHEET

**Client:** Big Canoe Property Owners Association **Project:** Spillway Design of Lake Petit Dam

**Project No.:** TJD10771 **Task #:** 04/02

**TITLE OF COMPUTATION** Soil Nail Excavation Reinforcement

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DATE: 02/10/2025

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|---|---|
| Rev. 0 – 10 February 2025 | Initial Submittal |

# CALCULATION PACKAGE

## 1 PURPOSE AND SCOPE

This Calculation Package (Package) was prepared by Geosyntec Consultants, Inc. (Geosyntec) for the design of a soil nail reinforced excavation along the existing spillway chute alignment as part of the spillway chute replacement for the Lake Petit Dam (Dam). A section of the spillway chute alignment for Lake Petit Dam has an existing property upslope (east) of the chute. An unsupported excavation cut at a two-horizontal-to-one-vertical (2.0H:1.0V) slope, which is being implemented elsewhere along the chute, may not be feasible along this section due to the possibility of undermining the existing property. To reduce the amount of cut material at the toe of the slope near the existing property, a steeper excavation slope reinforced by soil nails was selected as an alternative. This Package presents the methods used to identify the soil nail reinforcement required to support the steeper excavation slopes along this section of the spillway chute and the results of the analyses.

## 2 MAIN ASSUMPTIONS/CONSTRAINTS

The following information and constraints were considered for the analyses.

- Soil nails are only necessary for the steeper excavations along the spillway chute section in the vicinity of the existing property. The approximate limits of the steeper excavation are shown in **Figure 1**.
- The height of the steeper excavation to be reinforced by soil nails will not exceed 10 feet (ft), and the excavation slope will not be steeper than 0.5H:1.0V.
- The width of working space at the bottom of the excavation to the side of the spillway chute will be no less than 5 ft.
- The soil where the soil nail reinforcement is required is a sandy clay based on results from an investigation conducted by Geosyntec (2021).
- Soil strength parameters were selected based on Standard Penetration Test (SPT) N-value correlation (Meyerhof, 1956) and typical values from experience because no laboratory strength test data were available for the sandy clay encountered at the site.

- It is anticipated the soil nails will be rotary drilled, Grade 75 Number 8 threaded bars. The diameter of the drilled hole is expected to be a minimum of 4 inches (in.).
- Soil nail pullout resistance was selected from the Federal Highway Administration Soil Nail Walls Reference Manual (FHWA, 2015) based on the soil type and soil nail installation method.
- Soil nail tensile capacity was selected based on manufacturer specifications (Williams, 2025).
- Pullout and tensile capacity reduction factors for the soil nails were selected using factors of safety presented in the FHWA Soil Nail Walls Reference Manual (FHWA, 2015).

## 3 DESIGN CRITERIA

Slope stability analyses were performed to identify the soil nail reinforcement configuration required to achieve a minimum calculated factor of safety. A factor of safety equal to or greater than 1.50 is typically recommended for long-term (or drained) conditions while a factor of safety equal to or greater than 1.30 is typically recommended for short-term (or undrained) conditions (e.g., temporary or construction conditions) (U.S. Army Corps of Engineers, 2003). The excavation is expected to represent a short-term condition and thus, a minimum calculated factor of safety of 1.30 was selected as the design criterion for the slope stability analyses presented in this Package.

## 4 METHODOLOGY

Two representative cross-sections—one with an 8-ft excavation height and one with a 10-ft excavation height—were developed using approximate topography to analyze slope stability and the soil nail reinforcement configuration required for the steeper excavation along the spillway chute. The piezometric surface for the slope stability analyses was computed by seepage analyses performed with the computer program SEEP/W, version 2019 (Geo-Slope, 2019) using a steady-state groundwater elevation of 1,575 ft and drainage at the face of the excavation.

Limit equilibrium slope stability analyses were performed using the Morgenstern-Price method (Morgenstern and Price, 1965), as implemented in the computer program SLOPE/W, version 2019 (Geo-Slope, 2019). SLOPE/W generates potential slip surfaces within the defined soil stratigraphy then calculates the factor of safety for each slip surface and identifies the most critical slip surface with the lowest calculated factor of safety. Reinforcement lines (i.e., soil nails and anchors) were

Ranges of entry and exit locations for potential slip surfaces were defined along the analyzed cross-sections. The search for the critical slip surface was performed by initially selecting a large range of entry and exit locations, and then refining these ranges once the realistic locations of critical entry and exit locations were identified. SLOPE/W includes the capability to perform a segmental approach to optimize the critical slip surface and potentially reduce the calculated factor of safety. Following the identification of a critical slip surface, SLOPE/W incrementally modifies portions of the slip surface to identify an "optimized" slip surface with a lower calculated factor of safety. Slip surfaces produced by the optimization feature were scrutinized such that factors of safety corresponding to unrealistic failure surfaces were not reported. The maximum concave angles of the optimized failure surfaces were set at five degrees for the driving side and one degree for the resisting side of the sliding mass to preclude critical slip surfaces with concave shapes, which may not be physically admissible. The minimum sliding mass depth was set to 3 ft to avoid calculating slip surfaces representing surficial, localized failures that are not likely to impact the global stability of the excavation. These surficial failures can typically be repaired by routine maintenance.

## 5 INPUT PARAMETERS

The input parameters for the sandy clay soil and soil nail and anchor reinforcement modelled in the slope stability analyses are shown in **Tables 1 and 2**.

## 6 ANALYSIS OF RESULTS

The soil nail reinforcement configurations required for a 0.5H:1.0V excavation cut section along the spillway chute near the existing property are shown in **Figures 2 and 3** and are summarized below.

- For soil nail walls with a height of 8 ft or less, the following are required at 5-ft spacing along the excavation.
  - One 25-ft Grade 75 Number 8 soil nail installed 2.5 ft from the top of the excavation cut.
  - Top and bottom 5-ft-long Grade 75 Number 8 anchors.
- For soil nail walls with a height greater than 8 ft and up to 10 ft, the following are required at 5-ft spacing along the excavation.
  - Two 25-ft Grade 75 Number 8 soil nails. The top nail should be installed 2.5 ft from the top of the excavation cut, and the bottom nail should be installed 2.5 ft from the bottom of the excavation cut.
  - Top and bottom 5-ft Grade 75 Number 8 anchors.

Results of the slope stability analyses (i.e., critical slip surfaces and corresponding calculated factors of safety) to support the soil nail reinforcement design are shown in **Figures 4 to 7** and summarized in **Table 3**. Factors of safety greater than 1.30 were calculated for the cases analyzed, satisfying the design criterion for short-term conditions of the steeper excavations along the spillway chute.

# 7 REFERENCES

Federal Highway Administration, 2015. "*Soil Nail Walls Reference Manual.*" Publication No. FHWA-NHI-14-007, FHWA GEC 007. Washington, District of Columbia.

Geo-Slope, 2019a. SEEP/W – Finite Element Seepage Analysis Software. Geo-Slope International, Ltd., Calgary, Alberta, Canada.

Geo-Slope, 2019b. SLOPE/W – Slope Stability Analysis Software. Geo-Slope International, Ltd., Calgary, Alberta, Canada.

Geosyntec Consultants, 2021. "*Lake Petit Dam Spillway Improvements Alternatives Analysis – Draft.*" Johnson City, Tennessee.

Meyerhof, G. G., 1956. "*Penetration Tests and Bearing Capacity of Cohesionless Soils*." Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 82, No. SM1, pp. 1-19.

Peck, R., Hanson, W., and Thornburn, T., 1974. "*Foundation Engineering, Second Edition*." New York City, New York.

U.S. Army Corps of Engineers, 2003. *"Engineering and Design – Slope Stability."* Publication No. EM 1110-2-1902, U.S. Army Corps of Engineers, Washington, District of Columbia.

Williams Form Engineering Corp., 2025.

**TABLES**

**Table 1 – Summary of Soil Input Parameters [1]**

| Input Parameter (Units) | Sandy Clay | Partially Weathered Rock [4] |
|---|---|---|
| Unit Weight (pounds per cubic foot) | 125 | 125 |
| Effective Friction Angle (degrees) | 30 [2] | 35 |
| Effective Cohesion (pounds per square foot) | 50 [2] | 0 |
| Undrained Shear Strength (pounds per square foot) | 1,000 [3] | N/A |

**Notes:**

1. The concrete and bedrock were modelled as impenetrable in the slope stability analyses because the critical slip surfaces are not expected to pass through these elements.
2. Value selected based on Meyerhof (1956) SPT N-value correlations for an N-value of 10.
3. Value selected based on typical cohesion for sandy clay from Geosyntec experience.
4. Partially weathered rock is considered to be a freely draining unit and thus, is modelled using drained properties only, which were selected based on typical strength parameters encountered for this type of material.

**Table 2 – Summary of Soil Nail and Anchor Input Parameters**

| Input Parameter (Units) | Value |
|---|---|
| Pullout Resistance (pounds per square foot) | 1,000 [(1)] |
| Tensile Capacity (pounds-force) | 59,000 [(2)] |
| Diameter of Drilled Hole/Bond (inches) | 4 |
| Out-of-Plane Spacing (feet) | 5 |

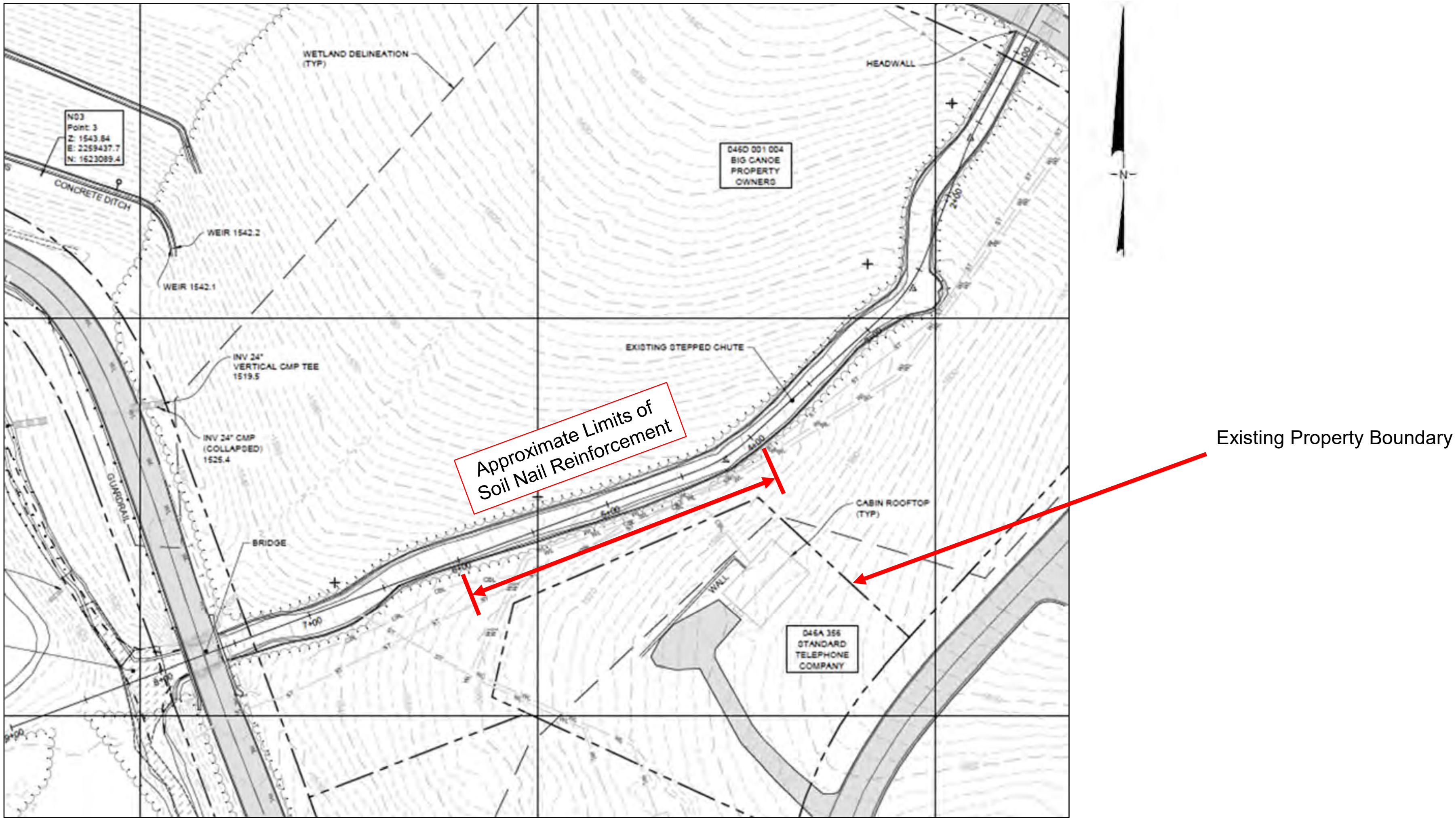
**Notes:**

1. Soil nail pullout resistance was selected from the FHWA Soil Nail Walls Reference Manual (FHWA, 2015) for rotary drilled installation method in silty clay soils.
2. Soil nail tensile capacity was selected based on manufacturer specifications (Williams, 2025).

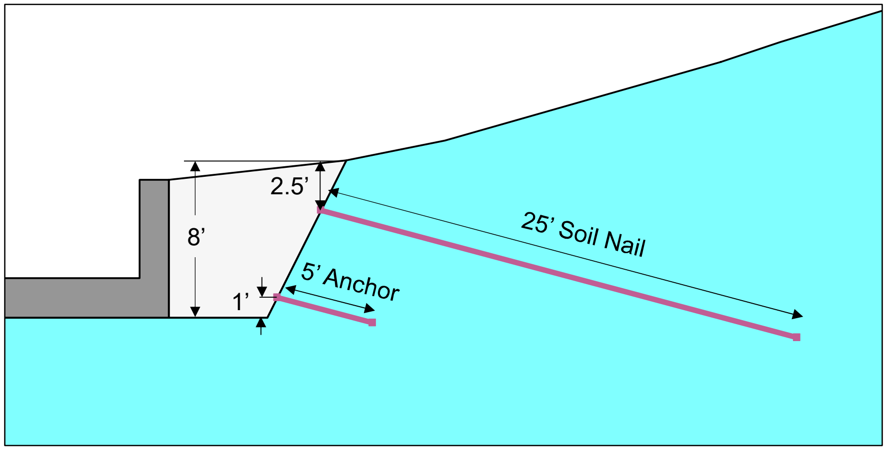
**Table 3 – Summary of Calculated Factors of Safety for Slope Stability Analyses**

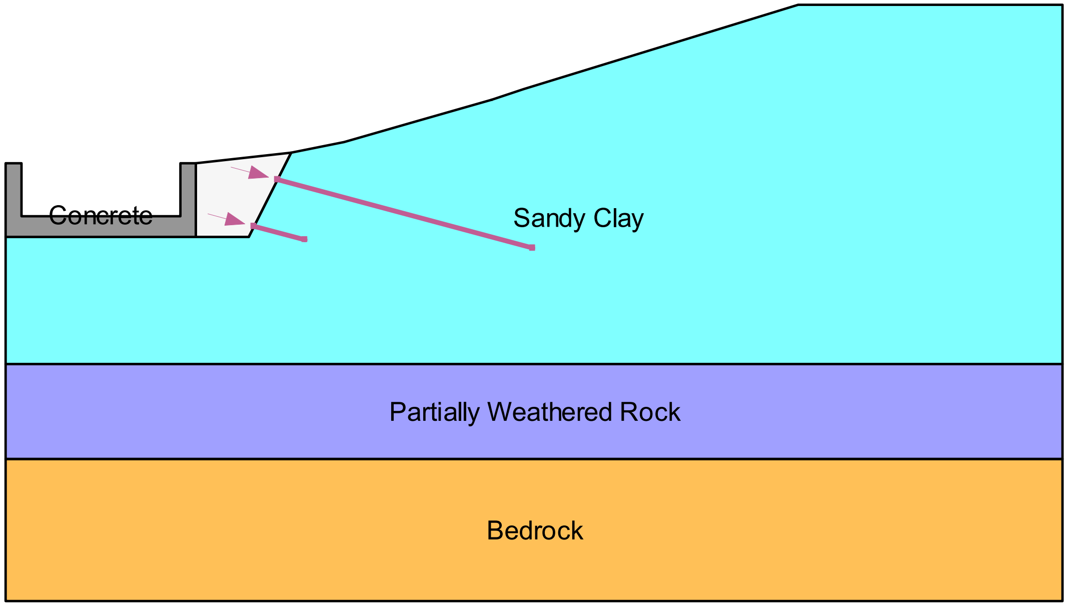
| Condition | Calculated Factor of Safety | | Required Minimum Factor of Safety |
|---|---|---|---|
| | 8 ft Excavation Height | 10 ft Excavation Height | |
| Drained | 1.46 | 1.57 | 1.30 |
| Undrained | 2.35 | 2.12 | 1.30 |

**FIGURES**




| **Plan View** | |
|---|---|
| Lake Petit Dam<br>Big Canoe | |
| Geosyntec consultants | **Figure**<br>1 |
| Project No.: TJD10771 | February 2025 |

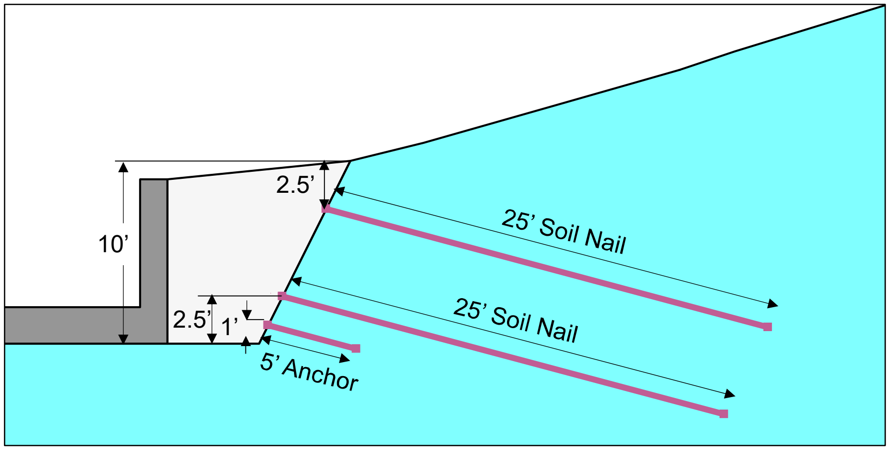


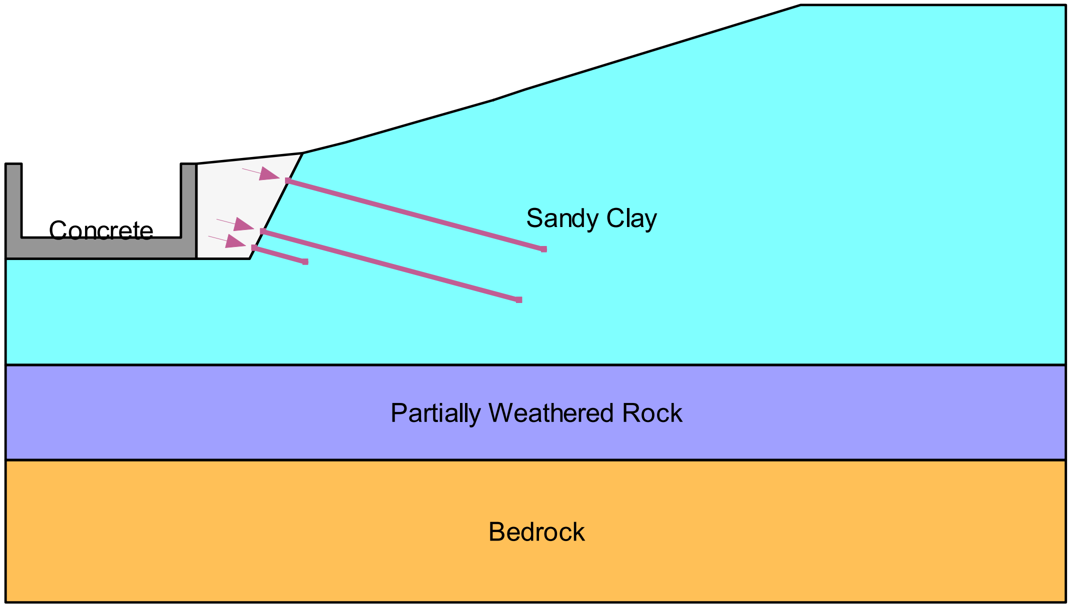




Note:

- Soil nails and anchors inclined 15 degrees from horizontal

| **8-Ft Excavation Geometry** | | |
|---|---|---|
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | **Figure**<br>2 |
| Project No.: TJD10771 | February 2025 | |



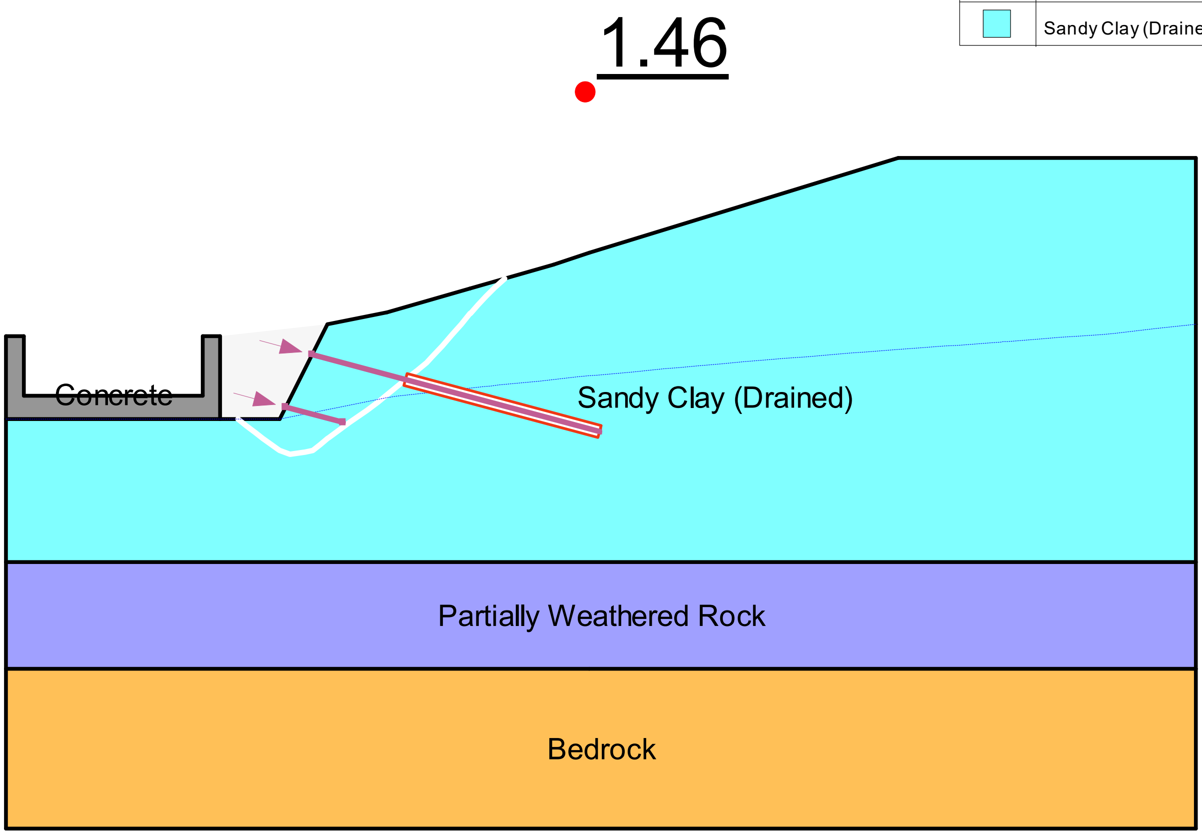




Note:

- Soil nails and anchors inclined 15 degrees from horizontal

| **10-Ft Excavation Geometry** | | |
|---|---|---|
| Lake Petit Dam<br>Big Canoe | | |
| Geosyntec consultants | | **Figure**<br>3 |
| Project No.: TJD10771 | February 2025 | |

| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|---|
| | Bedrock | Bedrock (Impenetrable) | | | |
| | Concrete | Bedrock (Impenetrable) | | | |
| | Partially Weathered Rock | Mohr-Coulomb | 125 | 0 | 35 |
| | Sandy Clay (Drained) | Mohr-Coulomb | 125 | 50 | 30 |




**8-Ft Excavation**
**Drained Slope Stability Results**

Lake Petit Dam
Big Canoe

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**Figure** 4

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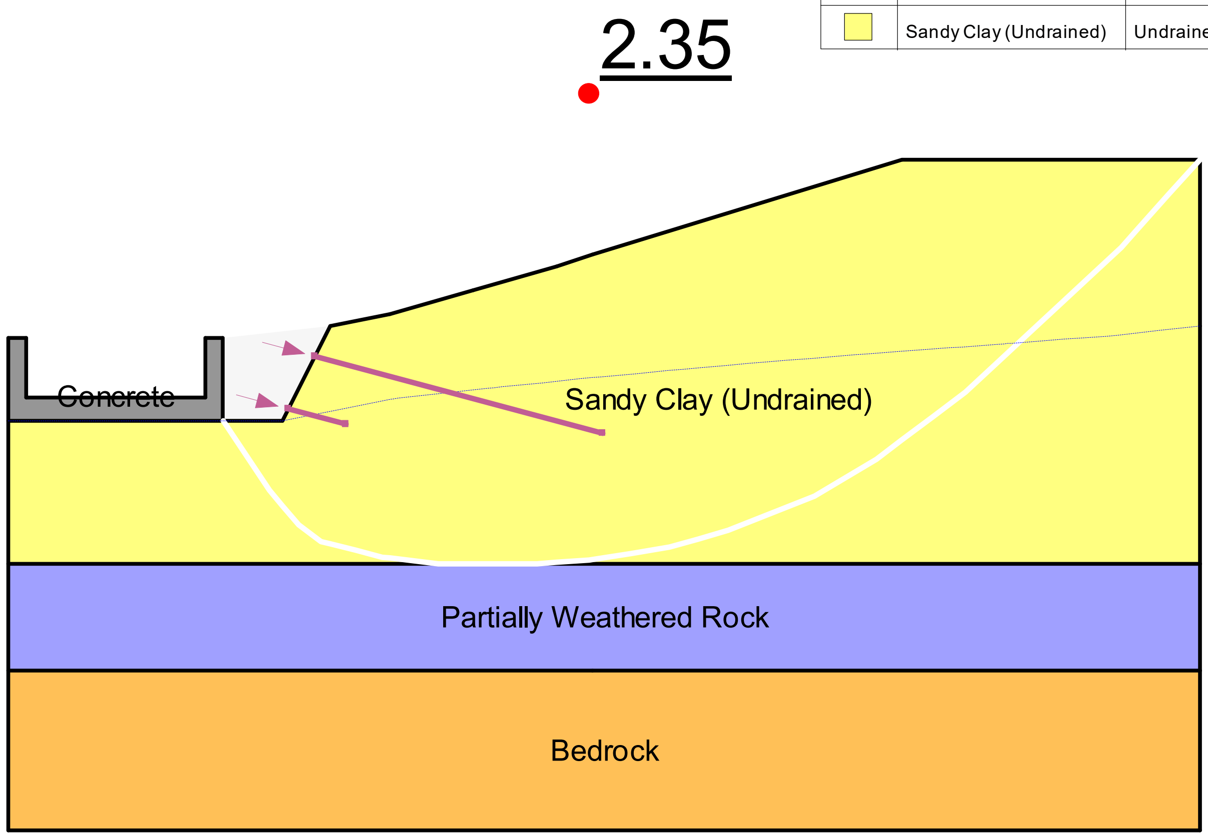
| Color | Name | Model | Unit Weight (pcf) | Cohesion (psf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|---|---|
| | Bedrock | Bedrock (Impenetrable) | | | | |
| | Concrete | Bedrock (Impenetrable) | | | | |
| | Partially Weathered Rock | Mohr-Coulomb | 125 | | 0 | 35 |
| | Sandy Clay (Undrained) | Undrained (Phi=0) | 125 | 1,000 | | |




**8-Ft Excavation**
**Undrained Slope Stability Results**

Lake Petit Dam
Big Canoe

Geosyntec consultants

**Figure** 5

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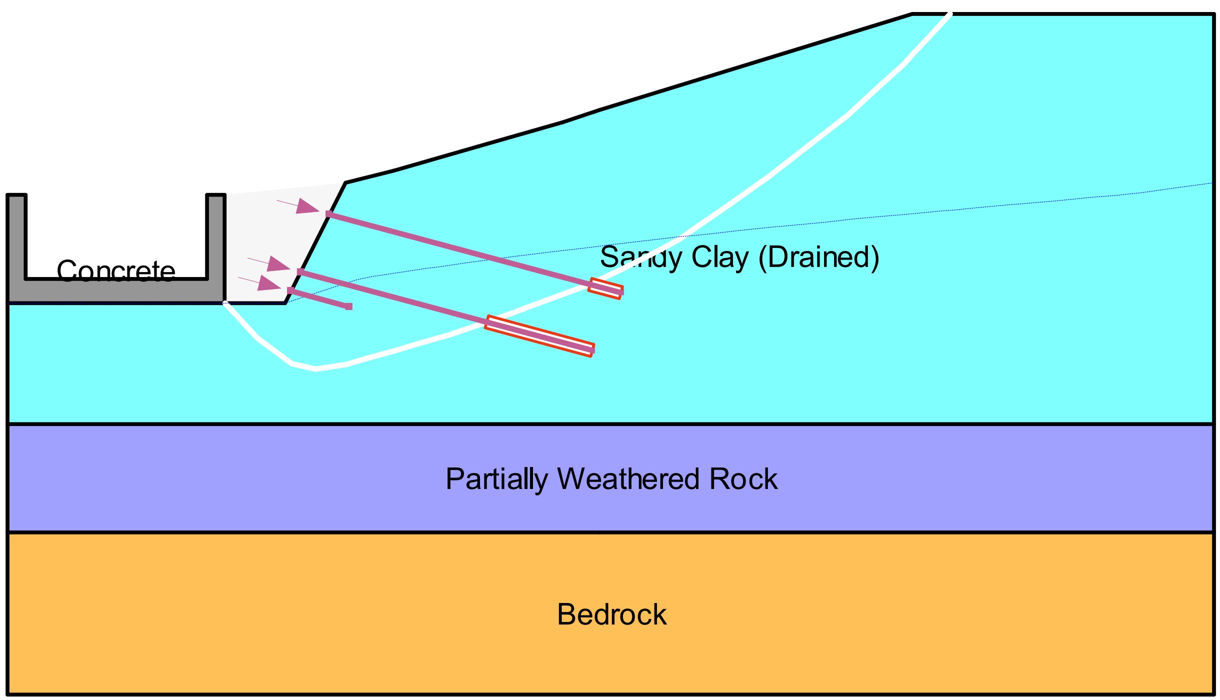
# 1.57

| Color | Name | Model | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|---|
| | Bedrock | Bedrock (Impenetrable) | | | |
| | Concrete | Bedrock (Impenetrable) | | | |
| | Partially Weathered Rock | Mohr-Coulomb | 125 | 0 | 35 |
| | Sandy Clay (Drained) | Mohr-Coulomb | 125 | 50 | 30 |




**10-Ft Excavation**
**Drained Slope Stability Results**

Lake Petit Dam
Big Canoe

Geosyntec consultants

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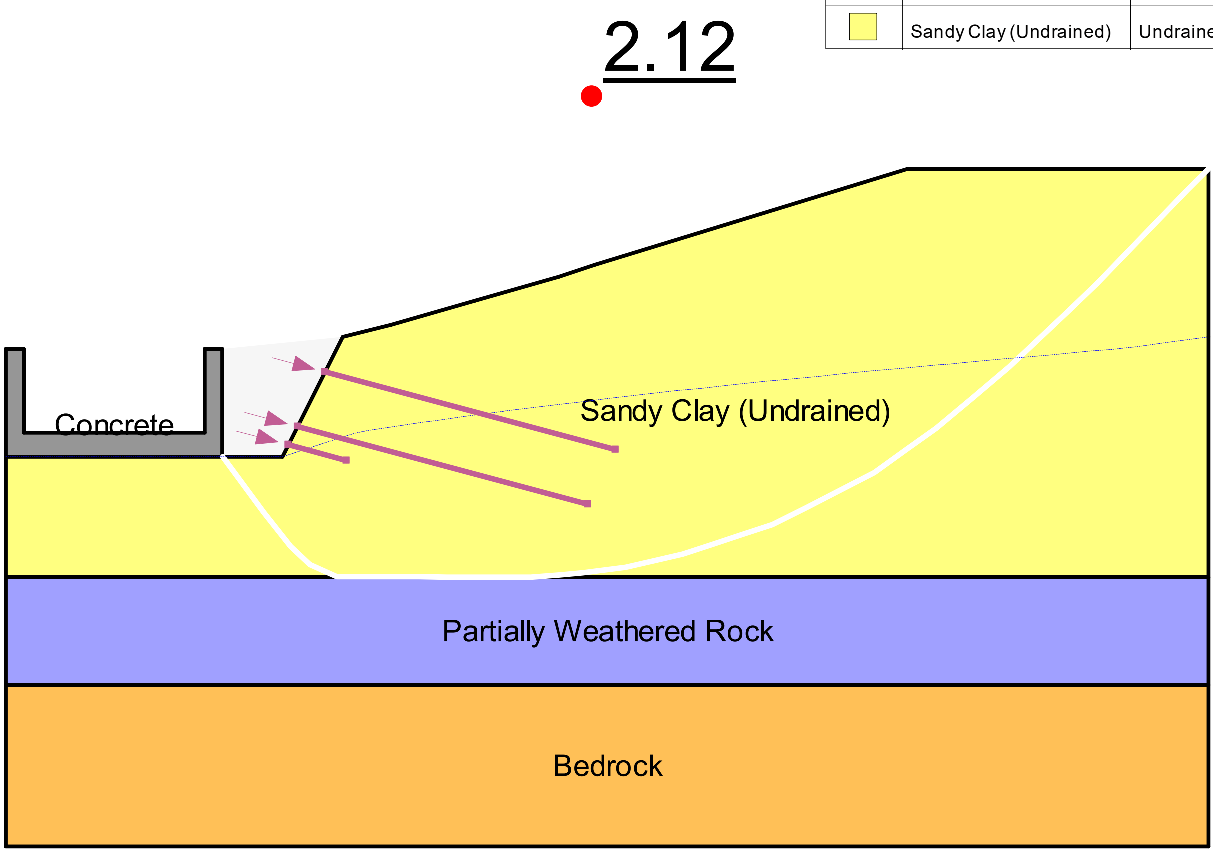
**Figure** 6

| Color | Name | Model | Unit Weight (pcf) | Cohesion (psf) | Cohesion' (psf) | Phi' (°) |
|---|---|---|---|---|---|---|
| | Bedrock | Bedrock (Impenetrable) | | | | |
| | Concrete | Bedrock (Impenetrable) | | | | |
| | Partially Weathered Rock | Mohr-Coulomb | 125 | | 0 | 35 |
| | Sandy Clay (Undrained) | Undrained (Phi=0) | 125 | 1,000 | | |




**10-Ft Excavation**
**Undrained Slope Stability Results**

Lake Petit Dam
Big Canoe

Geosyntec consultants

**Figure** 7

Project No.: TJD10771 | February 2025